

---

# **Blender Index**

***Release 2.59.0 - API***

**Blender Foundation**

August 26, 2011



# CONTENTS

<b>1</b>	<b>Blender/Python Documentation</b>	<b>3</b>
1.1	Quickstart Introduction . . . . .	3
1.2	Python API Overview . . . . .	11
1.3	Gotcha's . . . . .	18
<b>2</b>	<b>Application Modules</b>	<b>27</b>
2.1	Context Access (bpy.context) . . . . .	27
2.2	Data Access (bpy.data) . . . . .	31
2.3	Operators (bpy.ops) . . . . .	32
2.4	Types (bpy.types) . . . . .	170
2.5	Utilities (bpy.utils) . . . . .	1072
2.6	Path Utilities (bpy.path) . . . . .	1074
2.7	Application Data (bpy.app) . . . . .	1075
2.8	Property Definitions (bpy.props) . . . . .	1076
<b>3</b>	<b>Standalone Modules</b>	<b>1083</b>
3.1	Math Types & Utilities (mathutils) . . . . .	1083
3.2	Geometry Utilities (mathutils.geometry) . . . . .	1112
3.3	OpenGL Wrapper (bgl) . . . . .	1116
3.4	Font Drawing (blf) . . . . .	1146
3.5	Audio System (aud) . . . . .	1149
3.6	Extra Utilities (bpy_extras) . . . . .	1157
<b>4</b>	<b>Game Engine Modules</b>	<b>1163</b>
4.1	Game Types (bge.types) . . . . .	1163
4.2	Game Logic (bge.logic) . . . . .	1235
4.3	Rasterizer (bge.render) . . . . .	1249
4.4	Video Texture (bge.texture) . . . . .	1252
4.5	Game Keys (bge.events) . . . . .	1260
4.6	Physics Constraints (bge.constraints) . . . . .	1265
<b>5</b>	<b>API Info</b>	<b>1273</b>
5.1	Blender API Change Log . . . . .	1273
<b>Python Module Index</b>		<b>1291</b>
<b>Index</b>		<b>1293</b>



Welcome, this document is an API reference for Blender 2.59.0. built Unknown.

A PDF version of this document is also available



# BLENDER/PYTHON DOCUMENTATION

## 1.1 Quickstart Introduction

### 1.1.1 Intro

This API is generally stable but some areas are still being added and improved.

The Blender/Python API can do the following:

- Edit any data the user interface can (Scenes, Meshes, Particles etc.)
- Modify user preferences, keymaps and themes
- Run tools with own settings
- Create user interface elements such as menus, headers and panels
- Create new tools
- Create interactive tools
- Create new rendering engines that integrate with Blender
- Define new settings in existing Blender data
- Draw in the 3D view using OpenGL commands from Python

The Blender/Python API **can't** (yet)...

- Create new space types.
- Assign custom properties to every type.
- Define callbacks or listeners to be notified when data is changed.

### 1.1.2 Before Starting

This document isn't intended to fully cover each topic. Rather, its purpose is to familiarize you with Blender 2.5's new Python API.

A quick list of helpful things to know before starting:

- Blender uses Python 3.x; some 3rd party extensions are not available yet.
- The interactive console in Blender 2.5 has been improved; testing one-liners in the console is a good way to learn.
- Button tool tips show Python attributes and operator names.

- Right clicking on buttons and menu items directly links to API documentation.
- For more examples, the text menu has a templates section where some example operators can be found.
- To examine further scripts distributed with Blender, see `~/.blender/scripts/startup/bl_ui` for the user interface and `~/.blender/scripts/startup/bl_op` for operators.

### 1.1.3 Key Concepts

#### Data Access

##### Accessing datablocks

Python accesses Blender's data in the same way as the animation system and user interface, which means any setting that is changed via a button can also be changed from Python.

Accessing data from the currently loaded blend file is done with the module `bpy.data`. This gives access to library data. For example:

```
>>> bpy.data.objects
<bpy_collection[3], BlendDataObjects>

>>> bpy.data.scenes
<bpy_collection[1], BlendDataScenes>

>>> bpy.data.materials
<bpy_collection[1], BlendDataMaterials>
```

##### About Collections

You'll notice that an index as well as a string can be used to access members of the collection.

Unlike Python's dictionaries, both methods are acceptable; however, the index of a member may change while running Blender.

```
>>> list(bpy.data.objects)
[bpy.data.objects["Cube"], bpy.data.objects["Plane"]]

>>> bpy.data.objects['Cube']
bpy.data.objects["Cube"]

>>> bpy.data.objects[0]
bpy.data.objects["Cube"]
```

##### Accessing attributes

Once you have a data block such as a material, object, groups etc. its attributes can be accessed just like changing a setting in the interface; in fact, the button tooltip also displays the Python attribute which can help in finding what settings to change in a script.

```
>>> bpy.data.objects[0].name
'Camera'

>>> bpy.data.scenes["Scene"]
bpy.data.scenes['Scene']
```

```
>>> bpy.data.materials.new("MyMaterial")
bpy.data.materials['MyMaterial']
```

For testing what data to access it's useful to use the "Console", which is its own space type in Blender 2.5. This supports auto-complete, giving you a fast way to dig into different data in your file.

Example of a data path that can be quickly found via the console:

```
>>> bpy.data.scenes[0].render.resolution_percentage
100
>>> bpy.data.scenes[0].objects["Torus"].data.vertices[0].co.x
1.0
```

## Custom Properties

Python can access properties on any datablock that has an ID (data that can be linked in and accessed from `bpy.data`). When assigning a property, you can make up your own names, these will be created when needed or overwritten if they exist.

This data is saved with the blend file and copied with objects.

Example:

```
bpy.context.object["MyOwnProperty"] = 42

if "SomeProp" in bpy.context.object:
    print("Property found")

# Use the get function like a python dictionary
# which can have a fallback value.
value = bpy.data.scenes["Scene"].get("test_prop", "fallback value")

# dictionaries can be assigned as long as they only use basic types.
group = bpy.data.groups.new("MyTestGroup")
group["GameSettings"] = {"foo": 10, "bar": "spam", "baz": {}}

del group["GameSettings"]
```

Note that these properties can only be assigned basic Python types.

- int, float, string
- array of ints/floats
- dictionary (only string keys types on this list)

These properties are valid outside of Python. They can be animated by curves or used in driver paths.

## Context

While it's useful to be able to access data directly by name or as a list, it's more common to operate on the user's selection. The context is always available from "`bpy.context`" and can be used to get the active object, scene, tool settings along with many other attributes.

Common-use cases:

```
>>> bpy.context.object
>>> bpy.context.selected_objects
>>> bpy.context.visible_bones
```

Note that the context is read-only. These values cannot be modified directly, though they may be changed by running API functions or by using the data API.

So `bpy.context.object = obj` will raise an error.

But `bpy.context.scene.objects.active = obj` will work as expected.

The context attributes change depending on where it is accessed. The 3D view has different context members to the Console, so take care when accessing context attributes that the user state is known.

See [bpy.context](#) API reference

## Operators (Tools)

Operators are tools generally accessed by the user from buttons, menu items or key shortcuts. From the user perspective they are a tool but Python can run these with its own settings through the `bpy.ops` module.

Examples:

```
>>> bpy.ops.mesh.flip_normals()
{'FINISHED'}
>>> bpy.ops.mesh.hide(unselected=False)
{'FINISHED'}
>>> bpy.ops.object.scale_apply()
{'FINISHED'}
```

---

**Note:** The menu item: Help -> Operator Cheat Sheet” gives a list of all operators and their default values in Python syntax, along with the generated docs. This is a good way to get an overview of all blender’s operators.

---

### Operator Poll()

Many operators have a “poll” function which may check that the mouse is a valid area or that the object is in the correct mode (Edit Mode, Weight Paint etc). When an operator’s poll function fails within python, an exception is raised.

For example, calling `bpy.ops.view3d.render_border()` from the console raises the following error:

```
RuntimeError: Operator bpy.ops.view3d.render_border.poll() failed, context is incorrect
```

In this case the context must be the 3d view with an active camera.

To avoid using try/except clauses wherever operators are called you can call the operators own `.poll()` function to check if it can run in the current context.

```
if bpy.ops.view3d.render_border.poll():
    bpy.ops.view3d.render_border()
```

### 1.1.4 Integration

Python scripts can integrate with Blender in the following ways:

- By defining a rendering engine.

- By defining operators.
- By defining menus, headers and panels.
- By inserting new buttons into existing menus, headers and panels

In Python, this is done by defining a class, which is a subclass of an existing type.

### Example Operator

```
import bpy

def main(context):
    for ob in context.scene.objects:
        print(ob)

class SimpleOperator(bpy.types.Operator):
    '''Tooltip'''
    bl_idname = "object.simple_operator"
    bl_label = "Simple Object Operator"

    @classmethod
    def poll(cls, context):
        return context.active_object is not None

    def execute(self, context):
        main(context)
        return {'FINISHED'}

def register():
    bpy.utils.register_class(SimpleOperator)

def unregister():
    bpy.utils.unregister_class(SimpleOperator)

if __name__ == "__main__":
    register()

    # test call
    bpy.ops.object.simple_operator()
```

Once this script runs, `SimpleOperator` is registered with Blender and can be called from the operator search popup or added to the toolbar.

To run the script:

1. Highlight the above code then press **Ctrl+C** to copy it.
2. Start Blender
3. Press **Ctrl+Right** twice to change to the Scripting layout.
4. Press **Ctrl+V** to paste the code into the text panel (the upper left frame).
5. Click on the button **Run Script**.

6. Move your mouse into the 3D view, press spacebar for the operator search menu, and type “Simple”.
7. Click on the “Simple Operator” item found in search.

**See Also:**

The class members with the `bl_` prefix are documented in the API reference `bpy.types.Operator`

**Example Panel**

Panels register themselves as a class, like an operator. Notice the extra `bl_` variables used to set the context they display in.

```
import bpy

class HelloWorldPanel(bpy.types.Panel):
    bl_label = "Hello World Panel"
    bl_idname = "OBJECT_PT_hello"
    bl_space_type = "PROPERTIES"
    bl_region_type = "WINDOW"
    bl_context = "object"

    def draw(self, context):
        layout = self.layout

        obj = context.object

        row = layout.row()
        row.label(text="Hello world!", icon='WORLD_DATA')

        row = layout.row()
        row.label(text="Active object is: " + obj.name)
        row = layout.row()
        row.prop(obj, "name")

def register():
    bpy.utils.register_class(HelloWorldPanel)

def unregister():
    bpy.utils.unregister_class(HelloWorldPanel)

if __name__ == "__main__":
    register()
```

To run the script:

1. Highlight the above code then press Ctrl+C to copy it
2. Start Blender
3. Press Ctrl+Right twice to change to the Scripting layout
4. Press Ctrl+V to paste the code into the text panel (the upper left frame)
5. Click on the button **Run Script**.

To view the results:

1. Select the the default cube.
2. Click on the Object properties icon in the buttons panel (far right; appears as a tiny cube).
3. Scroll down to see a panel named **Hello World Panel**.
4. Changing the object name also updates **Hello World Panel's Name:** field.

Note the row distribution and the label and properties that are available through the code.

#### See Also:

`bpy.types.Panel`

### 1.1.5 Types

Blender defines a number of Python types but also uses Python native types.

Blender's Python API can be split up into 3 categories.

#### Native Types

In simple cases returning a number or a string as a custom type would be cumbersome, so these are accessed as normal python types.

- blender float/int/boolean -> float/int/boolean
  - blender enumerator -> string
- ```
>>> C.object.rotation_mode = 'AXIS_ANGLE'
```
- blender enumerator (multiple) -> set of strings
- ```
# setting multiple camera overlay guides
bpy.context.scene.camera.data.show_guide = {'GOLDEN', 'CENTER'}
```
- ```
# passing as an operator argument for report types
self.report({'WARNING', 'INFO'}, "Some message!")
```

#### Internal Types

Used for Blender datablocks and collections: `bpy.types.bpy_struct`

For data that contains its own attributes groups/meshes/bones/scenes... etc.

There are 2 main types that wrap Blenders data, one for datablocks (known internally as `bpy_struct`), another for properties.

```
>>> bpy.context.object
bpy.data.objects['Cube']

>>> C.scene.objects
bpy.data.scenes['Scene'].objects
```

Note that these types reference Blender's data so modifying them is immediately visible.

## Mathutils Types

Used for vectors, quaternion, eulers, matrix and color types, accessible from `mathutils`

Some attributes such as `bpy.types.Object.location`, `bpy.types.PoseBone.rotation_euler` and `bpy.types.Scene.cursor_location` can be accessed as special math types which can be used together and manipulated in various useful ways.

Example of a matrix, vector multiplication:

```
bpy.context.object.matrix_world * bpy.context.object.data.verts[0].co
```

---

**Note:** mathutils types keep a reference to Blender's internal data so changes can be applied back.

Example:

```
# modifies the Z axis in place.
bpy.context.object.location.z += 2.0

# location variable holds a reference to the object too.
location = bpy.context.object.location
location *= 2.0

# Copying the value drops the reference so the value can be passed to
# functions and modified without unwanted side effects.
location = bpy.context.object.location.copy()
```

---

## 1.1.6 Animation

There are 2 ways to add keyframes through Python.

The first is through key properties directly, which is similar to inserting a keyframe from the button as a user. You can also manually create the curves and keyframe data, then set the path to the property. Here are examples of both methods.

Both examples insert a keyframe on the active object's Z axis.

Simple example:

```
obj = bpy.context.object
obj.location[2] = 0.0
obj.keyframe_insert(data_path="location", frame=10.0, index=2)
obj.location[2] = 1.0
obj.keyframe_insert(data_path="location", frame=20.0, index=2)
```

Using Low-Level Functions:

```
obj = bpy.context.object
obj.animation_data_create()
obj.animation_data.action = bpy.data.actions.new(name="MyAction")
fcu_z = obj.animation_data.action.fcurves.new(data_path="location", index=2)
fcu_z.keyframe_points.add(2)
fcu_z.keyframe_points[0].co = 10.0, 0.0
fcu_z.keyframe_points[1].co = 20.0, 1.0
```

## 1.1.7 Style Conventions

For Blender 2.5 we have chosen to follow python suggested style guide to avoid mixing styles amongst our own scripts and make it easier to use python scripts from other projects.

Using our style guide for your own scripts makes it easier if you eventually want to contribute them to blender.

This style guide is known as pep8 and can be found [here](#)

A brief listing of pep8 criteria.

- camel caps for class names: MyClass
- all lower case underscore separated module names: my\_module
- indentation of 4 spaces (no tabs)
- spaces around operators. 1 + 1, not 1+1
- only use explicit imports, (no importing ‘\*’)
- don’t use single line: if val: body, separate onto 2 lines instead.

As well as pep8 we have other conventions used for blender python scripts.

- Use single quotes for enums, and double quotes for strings.

Both are of course strings but in our internal API enums are unique items from a limited set. eg.

```
bpy.context.scene.render.file_format = 'PNG'  
bpy.context.scene.render.filepath = "//render_out"
```

- pep8 also defines that lines should not exceed 79 characters, we felt this is too restrictive so this is optional per script.

Periodically we run checks for pep8 compliance on blender scripts, for scripts to be included in this check add this line as a comment at the top of the script.

```
# <pep8 compliant>
```

To enable line length checks use this instead.

```
# <pep8-80 compliant>
```

## 1.2 Python API Overview

This document is to give an understanding of how python and blender fit together, covering some of the functionality that isn’t obvious from reading the API reference and example scripts.

### 1.2.1 Python in Blender

Blender embeds a python interpreter which is started with blender and stays active. This interpreter runs scripts to draw the user interface and is used for some of Blender’s internal tools too.

This is a typical python environment so tutorials on how to write python scripts will work running the scripts in blender too. Blender provides the `bpy` module to the python interpreter. This module can be imported in a script and gives access to blender data, classes, and functions. Scripts that deal with blender data will need to import this module.

Here is a simple example of moving a vertex of the object named **Cube**:

```
import bpy
bpy.data.objects["Cube"].data.vertices[0].co.x += 1.0
```

This modifies Blender's internal data directly. When you run this in the interactive console you will see the 3D viewport update.

## 1.2.2 The Default Environment

When developing your own scripts it may help to understand how blender sets up its python environment. Many python scripts come bundled with blender and can be used as a reference because they use the same API that script authors write tools in. Typical usage for scripts include: user interface, import/export, scene manipulation, automation, defining your own toolset and customization.

On startup blender scans the `scripts/startup/` directory for python modules and imports them. The exact location of this directory depends on your installation. See the [directory layout docs](#)

## 1.2.3 Script Loading

This may seem obvious but it's important to note the difference between executing a script directly or importing it as a module.

Scripts that extend blender - define classes that exist beyond the scripts execution, this makes future access to these classes (to unregister for example) more difficult than importing as a module where class instance is kept in the module and can be accessed by importing that module later on.

For this reason it's preferable to only use directly execute scripts that don't extend blender by registering classes.

Here are some ways to run scripts directly in blender.

- Loaded in the text editor and press **Run Script**.
- Typed or pasted into the interactive console.
- Execute a python file from the command line with blender, eg:

```
blender --python /home/me/my_script.py
```

To run as modules:

- The obvious way, `import some_module` command from the text window or interactive console.
- Open as a text block and tick "Register" option, this will load with the blend file.
- copy into one of the directories `scripts/startup`, where they will be automatically imported on startup.
- define as an addon, enabling the addon will load it as a python module.

## Addons

Some of blenders functionality is best kept optional, alongside scripts loaded at startup we have addons which are kept in their own directory `scripts/addons`, and only load on startup if selected from the user preferences.

The only difference between addons and built-in python modules is that addons must contain a **bl\_info** variable which blender uses to read metadata such as name, author, category and URL.

The user preferences addon listing uses **bl\_info** to display information about each addon.

See [Addons](#) for details on the **bl\_info** dictionary.

## 1.2.4 Integration through Classes

Running python scripts in the text editor is useful for testing but you'll want to extend blender to make tools accessible like other built-in functionality.

The blender python api allows integration for:

- `bpy.types.Panel`
- `bpy.types.Menu`
- `bpy.types.Operator`
- `bpy.types.PropertyGroup`
- `bpy.types.KeyingSet`
- `bpy.types.RenderEngine`

This is intentionally limited. Currently, for more advanced features such as mesh modifiers, object types, or shader nodes, C/C++ must be used.

For python intergration Blender defines methods which are common to all types. This works by creating a python subclass of a Blender class which contains variables and functions specified by the parent class which are pre-defined to interface with Blender.

For example:

```
import bpy
class SimpleOperator(bpy.types.Operator):
    bl_idname = "object.simple_operator"
    bl_label = "Tool Name"

    def execute(self, context):
        print("Hello World")
        return {'FINISHED'}
```

`bpy.utils.register_class(SimpleOperator)`

First note that we subclass a member of `bpy.types`, this is common for all classes which can be integrated with blender and used so we know if this is an Operator and not a Panel when registering.

Both class properties start with a `bl_` prefix. This is a convention used to distinguish blender properties from those you add yourself.

Next see the `execute` function, which takes an instance of the operator and the current context. A common prefix is not used for functions.

Lastly the `register` function is called, this takes the class and loads it into blender. See [Class Registration](#).

Regarding inheritance, blender doesn't impose restrictions on the kinds of class inheritance used, the registration checks will use attributes and functions defined in parent classes.

class mix-in example:

```
import bpy
class BaseOperator:
    def execute(self, context):
        print("Hello World BaseClass")
        return {'FINISHED'}
```

```
class SimpleOperator(bpy.types.Operator, BaseOperator):
    bl_idname = "object.simple_operator"
    bl_label = "Tool Name"
```

```
bpy.utils.register_class(SimpleOperator)
```

Notice these classes don't define an `__init__(self)` function. While `__init__()` and `__del__()` will be called if defined, the class instances lifetime only spans the execution. So a panel for example will have a new instance for every redraw, for this reason there is rarely a cause to store variables in the panel instance. Instead, persistent variables should be stored in Blenders data so that the state can be restored when blender is restarted.

---

**Note:** Modal operators are an exception, keeping their instance variable as blender runs, see modal operator template.

---

So once the class is registered with blender, instancing the class and calling the functions is left up to blender. In fact you cannot instance these classes from the script as you would expect with most python API's.

To run operators you can call them through the operator api, eg:

```
import bpy
bpy.ops.object.simple_operator()
```

User interface classes are given a context in which to draw, buttons window, file header, toolbar etc, then they are drawn when that area is displayed so they are never called by python scripts directly.

## 1.2.5 Registration

### Module Registration

Blender modules loaded at startup require `register()` and `unregister()` functions. These are the *only* functions that blender calls from your code, which is otherwise a regular python module.

A simple blender/python module can look like this:

```
import bpy

class SimpleOperator(bpy.types.Operator):
    """ See example above """

    def register():
        bpy.utils.register_class(SimpleOperator)

    def unregister():
        bpy.utils.unregister_class(SimpleOperator)

    if __name__ == "__main__":
        register()
```

These functions usually appear at the bottom of the script containing class registration sometimes adding menu items. You can also use them for internal purposes setting up data for your own tools but take care since register won't re-run when a new blend file is loaded.

The register/unregister calls are used so it's possible to toggle addons and reload scripts while blender runs. If the register calls were placed in the body of the script, registration would be called on import, meaning there would be no distinction between importing a module or loading its classes into blender.

This becomes problematic when a script imports classes from another module making it difficult to manage which classes are being loaded and when.

The last 2 lines are only for testing:

```
if __name__ == "__main__":
    register()
```

This allows the script to be run directly in the text editor to test changes. This `register()` call won't run when the script is imported as a module since `__main__` is reserved for direct execution.

## Class Registration

Registering a class with blender results in the class definition being loaded into blender, where it becomes available alongside existing functionality.

Once this class is loaded you can access it from `bpy.types`, using the `bl_idname` rather than the classes original name.

When loading a class, blender performs sanity checks making sure all required properties and functions are found, that properties have the correct type, and that functions have the right number of arguments.

Mostly you will not need concern yourself with this but if there is a problem with the class definition it will be raised on registering:

Using the function arguments `def execute(self, context, spam)`, will raise an exception:

```
ValueError: expected Operator, SimpleOperator class "execute" function to
have 2 args, found 3
```

Using `bl_idname = 1` will raise.

```
TypeError: validating class error: Operator.bl_idname expected a string
type, not int
```

## Multiple-Classes

Loading classes into blender is described above, for simple cases calling `bpy.utils.register_class` (Some-Class) is sufficient, but when there are many classes or a packages submodule has its own classes it can be tedious to list them all for registration.

For more convenient loading/unloading `bpy.utils.register_module` (module) and `bpy.utils.unregister_module` (module) functions exist.

A script which defines many of its own operators, panels menus etc. you only need to write:

```
def register():
    bpy.utils.register_module(__name__)

def unregister():
    bpy.utils.unregister_module(__name__)
```

Internally blender collects subclasses on registerable types, storing them by the module in which they are defined. By passing the module name to `bpy.utils.register_module` blender can register all classes created by this module and its submodules.

## Inter Classes Dependencies

When customizing blender you may want to group your own settings together, after all, they will likely have to co-exist with other scripts. To group these properties classes need to be defined, for groups within groups or collections within groups you can find yourself having to deal with order of registration/unregistration.

Custom properties groups are themselves classes which need to be registered.

Say you want to store material settings for a custom engine.

```
# Create new property
# bpy.data.materials[0].my_custom_props.my_float
import bpy

class MyMaterialProps(bpy.types.PropertyGroup):
    my_float = bpy.props.FloatProperty()

def register():
    bpy.utils.register_class(MyMaterialProps)
    bpy.types.Material.my_custom_props = bpy.props.PointerProperty(type=MyMaterialProps)

def unregister():
    del bpy.types.Material.my_custom_props
    bpy.utils.unregister_class(MyMaterialProps)

if __name__ == "__main__":
    register()
```

---

**Note:** *The class must be registered before being used in a property, failing to do so will raise an error:*

```
ValueError: bpy_struct "Material" registration error: my_custom_props could
not register
```

---

```
# Create new property group with a sub property
# bpy.data.materials[0].my_custom_props.sub_group.my_float
import bpy

class MyMaterialSubProps(bpy.types.PropertyGroup):
    my_float = bpy.props.FloatProperty()

class MyMaterialGroupProps(bpy.types.PropertyGroup):
    sub_group = bpy.props.PointerProperty(type=MyMaterialSubProps)

def register():
    bpy.utils.register_class(MyMaterialSubProps)
    bpy.utils.register_class(MyMaterialGroupProps)
    bpy.types.Material.my_custom_props = bpy.props.PointerProperty(type=MyMaterialGroupProps)

def unregister():
    del bpy.types.Material.my_custom_props
    bpy.utils.unregister_class(MyMaterialGroupProps)
    bpy.utils.unregister_class(MyMaterialSubProps)

if __name__ == "__main__":
    register()
```

---

**Note:** *The lower most class needs to be registered first and that unregister() is a mirror of register()*

---

## Manipulating Classes

Properties can be added and removed as blender runs, normally happens on register or unregister but for some special cases it may be useful to modify types as the script runs.

For example:

```
# add a new property to an existing type
bpy.types.Object.my_float = bpy.props.FloatProperty()
# remove
del bpy.types.Object.my_float
```

This works just as well for PropertyGroup subclasses you define yourself.

```
class MyPropGroup(bpy.types.PropertyGroup):
    pass
MyPropGroup.my_float = bpy.props.FloatProperty()
```

...this is equivalent to:

```
class MyPropGroup(bpy.types.PropertyGroup):
    my_float = bpy.props.FloatProperty()
```

## Dynamic Defined-Classes (Advanced)

In some cases the specifier for data may not be in blender, renderman shader definitions for example and it may be useful to define types and remove them on the fly.

```
for i in range(10):
    idname = "object.operator_%d" % i

    def func(self, context):
        print("Hello World", self.bl_idname)
        return {'FINISHED'}

    opclass = type("DynOp%d" % i,
                   (bpy.types.Operator, ),
                   {"bl_idname": idname, "bl_label": "Test", "execute": func},
                   )
    bpy.utils.register_class(opclass)
```

---

**Note:** Notice `type()` is called to define the class. This is an alternative syntax for class creation in python, better suited to constructing classes dynamically.

---

Calling these operators:

```
>>> bpy.ops.object.operator_1()
Hello World OBJECT_OT_operator_1
{'FINISHED' }

>>> bpy.ops.object.operator_2()
Hello World OBJECT_OT_operator_2
{'FINISHED' }
```

## 1.3 Gotcha's

This document attempts to help you work with the Blender API in areas that can be troublesome and avoid practices that are known to give instability.

### 1.3.1 Using Operators

Blender's operators are tools for users to access, that python can access them too is very useful nevertheless operators have limitations that can make them cumbersome to script.

Main limits are...

- Can't pass data such as objects, meshes or materials to operate on (operators use the context instead)
- The return value from calling an operator gives the success (if it finished or was canceled), in some cases it would be more logical from an API perspective to return the result of the operation.
- Operators poll function can fail where an API function would raise an exception giving details on exactly why.

#### Why does an operator's poll fail?

When calling an operator gives an error like this:

```
>>> bpy.ops.action.clean(threshold=0.001)
Traceback (most recent call last):
  File "<blender_console>", line 1, in <module>
    File "scripts/modules/bpy/ops.py", line 179, in __call__
      ret = op_call(self.idname_py(), None, kw)
RuntimeError: Operator bpy.ops.action.clean.poll() failed, context is incorrect
```

Which raises the question as to what the correct context might be?

Typically operators check for the active area type, a selection or active object they can operate on, but some operators are more picky about when they run.

In most cases you can figure out what context an operator needs simply by seeing how its used in Blender and thinking about what it does.

Unfortunately if you're still stuck - the only way to **really** know whats going on is to read the source code for the poll function and see what its checking.

For python operators its not so hard to find the source since its included with Blender and the source file/line is included in the operator reference docs.

Downloading and searching the C code isn't so simple, especially if you're not familiar with the C language but by searching the operator name or description you should be able to find the poll function with no knowledge of C.

---

**Note:** Blender does have the functionality for poll functions to describe why they fail, but its currently not used much, if you're interested to help improve our API feel free to add calls to `CTX_wm_operator_poll_msg_set` where its not obvious why poll fails.

```
>>> bpy.ops.gpencil.draw()
RuntimeError: Operator bpy.ops.gpencil.draw.poll() Failed to find Grease Pencil data to draw into
```

---

## The operator still doesn't work!

Certain operators in Blender are only intended for use in a specific context, some operators for example are only called from the properties window where they check the current material, modifier or constraint.

Examples of this are:

- `bpy.ops.texture.slot_move`
- `bpy.ops.constraint.limitdistance_reset`
- `bpy.ops.object.modifier_copy`
- `bpy.ops.buttons.file_browse`

Another possibility is that you are the first person to attempt to use this operator in a script and some modifications need to be made to the operator to run in a different context, if the operator should logically be able to run but fails when accessed from a script it should be reported to the bug tracker.

## 1.3.2 Stale Data

### No updates after setting values

Sometimes you want to modify values from python and immediately access the updated values, eg:

Once changing the objects `bpy.types.Object.location` you may want to access its transformation right after from `bpy.types.Object.matrix_world`, but this doesn't work as you might expect.

Consider the calculations that might go into working out the objects final transformation, this includes:

- animation function curves.
- drivers and their pythons expressions.
- constraints
- parent objects and all of their f-curves, constraints etc.

To avoid expensive recalculations every time a property is modified, Blender defers making the actual calculations until they are needed.

However, while the script runs you may want to access the updated values.

This can be done by calling `bpy.types.Scene.update` after modifying values which recalculates all data that is tagged to be updated.

### Can I redraw during the script?

The official answer to this is no, or... “*You don't want to do that*”.

To give some background on the topic...

While a script executes Blender waits for it to finish and is effectively locked until its done, while in this state Blender won't redraw or respond to user input. Normally this is not such a problem because scripts distributed with Blender tend not to run for an extended period of time, nevertheless scripts *can* take ages to execute and its nice to see what's going on in the view port.

Tools that lock Blender in a loop and redraw are highly discouraged since they conflict with Blenders ability to run multiple operators at once and update different parts of the interface as the tool runs.

So the solution here is to write a **modal** operator, that is - an operator which defines a `modal()` function, See the modal operator template in the text editor.

Modal operators execute on user input or setup their own timers to run frequently, they can handle the events or pass through to be handled by the keymap or other modal operators.

Transform, Painting, Fly-Mode and File-Select are example of a modal operators.

Writing modal operators takes more effort then a simple `for` loop that happens to redraw but is more flexible and integrates better with Blenders design.

#### **Ok, Ok! I still want to draw from python**

If you insist - yes its possible, but scripts that use this hack wont be considered for inclusion in Blender and any issues with using it wont be considered bugs, this is also not guaranteed to work in future releases.

```
bpy.ops.wm.redraw_timer(type='DRAW_WIN_SWAP', iterations=1)
```

### **1.3.3 Matrix multiplication is wrong**

Every so often users complain that Blenders matrix math is wrong, the confusion comes from mathutils matrices being column-major to match OpenGL and the rest of Blenders matrix operations and stored matrix data.

This is different to **numpy** which is row-major which matches what you would expect when using conventional matrix math notation.

### **1.3.4 I can't edit the mesh in edit-mode!**

Blenders EditMesh is an internal data structure (not saved and not exposed to python), this gives the main annoyance that you need to exit edit-mode to edit the mesh from python.

The reason we have not made much attempt to fix this yet is because we will likely move to BMesh mesh API eventually, so any work on the API now will be wasted effort.

With the BMesh API we may expose mesh data to python so we can write useful tools in python which are also fast to execute while in edit-mode.

For the time being this limitation just has to be worked around but we're aware its frustrating needs to be addressed.

### **1.3.5 EditBones, PoseBones, Bone... Bones**

Armature Bones in Blender have three distinct data structures that contain them. If you are accessing the bones through one of them, you may not have access to the properties you really need.

---

**Note:** In the following examples `bpy.context.object` is assumed to be an armature object.

---

#### **Edit Bones**

`bpy.context.object.data.edit_bones` contains a `editbones`; to access them you must set the armature mode to edit mode first (`editbones` do not exist in object or pose mode). Use these to create new bones, set their head/tail or roll, change their parenting relationships to other bones, etc.

Example using `bpy.types.EditBone` in armature editmode:

```
# This is only possible in edit mode.  
bpy.context.object.data.edit_bones["Bone"].head = Vector((1.0, 2.0, 3.0))  
  
# This will be empty outside of editmode.  
mybones = bpy.context.selected_editable_bones  
  
# Returns an editbone only in edit mode.  
bpy.context.active_bone
```

## Bones (Object Mode)

bpy.context.object.data.bones contains bones. These *live* in object mode, and have various properties you can change, note that the head and tail properties are read-only.

Example using `bpy.types.Bone` in object or pose mode:

```
# returns a bone (not an editbone) outside of edit mode  
bpy.context.active_bone  
  
# This works, as with blender the setting can be edited in any mode  
bpy.context.object.data.bones["Bone"].use_deform = True  
  
# Accessible but read-only  
tail = myobj.data.bones["Bone"].tail
```

## Pose Bones

bpy.context.object.pose.bones contains pose bones. This is where animation data resides, i.e. animatable transformations are applied to pose bones, as are constraints and ik-settings.

Examples using `bpy.types.PoseBone` in object or pose mode:

```
# Gets the name of the first constraint (if it exists)  
bpy.context.object.pose.bones["Bone"].constraints[0].name  
  
# Gets the last selected pose bone (pose mode only)  
bpy.context.active_pose_bone
```

---

**Note:** Notice the pose is accessed from the object rather than the object data, this is why blender can have 2 or more objects sharing the same armature in different poses.

---

---

**Note:** Strictly speaking PoseBone's are not bones, they are just the state of the armature, stored in the `bpy.types.Object` rather than the `bpy.types.Armature`, the real bones are however accessible from the pose bones - `bpy.types.PoseBone.bone`

---

## Armature Mode Switching

While writing scripts that deal with armatures you may find you have to switch between modes, when doing so take care when switching out of editmode not to keep references to the edit-bones or their head/tail vectors. Further access to these will crash blender so its important the script clearly separates sections of the code which operate in different modes.

This is mainly an issue with editmode since pose data can be manipulated without having to be in pose mode, however for operator access you may still need to enter pose mode.

### 1.3.6 Unicode Problems

Python supports many different encodings so there is nothing stopping you from writing a script in latin1 or iso-8859-15.

See [pep-0263](#)

However this complicates things for the python api because blend files themselves dont have an encoding.

To simplify the problem for python integration and script authors we have decided all strings in blend files **must** be UTF-8 or ASCII compatible.

This means assigning strings with different encodings to an object names for instance will raise an error.

Paths are an exception to this rule since we cannot ignore the existence of non-utf-8 paths on peoples filesystems.

This means seemingly harmless expressions can raise errors, eg.

```
>>> print(bpy.data.filepath)
UnicodeEncodeError: 'ascii' codec can't encode characters in position 10-21: ordinal not in range(128, 256)

>>> bpy.context.object.name = bpy.data.filepath
Traceback (most recent call last):
  File "<blender_console>", line 1, in <module>
TypeError: bpy_struct: item.attr= val: Object.name expected a string type, not str
```

Here are 2 ways around filesystem encoding issues.

```
>>> print(repr(bpy.data.filepath))

>>> import os
>>> filepath_bytes = os.fsencode(bpy.data.filepath)
>>> filepath_utf8 = filepath_bytes.decode('utf-8', "replace")
>>> bpy.context.object.name = filepath_utf8
```

Unicode encoding/decoding is a big topic with comprehensive python documentation, to avoid getting stuck too deep in encoding problems - here are some suggestions:

- Always use utf-8 encoding or convert to utf-8 where the input is unknown.
- Avoid manipulating filepaths as strings directly, use `os.path` functions instead.
- Use `os.fsencode()` / `os.fsdecode()` rather than the built in string decoding functions when operating on paths.
- To print paths or to include them in the user interface use `repr(path)` first or `"%r" % path` with string formatting.
- **Possibly** - use bytes instead of python strings, when reading some input its less trouble to read it as binary data though you will still need to decide how to treat any strings you want to use with Blender, some importers do this.

### 1.3.7 Strange errors using ‘threading’ module

Python threading with Blender only works properly when the threads finish up before the script does. By using `threading.join()` for example.

Heres an example of threading supported by Blender:

```
import threading
import time

def prod():
    print(threading.current_thread().name, "Starting")

    # do something vaguely useful
    import bpy
    from mathutils import Vector
    from random import random

    prod_vec = Vector((random() - 0.5, random() - 0.5, random() - 0.5))
    print("Prodding", prod_vec)
    bpy.data.objects["Cube"].location += prod_vec
    time.sleep(random() + 1.0)
    # finish

    print(threading.current_thread().name, "Exiting")

threads = [threading.Thread(name="Prod %d" % i, target=prod) for i in range(10)]

print("Starting threads...")

for t in threads:
    t.start()

print("Waiting for threads to finish...")

for t in threads:
    t.join()
```

This an example of a timer which runs many times a second and moves the default cube continuously while Blender runs (Unsupported).

```
def func():
    print("Running...")
    import bpy
    bpy.data.objects['Cube'].location.x += 0.05

def my_timer():
    from threading import Timer
    t = Timer(0.1, my_timer)
    t.start()
    func()

my_timer()
```

Use cases like the one above which leave the thread running once the script finishes may seem to work for a while but end up causing random crashes or errors in Blenders own drawing code.

So far no work has gone into making Blenders python integration thread safe, so until its properly supported, best not make use of this.

---

**Note:** Pythons threads only allow co-currency and wont speed up you're scripts on multi-processor systems, the subprocess and multiprocessing modules can be used with blender and make use of multiple CPU's too.

---

### 1.3.8 Help! My script crashes Blender

Ideally it would be impossible to crash Blender from python however there are some problems with the API where it can be made to crash.

Strictly speaking this is a bug in the API but fixing it would mean adding memory verification on every access since most crashes are caused by the python objects referencing Blenders memory directly, whenever the memory is freed, further python access to it can crash the script. But fixing this would make the scripts run very slow, or writing a very different kind of API which doesn't reference the memory directly.

Here are some general hints to avoid running into these problems.

- Be aware of memory limits, especially when working with large lists since Blender can crash simply by running out of memory.
- Many hard to fix crashes end up being because of referencing freed data, when removing data be sure not to hold any references to it.
- Modules or classes that remain active while Blender is used, should not hold references to data the user may remove, instead, fetch data from the context each time the script is activated.
- Crashes may not happen every time, they may happen more on some configurations/operating-systems.

### Undo/Redo

Undo invalidates all `bpy.types.ID` instances (Object, Scene, Mesh etc).

This example shows how you can tell undo changes the memory locations.

```
>>> hash(bpy.context.object)
-9223372036849950810
>>> hash(bpy.context.object)
-9223372036849950810

# ... move the active object, then undo

>>> hash(bpy.context.object)
-9223372036849951740
```

As suggested above, simply not holding references to data when Blender is used interactively by the user is the only way to ensure the script doesn't become unstable.

### Array Re-Allocation

When adding new points to a curve or vertices's/edges/faces to a mesh, internally the array which stores this data is re-allocated.

```
bpy.ops.curve.primitive_bezier_curve_add()
point = bpy.context.object.datasplines[0].bezier_points[0]
bpy.context.object.datasplines[0].bezier_points.add()

# this will crash!
point.co = 1.0, 2.0, 3.0
```

This can be avoided by re-assigning the point variables after adding the new one or by storing indices's to the points rather then the points themselves.

The best way is to sidestep the problem altogether add all the points to the curve at once. This means you don't have to worry about array re-allocation and its faster too since reallocating the entire array for every point added is inefficient.

## Removing Data

**Any** data that you remove shouldn't be modified or accessed afterwards, this includes f-curves, drivers, render layers, timeline markers, modifiers, constraints along with objects, scenes, groups, bones.. etc.

This is a problem in the API at the moment that we should eventually solve.



# APPLICATION MODULES

## 2.1 Context Access (`bpy.context`)

The context members available depend on the area of blender which is currently being accessed.

Note that all context values are readonly, but may be modified through the data api or by running operators

### 2.1.1 Screen Context

```
bpy.context.scene
  Type bpy.types.Scene
bpy.context.visible_objects
  Type sequence of bpy.types.Object
bpy.context.visible_bases
  Type sequence of bpy.types.ObjectBase
bpy.context.selectable_objects
  Type sequence of bpy.types.Object
bpy.context.selectable_bases
  Type sequence of bpy.types.ObjectBase
bpy.context.selected_objects
  Type sequence of bpy.types.Object
bpy.context.selected_bases
  Type sequence of bpy.types.ObjectBase
bpy.context.selected_editable_objects
  Type sequence of bpy.types.Object
bpy.context.selected_editable_bases
  Type sequence of bpy.types.ObjectBase
bpy.context.visible_bones
  Type sequence of bpy.types.Object
bpy.context.editable_bones
```

**Type** sequence of `bpy.types.EditBone`  
`bpy.context.selected_bones`

**Type** sequence of `bpy.types.Bone`  
`bpy.context.selected_editable_bones`

**Type** sequence of `bpy.types.Bone`  
`bpy.context.visible_pose_bones`

**Type** sequence of `bpy.types.PoseBone`  
`bpy.context.selected_pose_bones`

**Type** sequence of `bpy.types.PoseBone`  
`bpy.context.active_bone`

**Type** `bpy.types.Bone`  
`bpy.context.active_pose_bone`

**Type** `bpy.types.PoseBone`  
`bpy.context.active_base`

**Type** `bpy.types.ObjectBase`  
`bpy.context.active_object`

**Type** `bpy.types.Object`  
`bpy.context.object`

**Type** `bpy.types.Object`  
`bpy.context.edit_object`

**Type** `bpy.types.Object`  
`bpy.context.sculpt_object`

**Type** `bpy.types.Object`  
`bpy.context.vertex_paint_object`

**Type** `bpy.types.Object`  
`bpy.context.weight_paint_object`

**Type** `bpy.types.Object`  
`bpy.context.image_paint_object`

**Type** `bpy.types.Object`  
`bpy.context.particle_edit_object`

**Type** `bpy.types.Object`  
`bpy.context.sequences`

**Type** sequence of `bpy.types.Sequence`  
`bpy.context.selected_sequences`

**Type** sequence of `bpy.types.Sequence`  
`bpy.context.selected_editable_sequences`

**Type** sequence of `bpy.types.Sequence`

## 2.1.2 View3D Context

```
bpy.context.selected_objects
    Type sequence of bpy.types.Object
bpy.context.selected_bases
    Type sequence of bpy.types.ObjectBase
bpy.context.selected_editable_objects
    Type sequence of bpy.types.Object
bpy.context.selected_editable_bases
    Type sequence of bpy.types.ObjectBase
bpy.context.visible_objects
    Type sequence of bpy.types.Object
bpy.context.visible_bases
    Type sequence of bpy.types.ObjectBase
bpy.context.selectable_objects
    Type sequence of bpy.types.Object
bpy.context.selectable_bases
    Type sequence of bpy.types.ObjectBase
bpy.context.active_base
    Type bpy.types.ObjectBase
bpy.context.active_object
    Type bpy.types.Object
```

## 2.1.3 Buttons Context

```
bpy.context.world
    Type bpy.types.World
bpy.context.object
    Type bpy.types.Object
bpy.context.mesh
    Type bpy.types.Mesh
bpy.context.armature
    Type bpy.types.Armature
bpy.context.lattice
    Type bpy.types.Lattice
bpy.context.curve
```

```
Type bpy.types.Curve
bpy.context.meta_ball
    Type bpy.types.MetaBall
bpy.context.lamp
    Type bpy.types.Lamp
bpy.context.camera
    Type bpy.types.Camera
bpy.context.material
    Type bpy.types.Material
bpy.context.material_slot
    Type bpy.types.MaterialSlot
bpy.context.texture
    Type bpy.types.Texture
bpy.context.texture_slot
    Type bpy.types.MaterialTextureSlot
bpy.context.bone
    Type bpy.types.Bone
bpy.context.edit_bone
    Type bpy.types.EditBone
bpy.context.pose_bone
    Type bpy.types.PoseBone
bpy.context.particle_system
    Type bpy.types.ParticleSystem
bpy.context.particle_system_editable
    Type bpy.types.ParticleSystem
bpy.context.cloth
    Type bpy.types.ClothModifier
bpy.context.soft_body
    Type bpy.types.SoftBodyModifier
bpy.context.fluid
    Type bpy.types.FluidSimulationModifier
bpy.context.smoke
    Type bpy.types.SmokeModifier
bpy.context.collision
    Type bpy.types.CollisionModifier
bpy.context.brush
```

Type bpy.types.Brush

## 2.1.4 Image Context

bpy.context.edit\_image

Type bpy.types.Image

## 2.1.5 Node Context

bpy.context.selected\_nodes

Type sequence of bpy.types.Node

## 2.1.6 Text Context

bpy.context.edit\_text

Type bpy.types.Text

## 2.2 Data Access (bpy.data)

This module is used for all blender/python access.

bpy.data

Access to blenders internal data

Type bpy.types.BlendData

import bpy

```
# print all objects
for obj in bpy.data.objects:
    print(obj.name)
```

```
# print all scene names in a list
print(bpy.data.scenes.keys())
```

```
# remove mesh Cube
if "Cube" in bpy.data.meshes:
    mesh = bpy.data.meshes["Cube"]
    print("removing mesh", mesh)
    bpy.data.meshes.remove(mesh)
```

```
# write images into a file next to the blend
import os
file = open(os.path.splitext(bpy.data.filepath)[0] + ".txt", 'w')

for image in bpy.data.images:
    file.write("%s %d x %d\n" % (image.filepath, image.size[0], image.size[1]))
```

```
file.close()
```

## 2.3 Operators (bpy.ops)

### 2.3.1 Calling Operators

Provides python access to calling operators, this includes operators written in C, Python or Macros.

Only keyword arguments can be used to pass operator properties.

Operators don't have return values as you might expect, instead they return a set() which is made up of: {'RUNNING\_MODAL', 'CANCELLED', 'FINISHED', 'PASS\_THROUGH'}. Common return values are {'FINISHED'} and {'CANCELLED'}.

Calling an operator in the wrong context will raise a RuntimeError, there is a poll() method to avoid this problem.

Note that the operator ID (bl\_idname) in this example is 'mesh.subdivide', 'bpy.ops' is just the access path for python.

```
import bpy

# calling an operator
bpy.ops.mesh.subdivide(number_cuts=3, smoothness=0.5)

# check poll() to avoid exception.
if bpy.ops.object.mode_set.poll():
    bpy.ops.object.mode_set(mode='EDIT')
```

### 2.3.2 Execution Context

When calling an operator you may want to pass the execution context.

This determines the context that's given to the operator to run in, and whether invoke() is called or execute().

'EXEC\_DEFAULT' is used by default but you may want the operator to take user interaction with 'INVOKE\_DEFAULT'.

The execution context is as a non keyword, string argument in: ('INVOKE\_DEFAULT', 'INVOKE\_REGION\_WIN', 'INVOKE\_REGION\_CHANNELS', 'INVOKE\_REGION\_PREVIEW', 'INVOKE\_AREA', 'INVOKE\_SCREEN', 'EXEC\_DEFAULT', 'EXEC\_REGION\_WIN', 'EXEC\_REGION\_CHANNELS', 'EXEC\_REGION\_PREVIEW', 'EXEC\_AREA', 'EXEC\_SCREEN')

```
# group add popup
import bpy
bpy.ops.object.group_instance_add('INVOKE_DEFAULT')
```

### Action Operators

```
bpy.ops.action.clean(threshold=0.001)
Simplify F-Curves by removing closely spaced keyframes
```

**Parameters** **threshold** (float in [0, inf], (optional)) – Threshold

```
bpy.ops.action.clickselect(extend=False, column=False)
Select keyframes by clicking on them
```

**Parameters**

- **extend** (*boolean, (optional)*) – Extend Select
- **column** (*boolean, (optional)*) – Column Select

bpy.ops.action.**copy**()

Copy selected keyframes to the copy/paste buffer

bpy.ops.action.**delete**()

Remove all selected keyframes

bpy.ops.action.**duplicate** (*mode='TRANSLATION'*)

Make a copy of all selected keyframes

**Parameters mode** (*enum in ['INIT', 'DUMMY', 'TRANSLATION', 'ROTATION', 'RESIZE', 'TO-SPHERE', 'SHEAR', 'WARP', 'SHRINKFATTEN', 'TILT', 'TRACKBALL', 'PUSHPULL', 'CREASE', 'MIRROR', 'BONE\_SIZE', 'BONE\_ENVELOPE', 'CURVE\_SHRINKFATTEN', 'BONE\_ROLL', 'TIME\_TRANSLATE', 'TIME\_SLIDE', 'TIME\_SCALE', 'TIME\_EXTEND', 'BAKE\_TIME', 'BEVEL', 'BWEIGHT', 'ALIGN', 'EDGESLIDE', 'SEQSLIDE'], (optional)*) – Mode

bpy.ops.action.**duplicate\_move** (*ACTION\_OT\_duplicate=None, FORM\_OT\_transform=None*)

*TRANS-*

Undocumented ([contribute](#))

**Parameters**

- **ACTION\_OT\_duplicate** (*ACTION\_OT\_duplicate, (optional)*) – Duplicate Keyframes, Make a copy of all selected keyframes
- **TRANSFORM\_OT\_transform** (*TRANSFORM\_OT\_transform, (optional)*) – Transform, Transform selected items by mode type

bpy.ops.action.**extrapolation\_type** (*type='CONSTANT'*)

Set extrapolation mode for selected F-Curves

**Parameters type** (*enum in ['CONSTANT', 'LINEAR'], (optional)*) – Type

bpy.ops.action.**frame\_jump**()

Set the current frame to the average frame of the selected keyframes

bpy.ops.action.**handle\_type** (*type='FREE'*)

Set type of handle for selected keyframes

**Parameters type** (*enum in ['FREE', 'VECTOR', 'ALIGNED', 'AUTO', 'ANIM\_CLAMPED'], (optional)*) – Type

bpy.ops.action.**interpolation\_type** (*type='CONSTANT'*)

Set interpolation mode for the F-Curve segments starting from the selected keyframes

**Parameters type** (*enum in ['CONSTANT', 'LINEAR', 'BEZIER'], (optional)*) – Type

bpy.ops.action.**keyframe\_insert** (*type='ALL'*)

Insert keyframes for the specified channels

**Parameters type** (*enum in ['ALL', 'SEL', 'GROUP'], (optional)*) – Type

bpy.ops.action.**keyframe\_type** (*type='KEYFRAME'*)

Set type of keyframe for the selected keyframes

**Parameters type** (*enum in ['KEYFRAME', 'BREAKDOWN', 'EXTREME', 'JITTER'], (optional)*) – Type

bpy.ops.action.markers\_make\_local()

Move selected scene markers to the active Action as local ‘pose’ markers

bpy.ops.action.mirror(type='CFRA')

Flip selected keyframes over the selected mirror line

**Parameters** **type** (enum in ['CFRA', 'XAXIS', 'MARKER'], (optional)) – Type

bpy.ops.action.new()

Create new action

bpy.ops.action.paste(offset='START', merge='MIX')

Paste keyframes from copy/paste buffer for the selected channels, starting on the current frame

**Parameters**

- **offset** (enum in ['START', 'END', 'RELATIVE', 'NONE'], (optional)) – Offset, Paste time offset of keys
- **merge** (enum in ['MIX', 'OVER\_ALL', 'OVER\_RANGE', 'OVER\_RANGE\_ALL'], (optional)) – Type, Method of merging pasted keys and existing

bpy.ops.action.previewrange\_set()

Set Preview Range based on extents of selected Keyframes

bpy.ops.action.sample()

Add keyframes on every frame between the selected keyframes

bpy.ops.action.select\_all\_toggle(invert=False)

Toggle selection of all keyframes

**Parameters** **invert** (boolean, (optional)) – Invert

bpy.ops.action.select\_border(gesture\_mode=0, xmin=0, xmax=0, ymin=0, ymax=0, axis\_range=False)

Select all keyframes within the specified region

**Parameters**

- **gesture\_mode** (int in [-inf, inf], (optional)) – Gesture Mode
- **xmin** (int in [-inf, inf], (optional)) – X Min
- **xmax** (int in [-inf, inf], (optional)) – X Max
- **ymin** (int in [-inf, inf], (optional)) – Y Min
- **ymax** (int in [-inf, inf], (optional)) – Y Max
- **axis\_range** (boolean, (optional)) – Axis Range

bpy.ops.action.select\_column(mode='KEYS')

Select all keyframes on the specified frame(s)

**Parameters** **mode** (enum in ['KEYS', 'CFRA', 'MARKERS\_COLUMN', 'MARKERS\_BETWEEN'], (optional)) – Mode

bpy.ops.action.select\_leftright(mode='CHECK', extend=False)

Select keyframes to the left or the right of the current frame

**Parameters**

- **mode** (enum in ['CHECK', 'LEFT', 'RIGHT'], (optional)) – Mode
- **extend** (boolean, (optional)) – Extend Select

```
bpy.ops.action.select_less()  
    Deselect keyframes on ends of selection islands  
  
bpy.ops.action.select_linked()  
    Select keyframes occurring the same F-Curves as selected ones  
  
bpy.ops.action.select_more()  
    Select keyframes beside already selected ones  
  
bpy.ops.action.snap(type='CFRA')  
    Snap selected keyframes to the times specified  
  
    Parameters type (enum in ['CFRA', 'NEAREST_FRAME', 'NEAREST_SECOND', 'NEAREST_MARKER'], (optional)) – Type  
  
bpy.ops.action.view_all()  
    Reset viewable area to show full keyframe range  
  
bpy.ops.action.view_selected()  
    Reset viewable area to show selected keyframes range
```

## Anim Operators

```
bpy.ops.anim.change_frame(frame=0)  
    Interactively change the current frame number  
  
    Parameters frame (int in [-300000, 300000], (optional)) – Frame  
  
bpy.ops.anim.channels_click(extend=False, children_only=False)  
    Handle mouse-clicks over animation channels  
  
    Parameters

- extend (boolean, (optional)) – Extend Select
- children_only (boolean, (optional)) – Select Children Only

  
bpy.ops.anim.channels_collapse(all=True)  
    Collapse (i.e. close) all selected expandable animation channels  
  
    Parameters all (boolean, (optional)) – All, Collapse all channels (not just selected ones)  
  
bpy.ops.anim.channels_delete()  
    Delete all selected animation channels  
  
bpy.ops.anim.channels_editable_toggle(mode='TOGGLE', type='PROTECT')  
    Toggle editability of selected channels  
  
    Parameters

- mode (enum in ['TOGGLE', 'DISABLE', 'ENABLE', 'INVERT'], (optional)) – Mode
- type (enum in ['PROTECT', 'MUTE'], (optional)) – Type

  
bpy.ops.anim.channels_expand(all=True)  
    Expand (i.e. open) all selected expandable animation channels  
  
    Parameters all (boolean, (optional)) – All, Expand all channels (not just selected ones)  
  
bpy.ops.anim.channels_fcurves_enable()  
    Clears ‘disabled’ tag from all F-Curves to get broken F-Curves working again  
  
bpy.ops.anim.channels_move(direction='DOWN')  
    Rearrange selected animation channels
```

**Parameters** **direction** (*enum in [‘TOP’, ‘UP’, ‘DOWN’, ‘BOTTOM’]*, *(optional)*) – Direction  
bpy.ops.anim.channels\_select\_all\_toggle (*invert=False*)  
Toggle selection of all animation channels

**Parameters** **invert** (*boolean, (optional)*) – Invert  
bpy.ops.anim.channels\_select\_border (*gesture\_mode=0, xmin=0, xmax=0, ymin=0, ymax=0*)  
Select all animation channels within the specified region

**Parameters**

- **gesture\_mode** (*int in [-inf, inf]*, *(optional)*) – Gesture Mode
- **xmin** (*int in [-inf, inf]*, *(optional)*) – X Min
- **xmax** (*int in [-inf, inf]*, *(optional)*) – X Max
- **ymin** (*int in [-inf, inf]*, *(optional)*) – Y Min
- **ymax** (*int in [-inf, inf]*, *(optional)*) – Y Max

bpy.ops.anim.channels\_setting\_disable (*mode=‘DISABLE’*, *type=‘PROTECT’*)  
Disable specified setting on all selected animation channels

**Parameters**

- **mode** (*enum in [‘TOGGLE’, ‘DISABLE’, ‘ENABLE’, ‘INVERT’]*, *(optional)*) – Mode
- **type** (*enum in [‘PROTECT’, ‘MUTE’]*, *(optional)*) – Type

bpy.ops.anim.channels\_setting\_enable (*mode=‘ENABLE’*, *type=‘PROTECT’*)  
Enable specified setting on all selected animation channels

**Parameters**

- **mode** (*enum in [‘TOGGLE’, ‘DISABLE’, ‘ENABLE’, ‘INVERT’]*, *(optional)*) – Mode
- **type** (*enum in [‘PROTECT’, ‘MUTE’]*, *(optional)*) – Type

bpy.ops.anim.channels\_setting\_toggle (*mode=‘TOGGLE’*, *type=‘PROTECT’*)  
Toggle specified setting on all selected animation channels

**Parameters**

- **mode** (*enum in [‘TOGGLE’, ‘DISABLE’, ‘ENABLE’, ‘INVERT’]*, *(optional)*) – Mode
- **type** (*enum in [‘PROTECT’, ‘MUTE’]*, *(optional)*) – Type

bpy.ops.anim.channels\_visibility\_set()  
Make only the selected animation channels visible in the Graph Editor

bpy.ops.anim.channels\_visibility\_toggle()  
Toggle visibility in Graph Editor of all selected animation channels

bpy.ops.anim.copy\_driver\_button()  
Copy the driver for the highlighted button

bpy.ops.anim.driver\_button\_add (*all=True*)  
Add driver(s) for the property(s) connected represented by the highlighted button

**Parameters** **all** (*boolean, (optional)*) – All, Create drivers for all elements of the array.

bpy.ops.anim.driver\_button\_remove (*all=True*)  
Remove the driver(s) for the property(s) connected represented by the highlighted button

**Parameters** **all** (*boolean, (optional)*) – All, Delete drivers for all elements of the array.

bpy.ops.anim.**keyframe\_delete**(*type='DEFAULT'*, *confirm\_success=True*)  
Delete keyframes on the current frame for all properties in the specified Keying Set

#### Parameters

- **type** (*enum in ['DEFAULT']*, *(optional)*) – Keying Set, The Keying Set to use
- **confirm\_success** (*boolean*, *(optional)*) – Confirm Successful Insert, Show a popup when the keyframes get successfully added

bpy.ops.anim.**keyframe\_delete\_button**(*all=True*)  
Undocumented ([contribute](#))

**Parameters** **all** (*boolean*, *(optional)*) – All, Delete keyfames from all elements of the array.

bpy.ops.anim.**keyframe\_delete\_v3d**()  
Remove keyframes on current frame for selected object

bpy.ops.anim.**keyframe\_insert**(*type='DEFAULT'*, *confirm\_success=True*)  
Insert keyframes on the current frame for all properties in the specified Keying Set

#### Parameters

- **type** (*enum in ['DEFAULT']*, *(optional)*) – Keying Set, The Keying Set to use
- **confirm\_success** (*boolean*, *(optional)*) – Confirm Successful Insert, Show a popup when the keyframes get successfully added

bpy.ops.anim.**keyframe\_insert\_button**(*all=True*)  
Undocumented ([contribute](#))

**Parameters** **all** (*boolean*, *(optional)*) – All, Insert a keyframe for all element of the array.

bpy.ops.anim.**keyframe\_insert\_menu**(*type='DEFAULT'*, *confirm\_success=False*, *always\_prompt=False*)  
Insert Keyframes for specified Keying Set, with menu of available Keying Sets if undefined

#### Parameters

- **type** (*enum in ['DEFAULT']*, *(optional)*) – Keying Set, The Keying Set to use
- **confirm\_success** (*boolean*, *(optional)*) – Confirm Successful Insert, Show a popup when the keyframes get successfully added
- **always\_prompt** (*boolean*, *(optional)*) – Always Show Menu

bpy.ops.anim.**keying\_set\_active\_set**(*type=0*)  
Undocumented ([contribute](#))

**Parameters** **type** (*int in [-inf, inf]*, *(optional)*) – Keying Set Number, Index (determined internally) of the Keying Set to use

bpy.ops.anim.**keying\_set\_add**()  
Add a new (empty) Keying Set to the active Scene

bpy.ops.anim.**keying\_set\_export**(*filepath=""*, *filter\_folder=True*, *filter\_text=True*, *filter\_python=True*)  
Export Keying Set to a python script.

#### Parameters

- **filepath** (*string*, *(optional)*) – File Path, Filepath to write file to.
- **filter\_folder** (*boolean*, *(optional)*) – Filter folders
- **filter\_text** (*boolean*, *(optional)*) – Filter text



**Parameters** **type** (*enum in ['XAXIS', 'YAXIS', 'ZAXIS']*, *(optional)*) – Axis, Axis tag names with.  
 bpy.ops.armature.bone\_layers (*layers=(False, False, False, False, False, False, False, False,*  
 *False, False, False,*  
 *False, False, False,*  
 *False, False)*)

Change the layers that the selected bones belong to

**Parameters** **layers** (*boolean array of 32 items*, *(optional)*) – Layer, Armature layers that bone belongs to

bpy.ops.armature.bone\_primitive\_add (*name="Bone"*)

Add a new bone located at the 3D-Cursor

**Parameters** **name** (*string*, *(optional)*) – Name, Name of the newly created bone

bpy.ops.armature.calculate\_roll (*type='X'*, *axis\_flip=False*, *axis\_only=False*)

Automatically fix alignment of select bones' axes

#### Parameters

- **type** (*enum in ['X', 'Y', 'Z', 'ACTIVE', 'VIEW', 'CURSOR']*, *(optional)*) – Type
- **axis\_flip** (*boolean*, *(optional)*) – Flip Axis, Negate the alignment axis.
- **axis\_only** (*boolean*, *(optional)*) – Shortest Rotation, Ignore the axis direction, use the shortest rotation to align.

bpy.ops.armature.click\_extrude ()

Create a new bone going from the last selected joint to the mouse position

bpy.ops.armature.delete ()

Remove selected bones from the armature

bpy.ops.armature.duplicate ()

Make copies of the selected bones within the same armature

bpy.ops.armature.duplicate\_move (*ARMATURE\_OT\_duplicate=None*,  
 *FORM\_OT\_translate=None*)

*TRANS-*

Undocumented ([contribute](#))

#### Parameters

- **ARMATURE\_OT\_duplicate** (*ARMATURE\_OT\_duplicate*, *(optional)*) – Duplicate Selected Bone(s), Make copies of the selected bones within the same armature
- **TRANSFORM\_OT\_translate** (*TRANSFORM\_OT\_translate*, *(optional)*) – Translate, Translate selected items

bpy.ops.armature.extrude (*forked=False*)

Create new bones from the selected joints

**Parameters** **forked** (*boolean*, *(optional)*) – Forked

bpy.ops.armature.extrude\_forked (*ARMATURE\_OT\_extrude=None*,  
 *FORM\_OT\_translate=None*)

*TRANS-*

Undocumented ([contribute](#))

#### Parameters

- **ARMATURE\_OT\_extrude** (*ARMATURE\_OT\_extrude*, *(optional)*) – Extrude, Create new bones from the selected joints
- **TRANSFORM\_OT\_translate** (*TRANSFORM\_OT\_translate*, *(optional)*) – Translate, Translate selected items

TRANS-

## Undocumented (contribute)

- **ARMATURE\_OT\_extrude** (ARMATURE\_OT\_extrude, (optional)) – Extrude, Create new bones from the selected joints
  - **TRANSFORM\_OT\_translate** (TRANSFORM\_OT\_translate, (optional)) – Translate, Translate selected items

`bpy.ops.armature.fill()`  
Add bone between selected joint(s) and/or 3D-Cursor

`bpy.ops.armature.flip_names()`  
Flips (and corrects) the axis suffixes of the names of selected bones

`bpy.ops.armature.hide(unselected=False)`  
Tag selected bones to not be visible in Edit Mode

**Parameters** `unselected (boolean, (optional))` – Unselected. Hide unselected rather than selected.

```
bpy.ops.armature.layers_show_all(all=True)  
    Make all armature layers visible
```

**Parameters** `all (boolean, (optional))` – All Layers, Enable all layers or just the first 16 (top row)

`bpy.ops.armature.merge(type='WITHIN_CHAIN')`  
Merge continuous chains of selected bones

**bpy.ops.armature.parent\_clear(type='CLEAR')**  
Remove the parent-child relationship between selected bones and their parents.

**Parameters** type (*enum in [‘CLEAR’, ‘DISCONNECTED’, ‘CONNECTED’]*)  
clear parenting

**Parent** (parent) (parent is [CONNECTED] (OPENSET)) (parent is [CONNECTED] (CLOSED)) Parent To Parent of

ing

Unhide all bones that have been tagged to be hidden in E

```
bpy.ops.armature.select_all(action='TOGGLE')  
    Toggle selection status of all bones
```

**Parameters** `action` (*enum in ['TOGGLE', 'SELECT', 'DESELECT', 'INVERSE']*, Selection action to execute)

.armature

- **direction** (*enum in ['PARENT', 'CHILD']*, *(optional)*) – Direction

- **extend** (*boolean, (optional)*) – Add to Selection

```
bpy.ops.armature.select_linked(extend=False)
    Select bones related to selected ones by parent/child relationships

Parameters extend (boolean, (optional)) – Extend, Extend selection instead of deselecting everything first.

bpy.ops.armature.separate()
    Isolate selected bones into a separate armature

bpy.ops.armature.subdivide(number_cuts=1)
    Break selected bones into chains of smaller bones

Parameters number_cuts (int in [1, inf], (optional)) – Number of Cuts

bpy.ops.armature.switch_direction()
    Change the direction that a chain of bones points in (head <-> tail swap)
```

## Boid Operators

```
bpy.ops.boid.rule_add(type='GOAL')
    Add a boid rule to the current boid state

Parameters type (enum in ['GOAL', 'AVOID', 'AVOID_COLLISION', 'SEPARATE', 'FLOCK', 'FOLLOW_LEADER', 'AVERAGE_SPEED', 'FIGHT'], (optional)) – Type

bpy.ops.boid.rule_del()
    Undocumented (contribute)

bpy.ops.boid.rule_move_down()
    Move boid rule down in the list

bpy.ops.boid.rule_move_up()
    Move boid rule up in the list

bpy.ops.boid.state_add()
    Add a boid state to the particle system

bpy.ops.boid.state_del()
    Undocumented (contribute)

bpy.ops.boid.state_move_down()
    Move boid state down in the list

bpy.ops.boid.state_move_up()
    Move boid state up in the list
```

## Brush Operators

```
bpy.ops.brush.active_index_set(mode=""", index=0)
    Set active sculpt/paint brush from it's number

Parameters
    • mode (string, (optional)) – mode, Paint mode to set brush for
    • index (int in [-inf, inf], (optional)) – number, Brush number

File startup/bl_operators/wm.py:161

bpy.ops.brush.add()
    Add brush by mode type
```

```
bpy.ops.brush.curve_preset(shape='SMOOTH')
    Set brush shape

Parameters shape (enum in ['SHARP', 'SMOOTH', 'MAX', 'LINE', 'ROUND', 'ROOT'], (optional)) – Mode

bpy.ops.brush.image_tool_set(tool='DRAW')
    Set the image tool

Parameters tool (enum in ['DRAW', 'SOFTEN', 'SMEAR', 'CLONE'], (optional)) – Tool

bpy.ops.brush.reset()
    Return brush to defaults based on current tool

bpy.ops.brush.scale_size(scalar=1.0)
    Change brush size by a scalar

Parameters scalar (float in [0, 2], (optional)) – Scalar, Factor to scale brush size by

bpy.ops.brush.sculpt_tool_set(tool='BLOB')
    Set the sculpt tool

Parameters tool (enum in ['BLOB', 'CLAY', 'CREASE', 'DRAW', 'FILL', 'FLATTEN', 'GRAB', 'INFLATE', 'LAYER', 'NUUDGE', 'PINCH', 'ROTATE', 'SCRAPE', 'SMOOTH', 'SNAKE_HOOK', 'THUMB'], (optional)) – Tool

bpy.ops.brush.vertex_tool_set(tool='MIX')
    Set the vertex paint tool

Parameters tool (enum in ['MIX', 'ADD', 'SUB', 'MUL', 'BLUR', 'LIGHTEN', 'DARKEN'], (optional)) – Tool

bpy.ops.brush.weight_tool_set(tool='MIX')
    Set the weight paint tool

Parameters tool (enum in ['MIX', 'ADD', 'SUB', 'MUL', 'BLUR', 'LIGHTEN', 'DARKEN'], (optional)) – Tool
```

## Buttons Operators

```
bpy.ops.buttons.directory_browse(directory=""", filter_blender=False, filter_image=False, filter_movie=False, filter_python=False, filter_font=False, filter_sound=False, filter_text=False, filter_btx=False, filter_collada=False, filter_folder=False, filemode=9, relative_path=False)
```

Open a directory browser, Hold Shift to open the file, Alt to browse containing directory

### Parameters

- **directory** (*string, (optional)*) – Directory, Directory of the file
- **filter\_blender** (*boolean, (optional)*) – Filter .blend files
- **filter\_image** (*boolean, (optional)*) – Filter image files
- **filter\_movie** (*boolean, (optional)*) – Filter movie files
- **filter\_python** (*boolean, (optional)*) – Filter python files
- **filter\_font** (*boolean, (optional)*) – Filter font files
- **filter\_sound** (*boolean, (optional)*) – Filter sound files
- **filter\_text** (*boolean, (optional)*) – Filter text files

- **filter\_btx** (*boolean, (optional)*) – Filter btx files
- **filter\_collada** (*boolean, (optional)*) – Filter COLLADA files
- **filter\_folder** (*boolean, (optional)*) – Filter folders
- **filemode** (*int in [1, 9], (optional)*) – File Browser Mode, The setting for the file browser mode to load a .blend file, a library or a special file
- **relative\_path** (*boolean, (optional)*) – Relative Path, Select the file relative to the blend file

```
bpy.ops.buttons.file_browser(filepath="", filter_blender=False, filter_image=False, filter_movie=False, filter_python=False, filter_font=False, filter_sound=False, filter_text=False, filter_btx=False, filter_collada=False, filter_folder=False, filemode=9, relative_path=False)
```

Open a file browser, Hold Shift to open the file, Alt to browse containing directory

#### Parameters

- **filepath** (*string, (optional)*) – File Path, Path to file
- **filter\_blender** (*boolean, (optional)*) – Filter .blend files
- **filter\_image** (*boolean, (optional)*) – Filter image files
- **filter\_movie** (*boolean, (optional)*) – Filter movie files
- **filter\_python** (*boolean, (optional)*) – Filter python files
- **filter\_font** (*boolean, (optional)*) – Filter font files
- **filter\_sound** (*boolean, (optional)*) – Filter sound files
- **filter\_text** (*boolean, (optional)*) – Filter text files
- **filter\_btx** (*boolean, (optional)*) – Filter btx files
- **filter\_collada** (*boolean, (optional)*) – Filter COLLADA files
- **filter\_folder** (*boolean, (optional)*) – Filter folders
- **filemode** (*int in [1, 9], (optional)*) – File Browser Mode, The setting for the file browser mode to load a .blend file, a library or a special file
- **relative\_path** (*boolean, (optional)*) – Relative Path, Select the file relative to the blend file

```
bpy.ops.buttons.toolbox()
```

Display button panel toolbox

## Cloth Operators

```
bpy.ops.cloth.preset_add(name="", remove_active=False)
```

Add a Cloth Preset

**Parameters** **name** (*string, (optional)*) – Name, Name of the preset, used to make the path name

**File** startup/bl\_operators/presets.py:50

## Console Operators

```
bpy.ops.console.autocomplete()
```

Evaluate the namespace up until the cursor and give a list of options or complete the name if there is only one

**File** startup/bl\_ui/space\_console.py:106

bpy.ops.console.banner()

Print a message when the terminal initializes

**File** startup/bl\_ui/space\_console.py:123

bpy.ops.console.clear(scrollback=True, history=False)

Clear text by type

#### Parameters

- **scrollback** (boolean, (optional)) – Scrollback, Clear the scrollback history
- **history** (boolean, (optional)) – History, Clear the command history

bpy.ops.console.copy()

Copy selected text to clipboard

bpy.ops.console.delete(type='NEXT\_CHARACTER')

Delete text by cursor position

**Parameters** **type** (enum in ['NEXT\_CHARACTER', 'PREVIOUS\_CHARACTER'], (optional)) – Type, Which part of the text to delete.

bpy.ops.console.execute()

Execute the current console line as a python expression

**File** startup/bl\_ui/space\_console.py:88

bpy.ops.console.history\_append(text="", current\_character=0, remove\_duplicates=False)

Append history at cursor position

#### Parameters

- **text** (string, (optional)) – Text, Text to insert at the cursor position.
- **current\_character** (int in [0, inf], (optional)) – Cursor, The index of the cursor.
- **remove\_duplicates** (boolean, (optional)) – Remove Duplicates, Remove duplicate items in the history

bpy.ops.console.history\_cycle(reverse=False)

Cycle through history

**Parameters** **reverse** (boolean, (optional)) – Reverse, reverse cycle history

bpy.ops.console.insert(text="")

Insert text at cursor position

**Parameters** **text** (string, (optional)) – Text, Text to insert at the cursor position.

bpy.ops.console.language(language="")

Set the current language for this console

**Parameters** **language** (string, (optional)) – Language

**File** startup/bl\_ui/space\_console.py:150

bpy.ops.console.move(type='LINE\_BEGIN')

Move cursor position

**Parameters** **type** (enum in ['LINE\_BEGIN', 'LINE\_END', 'PREVIOUS\_CHARACTER', 'NEXT\_CHARACTER', 'PREVIOUS\_WORD', 'NEXT\_WORD'], (optional)) – Type, Where to move cursor to.

```
bpy.ops.console.paste()  
    Paste text from clipboard
```

```
bpy.ops.console.scrollback_append(text=""", type='OUTPUT')  
    Append scrollback text by type
```

#### Parameters

- **text** (*string, (optional)*) – Text, Text to insert at the cursor position.
- **type** (*enum in ['OUTPUT', 'INPUT', 'INFO', 'ERROR'], (optional)*) – Type, Console output type.

```
bpy.ops.console.select_set()  
    Set the console selection
```

### Constraint Operators

```
bpy.ops.constraint.childof_clear_inverse(constraint=""", owner='OBJECT')  
    Clear inverse correction for ChildOf constraint
```

#### Parameters

- **constraint** (*string, (optional)*) – Constraint, Name of the constraint to edit
- **owner** (*enum in ['OBJECT', 'BONE'], (optional)*) – Owner, The owner of this constraint

```
bpy.ops.constraint.childof_set_inverse(constraint=""", owner='OBJECT')  
    Set inverse correction for ChildOf constraint
```

#### Parameters

- **constraint** (*string, (optional)*) – Constraint, Name of the constraint to edit
- **owner** (*enum in ['OBJECT', 'BONE'], (optional)*) – Owner, The owner of this constraint

```
bpy.ops.constraint.delete()  
    Remove constraint from constraint stack
```

```
bpy.ops.constraint.limitdistance_reset(constraint=""", owner='OBJECT')  
    Reset limiting distance for Limit Distance Constraint
```

#### Parameters

- **constraint** (*string, (optional)*) – Constraint, Name of the constraint to edit
- **owner** (*enum in ['OBJECT', 'BONE'], (optional)*) – Owner, The owner of this constraint

```
bpy.ops.constraint.move_down(constraint=""", owner='OBJECT')  
    Move constraint down in constraint stack
```

#### Parameters

- **constraint** (*string, (optional)*) – Constraint, Name of the constraint to edit
- **owner** (*enum in ['OBJECT', 'BONE'], (optional)*) – Owner, The owner of this constraint

```
bpy.ops.constraint.move_up(constraint=""", owner='OBJECT')  
    Move constraint up in constraint stack
```

#### Parameters

- **constraint** (*string, (optional)*) – Constraint, Name of the constraint to edit
- **owner** (*enum in ['OBJECT', 'BONE'], (optional)*) – Owner, The owner of this constraint

```
bpy.ops.constraint.stretchto_reset(constraint="", owner='OBJECT')
```

Reset original length of bone for Stretch To Constraint

#### Parameters

- **constraint** (*string, (optional)*) – Constraint, Name of the constraint to edit
- **owner** (*enum in ['OBJECT', 'BONE'], (optional)*) – Owner, The owner of this constraint

## Curve Operators

```
bpy.ops.curve.cyclic_toggle(direction='CYCLIC_U')
```

Make active spline closed/opened loop

**Parameters direction** (*enum in ['CYCLIC\_U', 'CYCLIC\_V'], (optional)*) – Direction, Direction to make surface cyclic in.

```
bpy.ops.curve.de_select_first()
```

Undocumented (contribute)

```
bpy.ops.curve.de_select_last()
```

Undocumented (contribute)

```
bpy.ops.curve.delete(type='SELECTED')
```

Delete selected control points or segments

**Parameters type** (*enum in ['SELECTED', 'SEGMENT', 'ALL'], (optional)*) – Type, Which elements to delete.

```
bpy.ops.curve.duplicate(mode='TRANSLATION')
```

Duplicate selected control points and segments between them

**Parameters mode** (*enum in ['INIT', 'DUMMY', 'TRANSLATION', 'ROTATION', 'RESIZE', 'TO-SPHERE', 'SHEAR', 'WARP', 'SHRINKFATTEN', 'TILT', 'TRACKBALL', 'PUSHPULL', 'CREASE', 'MIRROR', 'BONE\_SIZE', 'BONE\_ENVELOPE', 'CURVE\_SHRINKFATTEN', 'BONE\_ROLL', 'TIME\_TRANSLATE', 'TIME\_SLIDE', 'TIME\_SCALE', 'TIME\_EXTEND', 'BAKE\_TIME', 'BEVEL', 'BWEIGHT', 'ALIGN', 'EDGESLIDE', 'SEQSLIDE'], (optional)*) – Mode

```
bpy.ops.curve.extrude(mode='TRANSLATION')
```

Extrude selected control point(s) and move

**Parameters mode** (*enum in ['INIT', 'DUMMY', 'TRANSLATION', 'ROTATION', 'RESIZE', 'TO-SPHERE', 'SHEAR', 'WARP', 'SHRINKFATTEN', 'TILT', 'TRACKBALL', 'PUSHPULL', 'CREASE', 'MIRROR', 'BONE\_SIZE', 'BONE\_ENVELOPE', 'CURVE\_SHRINKFATTEN', 'BONE\_ROLL', 'TIME\_TRANSLATE', 'TIME\_SLIDE', 'TIME\_SCALE', 'TIME\_EXTEND', 'BAKE\_TIME', 'BEVEL', 'BWEIGHT', 'ALIGN', 'EDGESLIDE', 'SEQSLIDE'], (optional)*) – Mode

```
bpy.ops.curve.handle_type_set(type='AUTOMATIC')
```

Set type of handles for selected control points

**Parameters type** (*enum in ['AUTOMATIC', 'VECTOR', 'ALIGNED', 'FREE\_ALIGN', 'TOGGLE\_FREE\_ALIGN'], (optional)*) – Type, Spline type

```
bpy.ops.curve.hide(unselected=False)
```

Undocumented (contribute)

**Parameters unselected** (*boolean, (optional)*) – Unselected, Hide unselected rather than selected.

```
bpy.ops.curve.make_segment()
```

Undocumented (contribute)

```
bpy.ops.curve.primitive_bezier_circle_add(view_align=False, enter_editmode=False, location=(0.0, 0.0, 0.0), rotation=(0.0, 0.0, 0.0), layers=(False, False, False))
```

Construct a Bezier Circle

#### Parameters

- **view\_align** (*boolean, (optional)*) – Align to View, Align the new object to the view
- **enter\_editmode** (*boolean, (optional)*) – Enter Editmode, Enter editmode when adding this object
- **location** (*float array of 3 items in [-inf, inf], (optional)*) – Location, Location for the newly added object
- **rotation** (*float array of 3 items in [-inf, inf], (optional)*) – Rotation, Rotation for the newly added object
- **layers** (*boolean array of 20 items, (optional)*) – Layer

```
bpy.ops.curve.primitive_bezier_curve_add(view_align=False, enter_editmode=False, location=(0.0, 0.0, 0.0), rotation=(0.0, 0.0, 0.0), layers=(False, False, False))
```

Construct a Bezier Curve

#### Parameters

- **view\_align** (*boolean, (optional)*) – Align to View, Align the new object to the view
- **enter\_editmode** (*boolean, (optional)*) – Enter Editmode, Enter editmode when adding this object
- **location** (*float array of 3 items in [-inf, inf], (optional)*) – Location, Location for the newly added object
- **rotation** (*float array of 3 items in [-inf, inf], (optional)*) – Rotation, Rotation for the newly added object
- **layers** (*boolean array of 20 items, (optional)*) – Layer

```
bpy.ops.curve.primitive_nurbs_circle_add(view_align=False, enter_editmode=False, location=(0.0, 0.0, 0.0), rotation=(0.0, 0.0, 0.0), layers=(False, False, False))
```

Construct a Nurbs Circle

#### Parameters

- **view\_align** (*boolean, (optional)*) – Align to View, Align the new object to the view
- **enter\_editmode** (*boolean, (optional)*) – Enter Editmode, Enter editmode when adding this object
- **location** (*float array of 3 items in [-inf, inf], (optional)*) – Location, Location for the newly added object
- **rotation** (*float array of 3 items in [-inf, inf], (optional)*) – Rotation, Rotation for the newly added object

- **layers** (*boolean array of 20 items, (optional)*) – Layer

```
bpy.ops.curve.primitive_nurbs_curve_add(view_align=False, enter_editmode=False, location=(0.0, 0.0, 0.0), rotation=(0.0, 0.0, 0.0), layers=(False, False, False))
```

Construct a Nurb Curve

#### Parameters

- **view\_align** (*boolean, (optional)*) – Align to View, Align the new object to the view
- **enter\_editmode** (*boolean, (optional)*) – Enter Editmode, Enter editmode when adding this object
- **location** (*float array of 3 items in [-inf, inf], (optional)*) – Location, Location for the newly added object
- **rotation** (*float array of 3 items in [-inf, inf], (optional)*) – Rotation, Rotation for the newly added object
- **layers** (*boolean array of 20 items, (optional)*) – Layer

```
bpy.ops.curve.primitive_nurbs_path_add(view_align=False, enter_editmode=False, location=(0.0, 0.0, 0.0), rotation=(0.0, 0.0, 0.0), layers=(False, False, False))
```

Construct a Path

#### Parameters

- **view\_align** (*boolean, (optional)*) – Align to View, Align the new object to the view
- **enter\_editmode** (*boolean, (optional)*) – Enter Editmode, Enter editmode when adding this object
- **location** (*float array of 3 items in [-inf, inf], (optional)*) – Location, Location for the newly added object
- **rotation** (*float array of 3 items in [-inf, inf], (optional)*) – Rotation, Rotation for the newly added object
- **layers** (*boolean array of 20 items, (optional)*) – Layer

```
bpy.ops.curve.radius_set(radius=1.0)
```

Set per-point radius which is used for bevel tapering

**Parameters** **radius** (*float in [0, inf], (optional)*) – Radius

```
bpy.ops.curve.reveal()
```

Undocumented (contribute)

```
bpy.ops.curve.select_all(action='TOGGLE')
```

Undocumented (contribute)

**Parameters** **action** (*enum in ['TOGGLE', 'SELECT', 'DESELECT', 'INVERT'], (optional)*) – Action, Selection action to execute

```
bpy.ops.curve.select_inverse()
```

Undocumented (contribute)

```
bpy.ops.curve.select_less()
```

Undocumented (contribute)

```
bpy.ops.curve.select_linked()  
    Undocumented (contribute)  
  
bpy.ops.curve.select_linked_pick(deselect=False)  
    Undocumented (contribute)  
  
    Parameters deselect (boolean, (optional)) – Deselect, Deselect linked control points rather than  
        selecting them.  
  
bpy.ops.curve.select_more()  
    Undocumented (contribute)  
  
bpy.ops.curve.select_next()  
    Undocumented (contribute)  
  
bpy.ops.curve.select_nth(nth=2)  
    Undocumented (contribute)  
  
    Parameters nth (int in [2, 100], (optional)) – Nth Selection  
  
bpy.ops.curve.select_previous()  
    Undocumented (contribute)  
  
bpy.ops.curve.select_random(percent=50.0, extend=False)  
    Undocumented (contribute)  
  
    Parameters  
        • percent (float in [0, 100], (optional)) – Percent, Percentage of elements to select randomly.  
        • extend (boolean, (optional)) – Extend Selection, Extend selection instead of deselecting  
            everything first.  
  
bpy.ops.curve.select_row()  
    Undocumented (contribute)  
  
bpy.ops.curve.separate()  
    Undocumented (contribute)  
  
bpy.ops.curve.shade_flat()  
    Undocumented (contribute)  
  
bpy.ops.curve.shade_smooth()  
    Undocumented (contribute)  
  
bpy.ops.curve.smooth()  
    Flatten angles of selected points  
  
bpy.ops.curve.smooth_radius()  
    Flatten radiiuses of selected points  
  
bpy.ops.curve.spin(center=(0.0, 0.0, 0.0), axis=(0.0, 0.0, 0.0))  
    Undocumented (contribute)  
  
    Parameters  
        • center (float array of 3 items in [-inf, inf], (optional)) – Center, Center in global view space  
        • axis (float array of 3 items in [-1, 1], (optional)) – Axis, Axis in global view space  
  
bpy.ops.curve.spline_type_set(type='POLY')  
    Set type of active spline  
  
    Parameters type (enum in ['POLY', 'BEZIER', 'NURBS'], (optional)) – Type, Spline type
```

bpy.ops.curve.spline\_weight\_set (*weight=1.0*)

Set softbody goal weight for selected points

**Parameters** **weight** (*float in [0, 1], (optional)*) – Weight

bpy.ops.curve.subdivide (*number\_cuts=1*)

Subdivide selected segments

**Parameters** **number\_cuts** (*int in [1, inf], (optional)*) – Number of cuts

bpy.ops.curve.switch\_direction()

Switch direction of selected splines

bpy.ops.curve.tilt\_clear()

Undocumented ([contribute](#))

bpy.ops.curve.vertex\_add (*location=(0.0, 0.0, 0.0)*)

Undocumented ([contribute](#))

**Parameters** **location** (*float array of 3 items in [-inf, inf], (optional)*) – Location, Location to add new vertex at.

## Ed Operators

bpy.ops.ed.redo()

Redo previous action

bpy.ops.ed.undo()

Undo previous action

bpy.ops.ed.undo\_history (*item=0*)

Redo specific action in history

**Parameters** **item** (*int in [0, inf], (optional)*) – Item

bpy.ops.ed.undo\_push (*message="Add an undo step \*function may be moved\*"*)

Add an undo state (internal use only)

**Parameters** **message** (*string, (optional)*) – Undo Message

## Export Anim Operators

bpy.ops.export\_anim.bvh (*filepath="“, check\_existing=True, filter\_glob="\*.bvh”, global\_scale=1.0, frame\_start=0, frame\_end=0, rotate\_mode='NATIVE’, root\_transform\_only=False*)

Save a BVH motion capture file from an armature

### Parameters

- **filepath** (*string, (optional)*) – File Path, Filepath used for exporting the file
- **check\_existing** (*boolean, (optional)*) – Check Existing, Check and warn on overwriting existing files
- **global\_scale** (*float in [0.0001, 1e+06], (optional)*) – Scale, Scale the BVH by this value
- **frame\_start** (*int in [-inf, inf], (optional)*) – Start Frame, Starting frame to export
- **frame\_end** (*int in [-inf, inf], (optional)*) – End Frame, End frame to export
- **rotate\_mode** (*enum in ['NATIVE’, ‘XYZ’, ‘XZY’, ‘YXZ’, ‘YZX’, ‘ZXY’, ‘ZYX’], (optional)*) – Rotation, Rotation conversion.

- **root\_transform\_only** (*boolean, (optional)*) – Root Transform Only, Only write out transform channels for the root bone

**File** addons/io\_anim\_bvh/\_init\_\_.py:205

## Export Mesh Operators

```
bpy.ops.export_mesh.ply(filepath="", check_existing=True, filter_glob="*.ply",
                        use_modifiers=True, use_normals=True, use_uv_coords=True,
                        use_colors=True)
```

Export a single object as a stanford PLY with normals, colours and texture coordinates.

### Parameters

- **filepath** (*string, (optional)*) – File Path, Filepath used for exporting the file
- **check\_existing** (*boolean, (optional)*) – Check Existing, Check and warn on overwriting existing files
- **use\_modifiers** (*boolean, (optional)*) – Apply Modifiers, Apply Modifiers to the exported mesh
- **use\_normals** (*boolean, (optional)*) – Normals, Export Normals for smooth and hard shaded faces
- **use\_uv\_coords** (*boolean, (optional)*) – UVs, Export the active UV layer
- **use\_colors** (*boolean, (optional)*) – Vertex Colors, Export the active vertex color layer

**File** addons/io\_mesh\_ply/\_init\_\_.py:113

```
bpy.ops.export_mesh.stl(filepath="", check_existing=True, ascii=False, apply_modifiers=True)
```

Save STL triangle mesh data from the active object

### Parameters

- **filepath** (*string, (optional)*) – File Path, Filepath used for exporting the file
- **check\_existing** (*boolean, (optional)*) – Check Existing, Check and warn on overwriting existing files
- **ascii** (*boolean, (optional)*) – Ascii, Save the file in ASCII file format
- **apply\_modifiers** (*boolean, (optional)*) – Apply Modifiers, Apply the modifiers before saving

**File** addons/io\_mesh\_stl/\_init\_\_.py:125

## Export Scene Operators

```
bpy.ops.export_scene.autodesk_3ds(filepath="", check_existing=True, filter_glob="*.3ds",
                                    use_selection=False, axis_forward='Y', axis_up='Z')
```

Export to 3DS file format (.3ds)

### Parameters

- **filepath** (*string, (optional)*) – File Path, Filepath used for exporting the file
- **check\_existing** (*boolean, (optional)*) – Check Existing, Check and warn on overwriting existing files
- **use\_selection** (*boolean, (optional)*) – Selection Only, Export selected objects only

- **axis\_forward** (*enum in [‘X’, ‘Y’, ‘Z’, ‘-X’, ‘-Y’, ‘-Z’], (optional)*) – Forward
- **axis\_up** (*enum in [‘X’, ‘Y’, ‘Z’, ‘-X’, ‘-Y’, ‘-Z’], (optional)*) – Up

**File** addons/io\_scene\_3ds/\_\_init\_\_.py:163

```
bpy.ops.export_scene.fbx(filepath="", check_existing=True, filter_glob="*.fbx",
    use_selection=False, global_scale=1.0, axis_forward='-'-
    Z, axis_up='Y', object_types={'ARMATURE', 'LAMP',
    'CAMERA', 'MESH', 'EMPTY'}, use_mesh_modifiers=True,
    mesh_smooth_type='FACE', use_mesh_edges=False,
    use_anim=True, use_anim_action_all=True, use_default_take=False,
    use_anim_optimize=True, anim_optimize_precision=6.0,
    path_mode='AUTO', use_rotate_workaround=False,
    xna_validate=False, batch_mode='OFF', use_batch_own_dir=True,
    use_metadata=True)
```

Selection to an ASCII Autodesk FBX

#### Parameters

- **filepath** (*string, (optional)*) – File Path, Filepath used for exporting the file
- **check\_existing** (*boolean, (optional)*) – Check Existing, Check and warn on overwriting existing files
- **use\_selection** (*boolean, (optional)*) – Selected Objects, Export selected objects on visible layers
- **global\_scale** (*float in [0.01, 1000], (optional)*) – Scale, Scale all data. Some importers do not support scaled armatures!
- **axis\_forward** (*enum in [‘X’, ‘Y’, ‘Z’, ‘-X’, ‘-Y’, ‘-Z’], (optional)*) – Forward
- **axis\_up** (*enum in [‘X’, ‘Y’, ‘Z’, ‘-X’, ‘-Y’, ‘-Z’], (optional)*) – Up
- **object\_types** (*enum set in {‘EMPTY’, ‘CAMERA’, ‘LAMP’, ‘ARMATURE’, ‘MESH’}, (optional)*) – Object Types
- **use\_mesh\_modifiers** (*boolean, (optional)*) – Apply Modifiers, Apply modifiers to mesh objects
- **mesh\_smooth\_type** (*enum in [‘OFF’, ‘FACE’, ‘EDGE’], (optional)*) – Smoothing
- **use\_mesh\_edges** (*boolean, (optional)*) – Include Edges, Edges may not be necessary, can cause import pipeline errors with XNA
- **use\_anim** (*boolean, (optional)*) – Include Animation, Export keyframe animation
- **use\_anim\_action\_all** (*boolean, (optional)*) – All Actions, Export all actions for armatures or just the currently selected action
- **use\_default\_take** (*boolean, (optional)*) – Include Default Take, Export currently assigned object and armature animations into a default take from the scene start/end frames
- **use\_anim\_optimize** (*boolean, (optional)*) – Optimize Keyframes, Remove double keyframes
- **anim\_optimize\_precision** (*float in [1, 16], (optional)*) – Precision, Tolerance for comparing double keyframes (higher for greater accuracy)
- **path\_mode** (*enum in [‘AUTO’, ‘ABSOLUTE’, ‘RELATIVE’, ‘MATCH’, ‘STRIP’, ‘COPY’], (optional)*) – Path Mode, Method used to reference paths
- **use\_rotate\_workaround** (*boolean, (optional)*) – Rotate Animation Fix, Disable global rotation, for XNA compatibility

- **xna\_validate** (*boolean, (optional)*) – XNA Strict Options, Make sure options are compatible with Microsoft XNA
- **batch\_mode** (*enum in [‘OFF’, ‘SCENE’, ‘GROUP’], (optional)*) – Batch Mode
- **use\_batch\_own\_dir** (*boolean, (optional)*) – Own Dir, Create a dir for each exported file
- **use\_metadata** (*boolean, (optional)*) – Use Metadata

**File** addons/io\_scene\_fbx/\_init\_\_.py:232

```
bpy.ops.export_scene.obj(filepath="", check_existing=True, filter_glob="*.obj;*.mtl",
                      use_selection=False, use_all_scenes=False, use_animation=False,
                      use_apply_modifiers=True, use_edges=True, use_normals=False,
                      use_hq_normals=True, useUvs=True, use_materials=True,
                      use_triangles=False, use_vertex_groups=False, use_nurbs=False,
                      use_blen_objects=True, group_by_object=False,
                      group_by_material=False, keep_vertex_order=False, global_scale=1.0,
                      axis_forward='Z', axis_up='Y', path_mode='AUTO')
```

Save a Wavefront OBJ File

#### Parameters

- **filepath** (*string, (optional)*) – File Path, Filepath used for exporting the file
- **check\_existing** (*boolean, (optional)*) – Check Existing, Check and warn on overwriting existing files
- **use\_selection** (*boolean, (optional)*) – Selection Only, Export selected objects only
- **use\_all\_scenes** (*boolean, (optional)*) – All Scenes
- **use\_animation** (*boolean, (optional)*) – Animation
- **use\_apply\_modifiers** (*boolean, (optional)*) – Apply Modifiers, Apply modifiers (preview resolution)
- **use\_edges** (*boolean, (optional)*) – Edges
- **use\_normals** (*boolean, (optional)*) – Normals
- **use\_hq\_normals** (*boolean, (optional)*) – High Quality Normals
- **useUvs** (*boolean, (optional)*) – UVs
- **use\_materials** (*boolean, (optional)*) – Materials
- **use\_triangles** (*boolean, (optional)*) – Triangulate
- **use\_vertex\_groups** (*boolean, (optional)*) – Polygroups
- **use\_nurbs** (*boolean, (optional)*) – Nurbs
- **use\_blen\_objects** (*boolean, (optional)*) – Objects as OBJ Objects
- **group\_by\_object** (*boolean, (optional)*) – Objects as OBJ Groups
- **group\_by\_material** (*boolean, (optional)*) – Material Groups
- **keep\_vertex\_order** (*boolean, (optional)*) – Keep Vertex Order
- **global\_scale** (*float in [0.01, 1000], (optional)*) – Scale, Scale all data
- **axis\_forward** (*enum in [‘X’, ‘Y’, ‘Z’, ‘-X’, ‘-Y’, ‘-Z’], (optional)*) – Forward
- **axis\_up** (*enum in [‘X’, ‘Y’, ‘Z’, ‘-X’, ‘-Y’, ‘-Z’], (optional)*) – Up

- **path\_mode** (*enum in ['AUTO', 'ABSOLUTE', 'RELATIVE', 'MATCH', 'STRIP', 'COPY']*, *(optional)*) – Path Mode, Method used to reference paths

**File** `addons/io_scene_obj/_init__.py:337`

```
bpy.ops.export_scene.x3d(filepath="", check_existing=True, filter_glob="*.x3d",
    use_selection=False, use_apply_modifiers=True, use_triangulate=False,
    use_normals=False, use_compress=False, use_hierarchy=True,
    axis_forward='Z', axis_up='Y', path_mode='AUTO')
```

Export selection to Extensible 3D file (.x3d)

#### Parameters

- **filepath** (*string, (optional)*) – File Path, Filepath used for exporting the file
- **check\_existing** (*boolean, (optional)*) – Check Existing, Check and warn on overwriting existing files
- **use\_selection** (*boolean, (optional)*) – Selection Only, Export selected objects only
- **use\_apply\_modifiers** (*boolean, (optional)*) – Apply Modifiers, Use transformed mesh data from each object
- **use\_triangulate** (*boolean, (optional)*) – Triangulate, Write quads into ‘IndexedTriangleSet’
- **use\_normals** (*boolean, (optional)*) – Normals, Write normals with geometry
- **use\_compress** (*boolean, (optional)*) – Compress, Compress the exported file
- **use\_hierarchy** (*boolean, (optional)*) – Hierarchy, Export parent child relationships
- **axis\_forward** (*enum in ['X', 'Y', 'Z', '-X', '-Y', '-Z']*, *(optional)*) – Forward
- **axis\_up** (*enum in ['X', 'Y', 'Z', '-X', '-Y', '-Z']*, *(optional)*) – Up
- **path\_mode** (*enum in ['AUTO', 'ABSOLUTE', 'RELATIVE', 'MATCH', 'STRIP', 'COPY']*, *(optional)*) – Path Mode, Method used to reference paths

**File** `addons/io_scene_x3d/_init__.py:175`

## File Operators

```
bpy.ops.file.bookmark_add()
```

Add a bookmark for the selected/active directory

```
bpy.ops.file.bookmark_toggle()
```

Toggle bookmarks display

```
bpy.ops.file.cancel()
```

Cancel loading of selected file

```
bpy.ops.file.delete()
```

Delete selected file

```
bpy.ops.file.delete_bookmark(index=-1)
```

Delete selected bookmark

**Parameters** **index** (*int in [-1, 20000]*, *(optional)*) – Index

```
bpy.ops.file.directory()
```

Enter a directory name

```
bpy.ops.file.directory_new(directory="")
```

Create a new directory

**Parameters** **directory** (*string, (optional)*) – Directory, Name of new directory

bpy.ops.file.execute (*need\_active=False*)  
Execute selected file

**Parameters** **need\_active** (*boolean, (optional)*) – Need Active, Only execute if there's an active selected file in the file list.

bpy.ops.file.filenumber (*increment=1*)  
Increment number in filename

**Parameters** **increment** (*int in [-100, 100], (optional)*) – Increment

bpy.ops.file.find\_missing\_files (*filepath=""*, *filter\_blender=False*, *filter\_image=False*, *filter\_movie=False*, *filter\_python=False*, *filter\_font=False*, *filter\_sound=False*, *filter\_text=False*, *filter\_btx=False*, *filter\_collada=False*, *filter\_folder=False*, *filemode=9*)

Undocumented (contribute)

#### Parameters

- **filepath** (*string, (optional)*) – File Path, Path to file
- **filter\_blender** (*boolean, (optional)*) – Filter .blend files
- **filter\_image** (*boolean, (optional)*) – Filter image files
- **filter\_movie** (*boolean, (optional)*) – Filter movie files
- **filter\_python** (*boolean, (optional)*) – Filter python files
- **filter\_font** (*boolean, (optional)*) – Filter font files
- **filter\_sound** (*boolean, (optional)*) – Filter sound files
- **filter\_text** (*boolean, (optional)*) – Filter text files
- **filter\_btx** (*boolean, (optional)*) – Filter btx files
- **filter\_collada** (*boolean, (optional)*) – Filter COLLADA files
- **filter\_folder** (*boolean, (optional)*) – Filter folders
- **filemode** (*int in [1, 9], (optional)*) – File Browser Mode, The setting for the file browser mode to load a .blend file, a library or a special file

bpy.ops.file.hidedot()  
Toggle hide hidden dot files

bpy.ops.file.highlight()  
Highlight selected file(s)

bpy.ops.file.make\_paths\_absolute()  
Undocumented (contribute)

bpy.ops.file.make\_paths\_relative()  
Undocumented (contribute)

bpy.ops.file.next()  
Move to next folder

bpy.ops.file.pack\_all()  
Undocumented (contribute)

bpy.ops.file.parent()  
Move to parent directory

bpy.ops.file.previous()

Move to previous folder

bpy.ops.file.refresh()

Refresh the file list

bpy.ops.file.rename()

Rename file or file directory

bpy.ops.file.report\_missing\_files()

Undocumented (contribute)

bpy.ops.file.select(*extend=False, fill=False*)

Activate/select file

#### Parameters

- **extend** (*boolean, (optional)*) – Extend, Extend selection instead of deselecting everything first.
- **fill** (*boolean, (optional)*) – Fill, Select everything beginning with the last selection.

bpy.ops.file.select\_all\_toggle()

Select/deselect all files

bpy.ops.file.select\_bookmark(*dir=""*)

Select a bookmarked directory

#### Parameters **dir** (*string, (optional)*) – Dir

bpy.ops.file.select\_border(*gesture\_mode=0, xmin=0, xmax=0, ymin=0, ymax=0*)

Activate/select the file(s) contained in the border

#### Parameters

- **gesture\_mode** (*int in [-inf, inf], (optional)*) – Gesture Mode
- **xmin** (*int in [-inf, inf], (optional)*) – X Min
- **xmax** (*int in [-inf, inf], (optional)*) – X Max
- **ymin** (*int in [-inf, inf], (optional)*) – Y Min
- **ymax** (*int in [-inf, inf], (optional)*) – Y Max

bpy.ops.file.smoothscroll()

Smooth scroll to make editable file visible.

bpy.ops.file.unpack\_all(*method='USE\_LOCAL'*)

Undocumented (contribute)

#### Parameters **method** (*enum in ['USE\_LOCAL', 'WRITE\_LOCAL', 'USE\_ORIGINAL', 'WRITE\_ORIGINAL', 'KEEP', 'ASK'], (optional)*) – Method, How to unpack.

## Fluid Operators

bpy.ops.fluid.bake()

Bake fluid simulation

## Font Operators

bpy.ops.font.buffer\_paste()

Paste text from OS buffer

```
bpy.ops.font.case_set(case='LOWER')
    Set font case

Parameters case (enum in ['LOWER', 'UPPER'], (optional)) – Case, Lower or upper case.

bpy.ops.font.case_toggle()
    Toggle font case

bpy.ops.font.change_character(delta=1)
    Change font character code

Parameters delta (int in [-255, 255], (optional)) – Delta, Number to increase or decrease character code with.

bpy.ops.font.change_spacing(delta=1)
    Change font spacing

Parameters delta (int in [-20, 20], (optional)) – Delta, Amount to decrease or increasing character spacing with.

bpy.ops.font.delete(type='ALL')
    Delete text by cursor position

Parameters type (enum in ['ALL', 'NEXT_CHARACTER', 'PREVIOUS_CHARACTER', 'SELECTION', 'NEXT_OR_SELECTION', 'PREVIOUS_OR_SELECTION'], (optional)) – Type, Which part of the text to delete.

bpy.ops.font.file_paste(filepath=""", filter_blender=False, filter_image=False, filter_movie=False,
                        filter_python=False, filter_font=False, filter_sound=False, filter_text=True, filter_btx=False, filter_collada=False, filter_folder=True,
                        filemode=9)
    Paste contents from file

Parameters

- filepath (string, (optional)) – File Path, Path to file
- filter_blender (boolean, (optional)) – Filter .blend files
- filter_image (boolean, (optional)) – Filter image files
- filter_movie (boolean, (optional)) – Filter movie files
- filter_python (boolean, (optional)) – Filter python files
- filter_font (boolean, (optional)) – Filter font files
- filter_sound (boolean, (optional)) – Filter sound files
- filter_text (boolean, (optional)) – Filter text files
- filter_btx (boolean, (optional)) – Filter btx files
- filter_collada (boolean, (optional)) – Filter COLLADA files
- filter_folder (boolean, (optional)) – Filter folders
- filemode (int in [1, 9], (optional)) – File Browser Mode, The setting for the file browser mode to load a .blend file, a library or a special file



bpy.ops.font.insert_lorem()
    Insert placeholder text

bpy.ops.font.line_break(ctrl=False)
    Insert line break at cursor position

Parameters ctrl (boolean, (optional)) – Ctrl
```

```
bpy.ops.font.move(type='LINE_BEGIN')
```

Move cursor to position type

**Parameters** **type** (*enum in ['LINE\_BEGIN', 'LINE\_END', 'PREVIOUS\_CHARACTER', 'NEXT\_CHARACTER', 'PREVIOUS\_WORD', 'NEXT\_WORD', 'PREVIOUS\_LINE', 'NEXT\_LINE', 'PREVIOUS\_PAGE', 'NEXT\_PAGE']*, *(optional)*) – Type, Where to move cursor to.

```
bpy.ops.font.move_select(type='LINE_BEGIN')
```

Make selection from current cursor position to new cursor position type

**Parameters** **type** (*enum in ['LINE\_BEGIN', 'LINE\_END', 'PREVIOUS\_CHARACTER', 'NEXT\_CHARACTER', 'PREVIOUS\_WORD', 'NEXT\_WORD', 'PREVIOUS\_LINE', 'NEXT\_LINE', 'PREVIOUS\_PAGE', 'NEXT\_PAGE']*, *(optional)*) – Type, Where to move cursor to, to make a selection.

```
bpy.ops.font.open(filepath="", filter_blender=False, filter_image=False, filter_movie=False, filter_python=False, filter_font=True, filter_sound=False, filter_text=False, filter_btx=False, filter_collada=False, filter_folder=True, filemode=9, relative_path=False)
```

Undocumented ([contribute](#))

#### Parameters

- **filepath** (*string, (optional)*) – File Path, Path to file
- **filter\_blender** (*boolean, (optional)*) – Filter .blend files
- **filter\_image** (*boolean, (optional)*) – Filter image files
- **filter\_movie** (*boolean, (optional)*) – Filter movie files
- **filter\_python** (*boolean, (optional)*) – Filter python files
- **filter\_font** (*boolean, (optional)*) – Filter font files
- **filter\_sound** (*boolean, (optional)*) – Filter sound files
- **filter\_text** (*boolean, (optional)*) – Filter text files
- **filter\_btx** (*boolean, (optional)*) – Filter btx files
- **filter\_collada** (*boolean, (optional)*) – Filter COLLADA files
- **filter\_folder** (*boolean, (optional)*) – Filter folders
- **filemode** (*int in [1, 9], (optional)*) – File Browser Mode, The setting for the file browser mode to load a .blend file, a library or a special file
- **relative\_path** (*boolean, (optional)*) – Relative Path, Select the file relative to the blend file

```
bpy.ops.font.style_set(style='BOLD', clear=False)
```

Set font style

#### Parameters

- **style** (*enum in ['BOLD', 'ITALIC', 'UNDERLINE', 'SMALL\_CAPS']*, *(optional)*) – Style, Style to set selection to.
- **clear** (*boolean, (optional)*) – Clear, Clear style rather than setting it.

```
bpy.ops.font.style_toggle(style='BOLD')
```

Toggle font style

**Parameters** **style** (*enum in ['BOLD', 'ITALIC', 'UNDERLINE', 'SMALL\_CAPS']*, *(optional)*) – Style, Style to set selection to.

```
bpy.ops.font.text_copy()  
    Copy selected text to clipboard  
  
bpy.ops.font.text_cut()  
    Cut selected text to clipboard  
  
bpy.ops.font.text_insert(text="", accent=False)  
    Insert text at cursor position
```

#### Parameters

- **text** (*string, (optional)*) – Text, Text to insert at the cursor position.
- **accent** (*boolean, (optional)*) – Accent mode, Next typed character will strike through previous, for special character input.

```
bpy.ops.font.text_paste()  
    Paste text from clipboard
```

```
bpy.ops.font.textbox_add()  
    Add a new text box
```

```
bpy.ops.font.textbox_remove(index=0)  
    Remove the textbox
```

#### Parameters **index** (*int in [0, inf], (optional)*) – Index, The current text box.

```
bpy.ops.font.unlink()  
    Unlink active font data block
```

## Gpencil Operators

```
bpy.ops.gpencil.active_frame_delete()  
    Delete the active frame for the active Grease Pencil datablock
```

```
bpy.ops.gpencil.convert(type='PATH')  
    Convert the active Grease Pencil layer to a new Object
```

#### Parameters **type** (*enum in ['PATH', 'CURVE'], (optional)*) – Type

```
bpy.ops.gpencil.data_add()  
    Add new Grease Pencil datablock
```

```
bpy.ops.gpencil.data_unlink()  
    Unlink active Grease Pencil datablock
```

```
bpy.ops.gpencil.draw(mode='DRAW', stroke=None)  
    Make annotations on the active data
```

#### Parameters

- **mode** (*enum in ['DRAW', 'DRAW\_STRAIGHT', 'ERASER'], (optional)*) – Mode, Way to interpret mouse movements.
- **stroke** (*bpy\_prop\_collection of OperatorStrokeElement, (optional)*) – Stroke

```
bpy.ops.gpencil.layer_add()  
    Add new Grease Pencil layer for the active Grease Pencil datablock
```

## Graph Operators

bpy.ops.graph.**bake**()  
Bake selected F-Curves to a set of sampled points defining a similar curve

bpy.ops.graph.**clean**(*threshold*=0.001)  
Simplify F-Curves by removing closely spaced keyframes

**Parameters** **threshold** (*float in [0, inf], (optional)*) – Threshold

bpy.ops.graph.**click\_insert**(*frame*=1.0, *value*=1.0)  
Insert new keyframe at the cursor position for the active F-Curve

**Parameters**

- **frame** (*float in [-inf, inf], (optional)*) – Frame Number, Frame to insert keyframe on
- **value** (*float in [-inf, inf], (optional)*) – Value, Value for keyframe on

bpy.ops.graph.**clickselect**(*extend*=False, *column*=False, *curves*=False)  
Select keyframes by clicking on them

**Parameters**

- **extend** (*boolean, (optional)*) – Extend Select
- **column** (*boolean, (optional)*) – Column Select, Select all keyframes that occur on the same frame as the one under the mouse
- **curves** (*boolean, (optional)*) – Only Curves, Select all the keyframes in the curve

bpy.ops.graph.**copy**()  
Copy selected keyframes to the copy/paste buffer

bpy.ops.graph.**cursor\_set**(*frame*=0, *value*=0.0)  
Interactively set the current frame number and value cursor

**Parameters**

- **frame** (*int in [-300000, 300000], (optional)*) – Frame
- **value** (*float in [1.17549e-38, inf], (optional)*) – Value

bpy.ops.graph.**delete**()  
Remove all selected keyframes

bpy.ops.graph.**duplicate**(*mode*='TRANSLATION')  
Make a copy of all selected keyframes

**Parameters** **mode** (*enum in ['INIT', 'DUMMY', 'TRANSLATION', 'ROTATION', 'RESIZE', 'TO-SPHERE', 'SHEAR', 'WARP', 'SHRINKFATTEN', 'TILT', 'TRACKBALL', 'PUSHPULL', 'CREASE', 'MIRROR', 'BONE\_SIZE', 'BONE\_ENVELOPE', 'CURVE\_SHRINKFATTEN', 'BONE\_ROLL', 'TIME\_TRANSLATE', 'TIME\_SLIDE', 'TIME\_SCALE', 'TIME\_EXTEND', 'BAKE\_TIME', 'BEVEL', 'BWEIGHT', 'ALIGN', 'EDGESLIDE', 'SEQSLIDE'], (optional)*) – Mode

bpy.ops.graph.**duplicate\_move**(*GRAPH\_OT\_duplicate=None*, *FORM\_OT\_transform=None*)  
UNDOKED (contribute)

**Parameters**

- **GRAPH\_OT\_duplicate** (*GRAPH\_OT\_duplicate, (optional)*) – Duplicate Keyframes, Make a copy of all selected keyframes

- **TRANSFORM\_OT\_transform** (TRANSFORM\_OT\_transform, (optional)) – Transform, Transform selected items by mode type

bpy.ops.graph.**euler\_filter**()

Fixes the most common causes of gimbal lock in the selected Euler Rotation F-Curves

bpy.ops.graph.**extrapolation\_type** (type='CONSTANT')

Set extrapolation mode for selected F-Curves

**Parameters** **type** (enum in ['CONSTANT', 'LINEAR'], (optional)) – Type

bpy.ops.graph.**fmodifier\_add** (type='NULL', only\_active=True)

Add F-Modifiers to the selected F-Curves

#### Parameters

- **type** (enum in ['NULL', 'GENERATOR', 'FNGENERATOR', 'ENVELOPE', 'CYCLES', 'NOISE', 'FILTER', 'LIMITS', 'STEPPED'], (optional)) – Type
- **only\_active** (boolean, (optional)) – Only Active, Only add F-Modifier to active F-Curve.

bpy.ops.graph.**fmodifier\_copy**()

Copy the F-Modifier(s) of the active F-Curve.

bpy.ops.graph.**fmodifier\_paste**()

Add copied F-Modifiers to the selected F-Curves

bpy.ops.graph.**frame\_jump**()

Set the current frame to the average frame of the selected keyframes

bpy.ops.graph.**ghost\_curves\_clear**()

Clear F-Curve snapshots (Ghosts) for active Graph Editor

bpy.ops.graph.**ghost\_curves\_create**()

Create snapshot (Ghosts) of selected F-Curves as background aid for active Graph Editor

bpy.ops.graph.**handle\_type** (type='FREE\_ALIGN')

Set type of handle for selected keyframes

**Parameters** **type** (enum in ['AUTO', 'VECTOR', 'ALIGNED', 'FREE\_ALIGN', 'ANIM\_CLAMPED'], (optional)) – Type

bpy.ops.graph.**handles\_view\_toggle**()

Toggle whether handles are drawn on all keyframes that need them

bpy.ops.graph.**interpolation\_type** (type='CONSTANT')

Set interpolation mode for the F-Curve segments starting from the selected keyframes

**Parameters** **type** (enum in ['CONSTANT', 'LINEAR', 'BEZIER'], (optional)) – Type

bpy.ops.graph.**keyframe\_insert** (type='ALL')

Insert keyframes for the specified channels

**Parameters** **type** (enum in ['ALL', 'SEL'], (optional)) – Type

bpy.ops.graph.**mirror** (type='CFRA')

Flip selected keyframes over the selected mirror line

**Parameters** **type** (enum in ['CFRA', 'VALUE', 'YAXIS', 'XAXIS', 'MARKER'], (optional)) – Type

bpy.ops.graph.**paste** (offset='START', merge='MIX')

Paste keyframes from copy/paste buffer for the selected channels, starting on the current frame

#### Parameters

- **offset** (*enum in [‘START’, ‘END’, ‘RELATIVE’, ‘NONE’]*, *(optional)*) – Offset, Paste time offset of keys
- **merge** (*enum in [‘MIX’, ‘OVER\_ALL’, ‘OVER\_RANGE’, ‘OVER\_RANGE\_ALL’]*, *(optional)*) – Type, Method of merging pasted keys and existing

bpy.ops.graph.previewrange\_set()

Automatically set Preview Range based on range of keyframes

bpy.ops.graph.properties()

Toggle display properties panel

bpy.ops.graph.sample()

Add keyframes on every frame between the selected keyframes

bpy.ops.graph.select\_all\_toggle(*invert=False*)

Toggle selection of all keyframes

**Parameters** **invert** (*boolean, (optional)*) – Invert

bpy.ops.graph.select\_border(*gesture\_mode=0, xmin=0, xmax=0, ymin=0, ymax=0, axis\_range=False, include\_handles=False*)

Select all keyframes within the specified region

**Parameters**

- **gesture\_mode** (*int in [-inf, inf]*, *(optional)*) – Gesture Mode
- **xmin** (*int in [-inf, inf]*, *(optional)*) – X Min
- **xmax** (*int in [-inf, inf]*, *(optional)*) – X Max
- **ymin** (*int in [-inf, inf]*, *(optional)*) – Y Min
- **ymax** (*int in [-inf, inf]*, *(optional)*) – Y Max
- **axis\_range** (*boolean, (optional)*) – Axis Range
- **include\_handles** (*boolean, (optional)*) – Include Handles, Are handles tested individually against the selection criteria

bpy.ops.graph.select\_column(*mode=‘KEYS’*)

Select all keyframes on the specified frame(s)

**Parameters** **mode** (*enum in [‘KEYS’, ‘CFRA’, ‘MARKERS\_COLUMN’, ‘MARKERS\_BETWEEN’]*, *(optional)*) – Mode

bpy.ops.graph.select\_leftright(*mode=‘CHECK’, extend=False*)

Select keyframes to the left or the right of the current frame

**Parameters**

- **mode** (*enum in [‘CHECK’, ‘LEFT’, ‘RIGHT’]*, *(optional)*) – Mode
- **extend** (*boolean, (optional)*) – Extend Select

bpy.ops.graph.select\_less()

Deselect keyframes on ends of selection islands

bpy.ops.graph.select\_linked()

Select keyframes occurring on the same F-Curves as selected ones

bpy.ops.graph.select\_more()

Select keyframes beside already selected ones

bpy.ops.graph.smooth()

Apply weighted moving means to make selected F-Curves less bumpy

```
bpy.ops.graph.snap(type='CFRA')
    Snap selected keyframes to the chosen times/values
```

**Parameters** **type** (*enum in* ['CFRA', 'VALUE', 'NEAREST\_FRAME', 'NEAREST\_SECOND', 'NEAREST\_MARKER', 'HORIZONTAL'], *(optional)*) – Type

```
bpy.ops.graph.sound_bake(filepath="", filter_blender=False, filter_image=False, filter_movie=True, filter_python=False, filter_font=False, filter_sound=True, filter_text=False, filter_btx=False, filter_collada=False, filter_folder=True, filemode=9, low=0.0, high=100000.0, attack=0.005, release=0.2, threshold=0.0, accumulate=False, use_additive=False, square=False, sthreshold=0.1)
```

Bakes a sound wave to selected F-Curves

#### Parameters

- **filepath** (*string, (optional)*) – File Path, Path to file
- **filter\_blender** (*boolean, (optional)*) – Filter .blend files
- **filter\_image** (*boolean, (optional)*) – Filter image files
- **filter\_movie** (*boolean, (optional)*) – Filter movie files
- **filter\_python** (*boolean, (optional)*) – Filter python files
- **filter\_font** (*boolean, (optional)*) – Filter font files
- **filter\_sound** (*boolean, (optional)*) – Filter sound files
- **filter\_text** (*boolean, (optional)*) – Filter text files
- **filter\_btx** (*boolean, (optional)*) – Filter btx files
- **filter\_collada** (*boolean, (optional)*) – Filter COLLADA files
- **filter\_folder** (*boolean, (optional)*) – Filter folders
- **filemode** (*int in* [1, 9], *(optional)*) – File Browser Mode, The setting for the file browser mode to load a .blend file, a library or a special file
- **low** (*float in* [0, 100000], *(optional)*) – Lowest frequency
- **high** (*float in* [0, 100000], *(optional)*) – Highest frequency
- **attack** (*float in* [0, 2], *(optional)*) – Attack time
- **release** (*float in* [0, 5], *(optional)*) – Release time
- **threshold** (*float in* [0, 1], *(optional)*) – Threshold
- **accumulate** (*boolean, (optional)*) – Accumulate
- **use\_additive** (*boolean, (optional)*) – Additive
- **square** (*boolean, (optional)*) – Square
- **sthreshold** (*float in* [0, 1], *(optional)*) – Square Threshold

```
bpy.ops.graph.view_all()
    Reset viewable area to show full keyframe range
```

```
bpy.ops.graph.view_selected()
    Reset viewable area to show selected keyframe range
```

## Group Operators

```
bpy.ops.group.create(name="Group")  
Create an object group from selected objects
```

**Parameters** `name` (*string, (optional)*) – Name, Name of the new group

```
bpy.ops.group.objects_add_active()  
Add the object to an object group that contains the active object
```

```
bpy.ops.group.objects_remove()  
Remove selected objects from all groups
```

```
bpy.ops.group.objects_remove_active()  
Remove the object from an object group that contains the active object
```

## Help Operators

```
bpy.ops.help.operator_cheat_sheet()  
Undocumented (contribute)
```

**File** `startup/bl_ui/space_info.py:391`

## Image Operators

```
bpy.ops.image.curves_point_set(point='BLACK_POINT')  
Undocumented (contribute)
```

**Parameters** `point` (*enum in ['BLACK\_POINT', 'WHITE\_POINT'], (optional)*) – Point, Set black point or white point for curves.

```
bpy.ops.image.cycle_render_slot(reverse=False)  
Undocumented (contribute)
```

**Parameters** `reverse` (*boolean, (optional)*) – Cycle in Reverse

```
bpy.ops.image.external_edit(filepath="")  
Edit image in an external application
```

**Parameters** `filepath` (*string, (optional)*) – File Path, Path to an image file

**File** `startup/bl_operators/image.py:62`

```
bpy.ops.image.invert(invert_r=False, invert_g=False, invert_b=False, invert_a=False)  
Undocumented (contribute)
```

**Parameters**

- `invert_r` (*boolean, (optional)*) – Red, Invert Red Channel
- `invert_g` (*boolean, (optional)*) – Green, Invert Green Channel
- `invert_b` (*boolean, (optional)*) – Blue, Invert Blue Channel
- `invert_a` (*boolean, (optional)*) – Alpha, Invert Alpha Channel

```
bpy.ops.image.new(name="untitled", width=1024, height=1024, color=(0.0, 0.0, 0.0, 1.0), al-  
pha=True, uv_test_grid=False, float=False)  
Create a new image
```

**Parameters**

- `name` (*string, (optional)*) – Name, Image datablock name.

- **width** (*int in [1, inf], (optional)*) – Width, Image width.
- **height** (*int in [1, inf], (optional)*) – Height, Image height.
- **color** (*float array of 4 items in [0, inf], (optional)*) – Color, Default fill color.
- **alpha** (*boolean, (optional)*) – Alpha, Create an image with an alpha channel.
- **uv\_test\_grid** (*boolean, (optional)*) – UV Test Grid, Fill the image with a grid for UV map testing.
- **float** (*boolean, (optional)*) – 32 bit Float, Create image with 32 bit floating point bit depth.

```
bpy.ops.image.open(filepath=""", filter blender=False, filter image=True, filter movie=True, filter python=False, filter font=False, filter sound=False, filter text=False, filter btx=False, filter collada=False, filter folder=True, filemode=9, relative path=False)
```

Open image

#### Parameters

- **filepath** (*string, (optional)*) – File Path, Path to file
- **filter blender** (*boolean, (optional)*) – Filter .blend files
- **filter image** (*boolean, (optional)*) – Filter image files
- **filter movie** (*boolean, (optional)*) – Filter movie files
- **filter python** (*boolean, (optional)*) – Filter python files
- **filter font** (*boolean, (optional)*) – Filter font files
- **filter sound** (*boolean, (optional)*) – Filter sound files
- **filter text** (*boolean, (optional)*) – Filter text files
- **filter btx** (*boolean, (optional)*) – Filter btx files
- **filter collada** (*boolean, (optional)*) – Filter COLLADA files
- **filter folder** (*boolean, (optional)*) – Filter folders
- **filemode** (*int in [1, 9], (optional)*) – File Browser Mode, The setting for the file browser mode to load a .blend file, a library or a special file
- **relative path** (*boolean, (optional)*) – Relative Path, Select the file relative to the blend file

```
bpy.ops.image.pack(as_png=False)
```

Pack an image as embedded data into the .blend file

**Parameters** **as\_png** (*boolean, (optional)*) – Pack As PNG, Pack image as lossless PNG.

```
bpy.ops.image.project_apply()
```

Project edited image back onto the object

**File** `startup/bl_operators/image.py:206`

```
bpy.ops.image.project_edit()
```

Edit a snapshot of the viewport in an external image editor

**File** `startup/bl_operators/image.py:141`

```
bpy.ops.image.properties()
```

Toggle display properties panel

```
bpy.ops.image.record_composite()
```

Undocumented ([contribute](#))

bpy.ops.image.reload()  
Undocumented (contribute)

bpy.ops.image.replace(filepath=""“, filter\_blender=False, filter\_image=True, filter\_movie=True, filter\_python=False, filter\_font=False, filter\_sound=False, filter\_text=False, filter\_btx=False, filter\_collada=False, filter\_folder=True, filemode=9, relative\_path=False)  
Undocumented (contribute)

#### Parameters

- **filepath** (*string, (optional)*) – File Path, Path to file
- **filter\_blender** (*boolean, (optional)*) – Filter .blend files
- **filter\_image** (*boolean, (optional)*) – Filter image files
- **filter\_movie** (*boolean, (optional)*) – Filter movie files
- **filter\_python** (*boolean, (optional)*) – Filter python files
- **filter\_font** (*boolean, (optional)*) – Filter font files
- **filter\_sound** (*boolean, (optional)*) – Filter sound files
- **filter\_text** (*boolean, (optional)*) – Filter text files
- **filter\_btx** (*boolean, (optional)*) – Filter btx files
- **filter\_collada** (*boolean, (optional)*) – Filter COLLADA files
- **filter\_folder** (*boolean, (optional)*) – Filter folders
- **filemode** (*int in [1, 9], (optional)*) – File Browser Mode, The setting for the file browser mode to load a .blend file, a library or a special file
- **relative\_path** (*boolean, (optional)*) – Relative Path, Select the file relative to the blend file

bpy.ops.image.sample()  
Undocumented (contribute)

bpy.ops.image.sample\_line(xstart=0, xend=0, ystart=0, yend=0, cursor=1002)  
Undocumented (contribute)

#### Parameters

- **xstart** (*int in [-inf, inf], (optional)*) – X Start
- **xend** (*int in [-inf, inf], (optional)*) – X End
- **ystart** (*int in [-inf, inf], (optional)*) – Y Start
- **yend** (*int in [-inf, inf], (optional)*) – Y End
- **cursor** (*int in [0, inf], (optional)*) – Cursor, Mouse cursor style to use during the modal operator

bpy.ops.image.save()  
Undocumented (contribute)

bpy.ops.image.save\_as(file\_format='PNG', color\_mode='RGB', file\_quality=90, filepath=""“, check\_existing=True, filter\_blender=False, filter\_image=True, filter\_movie=True, filter\_python=False, filter\_font=False, filter\_sound=False, filter\_text=False, filter\_btx=False, filter\_collada=False, filter\_folder=True, filemode=9, relative\_path=False, copy=False)  
Undocumented (contribute)

### Parameters

- **file\_format** (*enum in [‘TARGA’, ‘TARGA RAW’, ‘PNG’, ‘BMP’, ‘JPEG’, ‘IRIS’]*, *(optional)*) – File Type, File type to save image as.
- **color\_mode** (*enum in [‘BW’, ‘RGB’, ‘RGBA’]*, *(optional)*) – Channels, Image channels to save
- **file\_quality** (*int in [0, 100]*, *(optional)*) – Quality
- **filepath** (*string, (optional)*) – File Path, Path to file
- **check\_existing** (*boolean, (optional)*) – Check Existing, Check and warn on overwriting existing files
- **filter\_blender** (*boolean, (optional)*) – Filter .blend files
- **filter\_image** (*boolean, (optional)*) – Filter image files
- **filter\_movie** (*boolean, (optional)*) – Filter movie files
- **filter\_python** (*boolean, (optional)*) – Filter python files
- **filter\_font** (*boolean, (optional)*) – Filter font files
- **filter\_sound** (*boolean, (optional)*) – Filter sound files
- **filter\_text** (*boolean, (optional)*) – Filter text files
- **filter\_btx** (*boolean, (optional)*) – Filter btx files
- **filter\_collada** (*boolean, (optional)*) – Filter COLLADA files
- **filter\_folder** (*boolean, (optional)*) – Filter folders
- **filemode** (*int in [1, 9]*, *(optional)*) – File Browser Mode, The setting for the file browser mode to load a .blend file, a library or a special file
- **relative\_path** (*boolean, (optional)*) – Relative Path, Select the file relative to the blend file
- **copy** (*boolean, (optional)*) – Copy, Create a new image file without modifying the current image in blender

bpy.ops.image.**save\_dirty**()  
Save all modified textures

**File** startup/bl\_operators/image.py:116

bpy.ops.image.**save\_sequence**()  
Undocumented ([contribute](#))

bpy.ops.image.**scopes**()  
Toggle display scopes panel

bpy.ops.image.**unpack**(*method=‘USE\_LOCAL’, id=”“*)  
Save an image packed in the .blend file to disk

### Parameters

- **method** (*enum in [‘USE\_LOCAL’, ‘WRITE\_LOCAL’, ‘USE\_ORIGINAL’, ‘WRITE\_ORIGINAL’]*, *(optional)*) – Method, How to unpack.
- **id** (*string, (optional)*) – Image Name, Image datablock name to unpack.

bpy.ops.image.**view\_all**()  
Undocumented ([contribute](#))

bpy.ops.image.**view\_ndof**()  
Undocumented (contribute)

bpy.ops.image.**view\_pan**(*offset*=(0.0, 0.0))  
Undocumented (contribute)

**Parameters** **offset** (*float array of 2 items in [-inf, inf], (optional)*) – Offset, Offset in floating point units, 1.0 is the width and height of the image.

bpy.ops.image.**view\_selected**()  
Undocumented (contribute)

bpy.ops.image.**view\_zoom**(*factor*=0.0)  
Undocumented (contribute)

**Parameters** **factor** (*float in [0, inf], (optional)*) – Factor, Zoom factor, values higher than 1.0 zoom in, lower values zoom out.

bpy.ops.image.**view\_zoom\_in**()  
Undocumented (contribute)

bpy.ops.image.**view\_zoom\_out**()  
Undocumented (contribute)

bpy.ops.image.**view\_zoom\_ratio**(*ratio*=0.0)  
Undocumented (contribute)

**Parameters** **ratio** (*float in [0, inf], (optional)*) – Ratio, Zoom ratio, 1.0 is 1:1, higher is zoomed in, lower is zoomed out.

## Import Anim Operators

bpy.ops.import\_anim.**bvh**(*filepath*=“”, *filter\_glob*=“\*.bvh”, *target*=‘ARMATURE’, *global\_scale*=1.0, *frame\_start*=1, *use\_cyclic*=False, *rotate\_mode*=‘NATIVE’, *axis\_forward*=‘-Z’, *axis\_up*=‘Y’)

Load a BVH motion capture file

### Parameters

- **filepath** (*string, (optional)*) – File Path, Filepath used for importing the file
- **target** (*enum in [‘ARMATURE’, ‘OBJECT’], (optional)*) – Target, Import target type.
- **global\_scale** (*float in [0.0001, 1e+06], (optional)*) – Scale, Scale the BVH by this value
- **frame\_start** (*int in [-inf, inf], (optional)*) – Start Frame, Starting frame for the animation
- **use\_cyclic** (*boolean, (optional)*) – Loop, Loop the animation playback
- **rotate\_mode** (*enum in [‘QUATERNION’, ‘NATIVE’, ‘XYZ’, ‘XZY’, ‘YXZ’, ‘YZX’, ‘ZXY’, ‘ZYX’], (optional)*) – Rotation, Rotation conversion.
- **axis\_forward** (*enum in [‘X’, ‘Y’, ‘Z’, ‘-X’, ‘-Y’, ‘-Z’], (optional)*) – Forward
- **axis\_up** (*enum in [‘X’, ‘Y’, ‘Z’, ‘-X’, ‘-Y’, ‘-Z’], (optional)*) – Up

**File** addons/io\_anim\_bvh/\_init\_.py:130

## Import Curve Operators

bpy.ops.import\_curve.**svg**(*filepath*=“”, *filter\_glob*=“\*.svg”)

Load a SVG file

**Parameters** **filepath** (*string, (optional)*) – File Path, Filepath used for importing the file

**File** addons/io\_curve\_svg/\_init\_\_.py:57

## Import Mesh Operators

bpy.ops.import\_mesh.ply(*filepath=""*, *files=None*, *directory=""*, *filter\_glob="\*.ply"*)  
Load a PLY geometry file

### Parameters

- **filepath** (*string, (optional)*) – File Path, Filepath used for importing the file
- **files** (*bpy\_prop\_collection* of *OperatorFileListElement*, *(optional)*) – File Path, File path used for importing the PLY file

**File** addons/io\_mesh\_ply/\_init\_\_.py:66

bpy.ops.import\_mesh.stl(*filepath=""*, *filter\_glob="\*.stl"*, *files=None*, *directory=""*)  
Load STL triangle mesh data

### Parameters

- **filepath** (*string, (optional)*) – File Path, Filepath used for importing the file
- **files** (*bpy\_prop\_collection* of *OperatorFileListElement*, *(optional)*) – File Path

**File** addons/io\_mesh\_stl/\_init\_\_.py:84

## Import Scene Operators

bpy.ops.import\_scene.autodesk\_3ds(*filepath=""*, *filter\_glob="\*.3ds"*, *constrain\_size=10.0*,  
*use\_image\_search=True*, *use\_apply\_transform=True*,  
*axis\_forward='Y'*, *axis\_up='Z'*)

Import from 3DS file format (.3ds)

### Parameters

- **filepath** (*string, (optional)*) – File Path, Filepath used for importing the file
- **constrain\_size** (*float in [0, 1000], (optional)*) – Size Constraint, Scale the model by 10 until it reaches the size constraint. Zero Disables.
- **use\_image\_search** (*boolean, (optional)*) – Image Search, Search subdirectories for any associated images (Warning, may be slow)
- **use\_apply\_transform** (*boolean, (optional)*) – Apply Transform, Workaround for object transformations importing incorrectly
- **axis\_forward** (*enum in ['X', 'Y', 'Z', '-X', '-Y', '-Z']*, *(optional)*) – Forward
- **axis\_up** (*enum in ['X', 'Y', 'Z', '-X', '-Y', '-Z']*, *(optional)*) – Up

**File** addons/io\_scene\_3ds/\_init\_\_.py:106

bpy.ops.import\_scene.obj(*filepath=""*, *filter\_glob="\*.obj;\*.mtl"*, *use\_ngons=True*,  
*use\_edges=True*, *use\_smooth\_groups=True*, *use\_split\_objects=True*,  
*use\_split\_groups=True*, *use\_groups\_as\_vgroups=False*,  
*use\_image\_search=True*, *split\_mode='ON'*, *global\_clamp\_size=0.0*,  
*axis\_forward='Z'*, *axis\_up='Y'*)

Load a Wavefront OBJ File

### Parameters

- **filepath** (*string, (optional)*) – File Path, Filepath used for importing the file
- **use\_ngons** (*boolean, (optional)*) – NGons, Import faces with more than 4 verts as fgons
- **use\_edges** (*boolean, (optional)*) – Lines, Import lines and faces with 2 verts as edge
- **use\_smooth\_groups** (*boolean, (optional)*) – Smooth Groups, Surround smooth groups by sharp edges
- **use\_split\_objects** (*boolean, (optional)*) – Object, Import OBJ Objects into Blender Objects
- **use\_split\_groups** (*boolean, (optional)*) – Group, Import OBJ Groups into Blender Objects
- **use\_groups\_as\_vgroups** (*boolean, (optional)*) – Poly Groups, Import OBJ groups as vertex groups.
- **use\_image\_search** (*boolean, (optional)*) – Image Search, Search subdirs for any associated images (Warning, may be slow)
- **split\_mode** (*enum in [‘ON’, ‘OFF’], (optional)*) – Split
- **global\_clamp\_size** (*float in [0, 1000], (optional)*) – Clamp Scale, Clamp the size to this maximum (Zero to Disable)
- **axis\_forward** (*enum in [‘X’, ‘Y’, ‘Z’, ‘-X’, ‘-Y’, ‘-Z’], (optional)*) – Forward
- **axis\_up** (*enum in [‘X’, ‘Y’, ‘Z’, ‘-X’, ‘-Y’, ‘-Z’], (optional)*) – Up

**File** addons/io\_scene\_obj/\_\_init\_\_.py:147

```
bpy.ops.import_scene.x3d(filepath="", filter_glob="*.x3d;*.wrl", axis_forward='Z',  
axis_up='Y')
```

Import and X3D or VRML file

### Parameters

- **filepath** (*string, (optional)*) – File Path, Filepath used for importing the file
- **axis\_forward** (*enum in [‘X’, ‘Y’, ‘Z’, ‘-X’, ‘-Y’, ‘-Z’], (optional)*) – Forward
- **axis\_up** (*enum in [‘X’, ‘Y’, ‘Z’, ‘-X’, ‘-Y’, ‘-Z’], (optional)*) – Up

**File** addons/io\_scene\_x3d/\_\_init\_\_.py:89

## Info Operators

```
bpy.ops.info.report_copy()  
Copy selected reports to Clipboard
```

```
bpy.ops.info.report_delete()  
Delete selected reports
```

```
bpy.ops.info.report_replay()  
Replay selected reports
```

```
bpy.ops.info.reports_display_update()  
Undocumented (contribute)
```

```
bpy.ops.info.select_all_toggle()  
(de)select all reports
```

```
bpy.ops.info.select_border(gesture_mode=0, xmin=0, xmax=0, ymin=0, ymax=0)  
Toggle border selection
```

### Parameters

- **gesture\_mode** (*int in [-inf, inf], (optional)*) – Gesture Mode
- **xmin** (*int in [-inf, inf], (optional)*) – X Min
- **xmax** (*int in [-inf, inf], (optional)*) – X Max
- **ymin** (*int in [-inf, inf], (optional)*) – Y Min
- **ymax** (*int in [-inf, inf], (optional)*) – Y Max

bpy.ops.info.select\_pick (report\_index=0)

Select reports by index

**Parameters** **report\_index** (*int in [0, inf], (optional)*) – Report, The index of the report.

## Lamp Operators

bpy.ops.lamp.sunsky\_preset\_add (name=""“, remove\_active=False)

Add a Sky & Atmosphere Preset

**Parameters** **name** (*string, (optional)*) – Name, Name of the preset, used to make the path name

**File** startup/bl\_operators/presets.py:50

## Lattice Operators

bpy.ops.lattice.make\_regular()

Set UVW control points a uniform distance apart

bpy.ops.lattice.select\_all (action='TOGGLE')

Change selection of all UVW control points

**Parameters** **action** (*enum in ['TOGGLE', 'SELECT', 'DESELECT', 'INVERT'], (optional)*) – Action, Selection action to execute

## Logic Operators

bpy.ops.logic.actuator\_add (type='', name=""“, object=""“)

Add a actuator to the active object

### Parameters

- **type** (*enum in [], (optional)*) – Type, Type of actuator to add
- **name** (*string, (optional)*) – Name, Name of the Actuator to add
- **object** (*string, (optional)*) – Object, Name of the Object to add the Actuator to

bpy.ops.logic.actuator\_move (actuator=""“, object=""“, direction='UP')

Move Actuator

### Parameters

- **actuator** (*string, (optional)*) – Actuator, Name of the actuator to edit
- **object** (*string, (optional)*) – Object, Name of the object the actuator belongs to
- **direction** (*enum in ['UP', 'DOWN'], (optional)*) – Direction, Move Up or Down

bpy.ops.logic.actuator\_remove(*actuator*=““,*object*=““)

Remove a actuator from the active object

#### Parameters

- **actuator** (*string, (optional)*) – Actuator, Name of the actuator to edit
- **object** (*string, (optional)*) – Object, Name of the object the actuator belongs to

bpy.ops.logic.controller\_add(*type*=‘LOGIC\_AND’,*name*=““,*object*=““)

Add a controller to the active object

#### Parameters

- **type** (*enum in [‘LOGIC\_AND’, ‘LOGIC\_OR’, ‘LOGIC\_NAND’, ‘LOGIC\_NOR’, ‘LOGIC\_XOR’, ‘LOGIC\_XNOR’, ‘EXPRESSION’, ‘PYTHON’], (optional)*) – Type, Type of controller to add
- **name** (*string, (optional)*) – Name, Name of the Controller to add
- **object** (*string, (optional)*) – Object, Name of the Object to add the Controller to

bpy.ops.logic.controller\_move(*controller*=““,*object*=““,*direction*=‘UP’)

Move Controller

#### Parameters

- **controller** (*string, (optional)*) – Controller, Name of the controller to edit
- **object** (*string, (optional)*) – Object, Name of the object the controller belongs to
- **direction** (*enum in [‘UP’, ‘DOWN’], (optional)*) – Direction, Move Up or Down

bpy.ops.logic.controller\_remove(*controller*=““,*object*=““)

Remove a controller from the active object

#### Parameters

- **controller** (*string, (optional)*) – Controller, Name of the controller to edit
- **object** (*string, (optional)*) – Object, Name of the object the controller belongs to

bpy.ops.logic.links\_cut(*path*=None,*cursor*=9)

Remove logic brick connections

#### Parameters

- **path** (*bpy\_prop\_collection of OperatorMousePath, (optional)*) – path
- **cursor** (*int in [0, inf], (optional)*) – Cursor

bpy.ops.logic.properties()

Toggle display properties panel

bpy.ops.logic.sensor\_add(*type*=‘‘,*name*=““,*object*=““)

Add a sensor to the active object

#### Parameters

- **type** (*enum in [], (optional)*) – Type, Type of sensor to add
- **name** (*string, (optional)*) – Name, Name of the Sensor to add
- **object** (*string, (optional)*) – Object, Name of the Object to add the Sensor to

bpy.ops.logic.sensor\_move(*sensor*=““,*object*=““,*direction*=‘UP’)

Move Sensor

### Parameters

- **sensor** (*string, (optional)*) – Sensor, Name of the sensor to edit
- **object** (*string, (optional)*) – Object, Name of the object the sensor belongs to
- **direction** (*enum in ['UP', 'DOWN'], (optional)*) – Direction, Move Up or Down

bpy.ops.logic.**sensor\_remove**(*sensor=""*, *object=""*)

Remove a sensor from the active object

### Parameters

- **sensor** (*string, (optional)*) – Sensor, Name of the sensor to edit
- **object** (*string, (optional)*) – Object, Name of the object the sensor belongs to

## Marker Operators

bpy.ops.marker.**add**()

Add a new time marker

bpy.ops.marker.**camera\_bind**()

Bind the active camera to selected markers(s)

bpy.ops.marker.**delete**()

Delete selected time marker(s)

bpy.ops.marker.**duplicate**(*frames=0*)

Duplicate selected time marker(s)

**Parameters** **frames** (*int in [-inf, inf], (optional)*) – Frames

bpy.ops.marker.**make\_links\_scene**(*scene=""*)

Copy selected markers to another scene

**Parameters** **scene** (*enum in [], (optional)*) – Scene

bpy.ops.marker.**move**(*frames=0*)

Move selected time marker(s)

**Parameters** **frames** (*int in [-inf, inf], (optional)*) – Frames

bpy.ops.marker.**rename**(*name="RenamedMarker"*)

Rename first selected time marker

**Parameters** **name** (*string, (optional)*) – Name, New name for marker

bpy.ops.marker.**select**(*extend=False, camera=False*)

Select time marker(s)

### Parameters

- **extend** (*boolean, (optional)*) – Extend, extend the selection
- **camera** (*boolean, (optional)*) – Camera, Select the camera

bpy.ops.marker.**select\_all**(*action='TOGGLE'*)

Change selection of all time markers

**Parameters** **action** (*enum in ['TOGGLE', 'SELECT', 'DESELECT', 'INVERT'], (optional)*) – Action, Selection action to execute

bpy.ops.marker.**select\_border**(*gesture\_mode=0, xmin=0, xmax=0, ymin=0, ymax=0*)

Select all time markers using border selection

## Parameters

- **gesture\_mode** (*int in [-inf, inf], (optional)*) – Gesture Mode
- **xmin** (*int in [-inf, inf], (optional)*) – X Min
- **xmax** (*int in [-inf, inf], (optional)*) – X Max
- **ymin** (*int in [-inf, inf], (optional)*) – Y Min
- **ymax** (*int in [-inf, inf], (optional)*) – Y Max

## Material Operators

bpy.ops.material.**copy**()

Copy the material settings and nodes

bpy.ops.material.**new**()

Add a new material

bpy.ops.material.**paste**()

Paste the material settings and nodes

bpy.ops.material.**sss\_preset\_add**(*name=""*, *remove\_active=False*)

Add a Subsurface Scattering Preset

**Parameters** **name** (*string, (optional)*) – Name, Name of the preset, used to make the path name

**File** startup/bl\_operators/presets.py:50

## Mball Operators

bpy.ops.mball.**delete\_metaelems**()

Delete selected metaelement(s)

bpy.ops.mball.**duplicate\_metaelems**(*mode='TRANSLATION'*)

Delete selected metaelement(s)

**Parameters** **mode** (*enum in ['INIT', 'DUMMY', 'TRANSLATION', 'ROTATION', 'RESIZE', 'TO-SPHERE', 'SHEAR', 'WARP', 'SHRINKFATTEN', 'TILT', 'TRACKBALL', 'PUSHPULL', 'CREASE', 'MIRROR', 'BONE\_SIZE', 'BONE\_ENVELOPE', 'CURVE\_SHRINKFATTEN', 'BONE\_ROLL', 'TIME\_TRANSLATE', 'TIME\_SLIDE', 'TIME\_SCALE', 'TIME\_EXTEND', 'BAKE\_TIME', 'BEVEL', 'BWEIGHT', 'ALIGN', 'EDGESLIDE', 'SEQSLIDE'], (optional)*) – Mode

bpy.ops.mball.**hide\_metaelems**(*unselected=False*)

Hide (un)selected metaelement(s)

**Parameters** **unselected** (*boolean, (optional)*) – Unselected, Hide unselected rather than selected.

bpy.ops.mball.**reveal\_metaelems**()

Reveal all hidden metaelements

bpy.ops.mball.**select\_all**(*action='TOGGLE'*)

Change selection of all meta elements

**Parameters** **action** (*enum in ['TOGGLE', 'SELECT', 'DESELECT', 'INVERT'], (optional)*) – Action, Selection action to execute

bpy.ops.mball.**select\_inverse\_metaelems**()

Select inverse of (un)selected metaelements

```
bpy.ops.mball.select_random_metaelems(percent=0.5)
```

Randomly select metaelements

**Parameters** **percent** (*float in [0, 1], (optional)*) – Percent, Percentage of metaelems to select randomly.

## Mesh Operators

```
bpy.ops.mesh.beautify_fill()
```

Rearrange geometry on a selected surface to avoid skinny faces

```
bpy.ops.mesh.blend_from_shape(shape='', blend=1.0, add=False)
```

Blend in shape from a shape key

### Parameters

- **shape** (*enum in [], (optional)*) – Shape, Shape key to use for blending.
- **blend** (*float in [-inf, inf], (optional)*) – Blend, Blending factor.
- **add** (*boolean, (optional)*) – Add, Add rather than blend between shapes.

```
bpy.ops.mesh.colors_mirror(axis='X')
```

Mirror UV/image color layer

**Parameters** **axis** (*enum in ['X', 'Y'], (optional)*) – Axis, Axis to mirror colors around.

```
bpy.ops.mesh.colors_rotate(direction='CW')
```

Rotate UV/image color layer

**Parameters** **direction** (*enum in ['CW', 'CCW'], (optional)*) – Direction, Direction to rotate edge around.

```
bpy.ops.mesh.delete(type='VERT')
```

Delete selected vertices, edges or faces

**Parameters** **type** (*enum in ['VERT', 'EDGE', 'FACE', 'ALL', 'EDGE\_FACE', 'ONLY\_FACE', 'EDGE\_LOOP'], (optional)*) – Type, Method used for deleting mesh data

```
bpy.ops.mesh.delete_edgeloop()
```

Delete an edge loop by merging the faces on each side to a single face loop

**File** startup/bl\_operators/wm.py:38

```
bpy.ops.mesh.drop_named_image(name="Image", filepath="Path")
```

Assigns Image to active UV layer, or creates a UV layer

### Parameters

- **name** (*string, (optional)*) – Name, Image name to assign.
- **filepath** (*string, (optional)*) – Filepath, Path to image file

```
bpy.ops.mesh.dupli_extrude_cursor(rotate_source=True)
```

Duplicate and extrude selected vertices, edges or faces towards 3D Cursor

**Parameters** **rotate\_source** (*boolean, (optional)*) – Rotate Source, Rotate initial selection giving better shape

```
bpy.ops.mesh.duplicate(mode='TRANSLATION')
```

Duplicate selected vertices, edges or faces

**Parameters mode** (*enum in* ['INIT', 'DUMMY', 'TRANSLATION', 'ROTATION', 'RESIZE', 'TO-SPHERE', 'SHEAR', 'WARP', 'SHRINKFATTEN', 'TILT', 'TRACKBALL', 'PUSHPULL', 'CREASE', 'MIRROR', 'BONE\_SIZE', 'BONE\_ENVELOPE', 'CURVE\_SHRINKFATTEN', 'BONE\_ROLL', 'TIME\_TRANSLATE', 'TIME\_SLIDE', 'TIME\_SCALE', 'TIME\_EXTEND', 'BAKE\_TIME', 'BEVEL', 'BWEIGHT', 'ALIGN', 'EDGESLIDE', 'SEQSLIDE'], *(optional)*) – Mode

bpy.ops.mesh.**duplicate\_move** (MESH\_OT\_duplicate=None, TRANSFORM\_OT\_translate=None)

Undocumented (contribute)

#### Parameters

- **MESH\_OT\_duplicate** (MESH\_OT\_duplicate, *(optional)*) – Duplicate Mesh, Duplicate selected vertices, edges or faces
- **TRANSFORM\_OT\_translate** (TRANSFORM\_OT\_translate, *(optional)*) – Translate, Translate selected items

bpy.ops.mesh.**edge\_face\_add**()

Add an edge or face to selected

bpy.ops.mesh.**edge\_flip**()

Flip selected edge or adjoining faces

bpy.ops.mesh.**edge\_rotate** (direction='CW')

Rotate selected edge or adjoining faces

**Parameters direction** (*enum in* ['CW', 'CCW'], *(optional)*) – Direction, Direction to rotate the edge around.

bpy.ops.mesh.**edgering\_select** (extend=False)

Select an edge ring

**Parameters extend** (*boolean, (optional)*) – Extend, Extend the selection

bpy.ops.mesh.**edges\_select\_sharp** (sharpness=0.01)

Marked selected edges as sharp

**Parameters sharpness** (*float in* [0, inf], *(optional)*) – sharpness

bpy.ops.mesh.**extrude** (type='REGION')

Extrude selected vertices, edges or faces

**Parameters type** (*enum in* ['REGION', 'FACES', 'EDGES', 'VERTS'], *(optional)*) – Type

bpy.ops.mesh.**extrude\_edges\_move** (MESH\_OT\_extrude=None,

TRANS-

FORM\_OT\_translate=None)

Undocumented (contribute)

#### Parameters

- **MESH\_OT\_extrude** (MESH\_OT\_extrude, *(optional)*) – Extrude, Extrude selected vertices, edges or faces
- **TRANSFORM\_OT\_translate** (TRANSFORM\_OT\_translate, *(optional)*) – Translate, Translate selected items

bpy.ops.mesh.**extrude\_faces\_move** (MESH\_OT\_extrude=None,

TRANS-

FORM\_OT\_shrink\_fatten=None)

Undocumented (contribute)

#### Parameters

- **MESH\_OT\_extrude** (MESH\_OT\_extrude, *(optional)*) – Extrude, Extrude selected vertices, edges or faces

- **TRANSFORM\_OT\_shrink\_fatten** (TRANSFORM\_OT\_shrink\_fatten, (optional)) – Shrink/Fatten, Shrink/fatten selected vertices along normals

bpy.ops.mesh.**extrude\_region\_move** (*MESH\_OT\_extrude=None,*  
*FORM\_OT\_translate=None*)  
Undocumented ([contribute](#))

#### Parameters

- **MESH\_OT\_extrude** (MESH\_OT\_extrude, (optional)) – Extrude, Extrude selected vertices, edges or faces
- **TRANSFORM\_OT\_translate** (TRANSFORM\_OT\_translate, (optional)) – Translate, Translate selected items

bpy.ops.mesh.**extrude\_repeat** (*offset=2.0, steps=10, direction=(0.0, 0.0, 0.0)*)  
Extrude selected vertices, edges or faces repeatedly

#### Parameters

- **offset** (*float in [0, 100], (optional)*) – Offset
- **steps** (*int in [0, 180], (optional)*) – Steps
- **direction** (*float array of 3 items in [-inf, inf], (optional)*) – Direction, Direction of extrude

bpy.ops.mesh.**extrude\_vertices\_move** (*MESH\_OT\_extrude=None,*  
*FORM\_OT\_translate=None*)  
Undocumented ([contribute](#))

#### Parameters

- **MESH\_OT\_extrude** (MESH\_OT\_extrude, (optional)) – Extrude, Extrude selected vertices, edges or faces
- **TRANSFORM\_OT\_translate** (TRANSFORM\_OT\_translate, (optional)) – Translate, Translate selected items

bpy.ops.mesh.**faces\_mirror\_uv** (*direction='POSITIVE'*)  
Copy mirror UV coordinates on the X axis based on a mirrored mesh

**Parameters** **direction** (*enum in ['POSITIVE', 'NEGATIVE'], (optional)*) – Axis Direction

**File** [startup/bl\\_operators/mesh.py:88](#)

bpy.ops.mesh.**faces\_select\_interior**()  
Select faces where all edges have more then 2 face users.

**File** [startup/bl\\_operators/mesh.py:39](#)

bpy.ops.mesh.**faces\_select\_linked\_flat** (*sharpness=135.0*)  
Select linked faces by angle

**Parameters** **sharpness** (*float in [0, inf], (optional)*) – sharpness

bpy.ops.mesh.**faces\_shade\_flat**()  
Display faces ‘flat’

bpy.ops.mesh.**faces\_shade\_smooth**()  
Display faces ‘smooth’ (using vertex normals)

bpy.ops.mesh.**fgon\_clear**()  
Clear fgon from selected face

bpy.ops.mesh.**fgon\_make**()  
Make fgon from selected faces

bpy.ops.mesh.fill()  
Create a segment, edge or face

bpy.ops.mesh.flip\_normals()  
Toggle the direction of selected face's vertex and face normals

bpy.ops.mesh.hide(unselected=False)  
Hide (un)selected vertices, edges or faces

**Parameters** **unselected** (boolean, (optional)) – Unselected, Hide unselected rather than selected.

bpy.ops.mesh.knife\_cut(type='EXACT', path=None, num\_cuts=1, cursor=9)  
Cut selected edges and faces into parts

**Parameters**

- **type** (enum in ['EXACT', 'MIDPOINTS', 'MULTICUT'], (optional)) – Type
- **path** (bpy\_prop\_collection of OperatorMousePath, (optional)) – path
- **num\_cuts** (int in [1, 256], (optional)) – Number of Cuts, Only for Multi-Cut
- **cursor** (int in [0, inf], (optional)) – Cursor

bpy.ops.mesh.loop\_multi\_select(ring=False)  
Select a loop of connected edges by connection type

**Parameters** **ring** (boolean, (optional)) – Ring

bpy.ops.mesh.loop\_select(extend=False, ring=False)  
Select a loop of connected edges

**Parameters**

- **extend** (boolean, (optional)) – Extend Select
- **ring** (boolean, (optional)) – Select Ring

bpy.ops.mesh.loop\_to\_region()  
Select a loop of connected edges as a region

bpy.ops.mesh.looptcut(number\_cuts=1)  
Add a new loop between existing loops

**Parameters** **number\_cuts** (int in [1, inf], (optional)) – Number of Cuts

bpy.ops.mesh.looptcut\_slide(MESH\_OT\_looptcut=None, TRANSFORM\_OT\_edge\_slide=None)  
Undocumented ([contribute](#))

**Parameters**

- **MESH\_OT\_looptcut** (MESH\_OT\_looptcut, (optional)) – Loop Cut, Add a new loop between existing loops
- **TRANSFORM\_OT\_edge\_slide** (TRANSFORM\_OT\_edge\_slide, (optional)) – Edge Slide, Slide an edge loop along a mesh

bpy.ops.mesh.mark\_seam(clear=False)  
(un)mark selected edges as a seam

**Parameters** **clear** (boolean, (optional)) – Clear

bpy.ops.mesh.mark\_sharp(clear=False)  
(un)mark selected edges as sharp

**Parameters** **clear** (boolean, (optional)) – Clear

```
bpy.ops.mesh.merge(type='CENTER', uvs=False)
Merge selected vertices
```

#### Parameters

- **type** (*enum in ['FIRST', 'LAST', 'CENTER', 'CURSOR', 'COLLAPSE']*, *(optional)*) – Type, Merge method to use.
- **uvs** (*boolean, (optional)*) – UVs, Move UVs according to merge.

```
bpy.ops.mesh.noise(factor=0.1)
Use vertex coordinate as texture coordinate
```

#### Parameters **factor** (*float in [-inf, inf]*, *(optional)*) – Factor

```
bpy.ops.mesh.normals_make_consistent(inside=False)
Flip all selected vertex and face normals in a consistent direction
```

#### Parameters **inside** (*boolean, (optional)*) – Inside

```
bpy.ops.mesh.primitive_circle_add(vertices=32, radius=1.0, fill=False, view_align=False, enter_editmode=False, location=(0.0, 0.0, 0.0), rotation=(0.0, 0.0, 0.0), layers=(False, False, False))
```

Construct a circle mesh

#### Parameters

- **vertices** (*int in [-inf, inf]*, *(optional)*) – Vertices
- **radius** (*float in [0, inf]*, *(optional)*) – Radius
- **fill** (*boolean, (optional)*) – Fill
- **view\_align** (*boolean, (optional)*) – Align to View, Align the new object to the view
- **enterEditMode** (*boolean, (optional)*) – Enter Editmode, Enter editmode when adding this object
- **location** (*float array of 3 items in [-inf, inf]*, *(optional)*) – Location, Location for the newly added object
- **rotation** (*float array of 3 items in [-inf, inf]*, *(optional)*) – Rotation, Rotation for the newly added object
- **layers** (*boolean array of 20 items, (optional)*) – Layer

```
bpy.ops.mesh.primitive_cone_add(vertices=32, radius=1.0, depth=2.0, cap_end=True, view_align=False, enterEditMode=False, location=(0.0, 0.0, 0.0), rotation=(0.0, 0.0, 0.0), layers=(False, False, False))
```

Construct a conic mesh (ends filled)

#### Parameters

- **vertices** (*int in [-inf, inf]*, *(optional)*) – Vertices
- **radius** (*float in [0, inf]*, *(optional)*) – Radius
- **depth** (*float in [0, inf]*, *(optional)*) – Depth
- **cap\_end** (*boolean, (optional)*) – Cap End
- **view\_align** (*boolean, (optional)*) – Align to View, Align the new object to the view

- **enter\_editmode** (*boolean, (optional)*) – Enter Editmode, Enter editmode when adding this object
- **location** (*float array of 3 items in [-inf, inf], (optional)*) – Location, Location for the newly added object
- **rotation** (*float array of 3 items in [-inf, inf], (optional)*) – Rotation, Rotation for the newly added object
- **layers** (*boolean array of 20 items, (optional)*) – Layer

```
bpy.ops.mesh.primitive_cube_add(view_align=False, enter_editmode=False, location=(0.0, 0.0, 0.0), rotation=(0.0, 0.0, 0.0), layers=(False, False, False))
```

Construct a cube mesh

#### Parameters

- **view\_align** (*boolean, (optional)*) – Align to View, Align the new object to the view
- **enter\_editmode** (*boolean, (optional)*) – Enter Editmode, Enter editmode when adding this object
- **location** (*float array of 3 items in [-inf, inf], (optional)*) – Location, Location for the newly added object
- **rotation** (*float array of 3 items in [-inf, inf], (optional)*) – Rotation, Rotation for the newly added object
- **layers** (*boolean array of 20 items, (optional)*) – Layer

```
bpy.ops.mesh.primitive_cylinder_add(vertices=32, radius=1.0, depth=2.0, cap_ends=True, view_align=False, enter_editmode=False, location=(0.0, 0.0, 0.0), rotation=(0.0, 0.0, 0.0), layers=(False, False, False))
```

Construct a cylinder mesh

#### Parameters

- **vertices** (*int in [-inf, inf], (optional)*) – Vertices
- **radius** (*float in [0, inf], (optional)*) – Radius
- **depth** (*float in [0, inf], (optional)*) – Depth
- **cap\_ends** (*boolean, (optional)*) – Cap Ends
- **view\_align** (*boolean, (optional)*) – Align to View, Align the new object to the view
- **enter\_editmode** (*boolean, (optional)*) – Enter Editmode, Enter editmode when adding this object
- **location** (*float array of 3 items in [-inf, inf], (optional)*) – Location, Location for the newly added object
- **rotation** (*float array of 3 items in [-inf, inf], (optional)*) – Rotation, Rotation for the newly added object
- **layers** (*boolean array of 20 items, (optional)*) – Layer

```
bpy.ops.mesh.primitive_grid_add(x_subdivisions=10,           y_subdivisions=10,           size=1.0,
                                 view_align=False,    enter_editmode=False,   location=(0.0,
                                 0.0, 0.0), rotation=(0.0, 0.0, 0.0), layers=(False, False, False,
                                 False, False, False, False, False, False, False, False, False,
                                 False, False, False, False, False, False, False, False))
```

Construct a grid mesh

#### Parameters

- **x\_subdivisions** (*int in [-inf, inf], (optional)*) – X Subdivisions
- **y\_subdivisions** (*int in [-inf, inf], (optional)*) – Y Subdivisions
- **size** (*float in [0, inf], (optional)*) – Size
- **view\_align** (*boolean, (optional)*) – Align to View, Align the new object to the view
- **enterEditMode** (*boolean, (optional)*) – Enter Editmode, Enter editmode when adding this object
- **location** (*float array of 3 items in [-inf, inf], (optional)*) – Location, Location for the newly added object
- **rotation** (*float array of 3 items in [-inf, inf], (optional)*) – Rotation, Rotation for the newly added object
- **layers** (*boolean array of 20 items, (optional)*) – Layer

```
bpy.ops.mesh.primitive_ico_sphere_add(subdivisions=2, size=1.0, view_align=False, enter_editmode=False, location=(0.0, 0.0, 0.0), rotation=(0.0, 0.0, 0.0), layers=(False, False, False))
```

Construct an Icosphere mesh

#### Parameters

- **subdivisions** (*int in [0, inf], (optional)*) – Subdivisions
- **size** (*float in [0, inf], (optional)*) – Size
- **view\_align** (*boolean, (optional)*) – Align to View, Align the new object to the view
- **enterEditMode** (*boolean, (optional)*) – Enter Editmode, Enter editmode when adding this object
- **location** (*float array of 3 items in [-inf, inf], (optional)*) – Location, Location for the newly added object
- **rotation** (*float array of 3 items in [-inf, inf], (optional)*) – Rotation, Rotation for the newly added object
- **layers** (*boolean array of 20 items, (optional)*) – Layer

```
bpy.ops.mesh.primitive_monkey_add(view_align=False, enter_editmode=False, location=(0.0, 0.0, 0.0), rotation=(0.0, 0.0, 0.0), layers=(False, False, False))
```

Construct a Suzanne mesh

#### Parameters

- **view\_align** (*boolean, (optional)*) – Align to View, Align the new object to the view

- **enter\_editmode** (*boolean, (optional)*) – Enter Editmode, Enter editmode when adding this object
- **location** (*float array of 3 items in [-inf, inf], (optional)*) – Location, Location for the newly added object
- **rotation** (*float array of 3 items in [-inf, inf], (optional)*) – Rotation, Rotation for the newly added object
- **layers** (*boolean array of 20 items, (optional)*) – Layer

```
bpy.ops.mesh.primitive_plane_add(view_align=False, enter_editmode=False, location=(0.0, 0.0, 0.0), rotation=(0.0, 0.0, 0.0), layers=(False, False, False))
```

Construct a filled planar mesh with 4 vertices

#### Parameters

- **view\_align** (*boolean, (optional)*) – Align to View, Align the new object to the view
- **enter\_editmode** (*boolean, (optional)*) – Enter Editmode, Enter editmode when adding this object
- **location** (*float array of 3 items in [-inf, inf], (optional)*) – Location, Location for the newly added object
- **rotation** (*float array of 3 items in [-inf, inf], (optional)*) – Rotation, Rotation for the newly added object
- **layers** (*boolean array of 20 items, (optional)*) – Layer

```
bpy.ops.mesh.primitive_torus_add(major_radius=1.0, minor_radius=0.25, major_segments=48, minor_segments=12, use_abso=False, abso_major_rad=1.0, abso_minor_rad=0.5, view_align=False, location=(0.0, 0.0, 0.0), rotation=(0.0, 0.0, 0.0))
```

Add a torus mesh

#### Parameters

- **major\_radius** (*float in [0.01, 100], (optional)*) – Major Radius, Radius from the origin to the center of the cross sections
- **minor\_radius** (*float in [0.01, 100], (optional)*) – Minor Radius, Radius of the torus' cross section
- **major\_segments** (*int in [3, 256], (optional)*) – Major Segments, Number of segments for the main ring of the torus
- **minor\_segments** (*int in [3, 256], (optional)*) – Minor Segments, Number of segments for the minor ring of the torus
- **use\_abso** (*boolean, (optional)*) – Use Int+Ext Controls, Use the Int / Ext controls for torus dimensions
- **abso\_major\_rad** (*float in [0.01, 100], (optional)*) – Exterior Radius, Total Exterior Radius of the torus
- **abso\_minor\_rad** (*float in [0.01, 100], (optional)*) – Inside Radius, Total Interior Radius of the torus
- **view\_align** (*boolean, (optional)*) – Align to View
- **location** (*float array of 3 items in [-inf, inf], (optional)*) – Location

- **rotation** (*float array of 3 items in [-inf, inf], (optional)*) – Rotation

**File** startup/bl\_operators/add\_mesh\_torus.py:148

```
bpy.ops.mesh.primitive_uv_sphere_add(segments=32,          ring_count=16,          size=1.0,
                                      view_align=False,      enter_editmode=False,      location=(0.0, 0.0, 0.0), rotation=(0.0, 0.0, 0.0), layers=(False, False, False))
```

Construct a UV sphere mesh

#### Parameters

- **segments** (*int in [-inf, inf], (optional)*) – Segments
- **ring\_count** (*int in [-inf, inf], (optional)*) – Rings
- **size** (*float in [0, inf], (optional)*) – Size
- **view\_align** (*boolean, (optional)*) – Align to View, Align the new object to the view
- **enter\_editmode** (*boolean, (optional)*) – Enter Editmode, Enter editmode when adding this object
- **location** (*float array of 3 items in [-inf, inf], (optional)*) – Location, Location for the newly added object
- **rotation** (*float array of 3 items in [-inf, inf], (optional)*) – Rotation, Rotation for the newly added object
- **layers** (*boolean array of 20 items, (optional)*) – Layer

```
bpy.ops.mesh.quads_convert_to_tris()
```

Convert selected quads to triangles

```
bpy.ops.mesh.region_to_loop()
```

Select a region as a loop of connected edges

```
bpy.ops.mesh.remove_doubles(limit=0.0001)
```

Remove duplicate vertices

**Parameters** **limit** (*float in [1e-06, 50], (optional)*) – Merge Threshold, Minimum distance between merged verts

```
bpy.ops.mesh.reveal()
```

Reveal all hidden vertices, edges and faces

```
bpy.ops.mesh.rip(constraint_axis=(False, False, False), constraint_orientation='', mirror=False, release_confirm=False)
```

Rip selection from mesh (quads only)

#### Parameters

- **constraint\_axis** (*boolean array of 3 items, (optional)*) – Constraint Axis
- **constraint\_orientation** (*enum in [], (optional)*) – Orientation, Transformation orientation
- **mirror** (*boolean, (optional)*) – Mirror Editing
- **release\_confirm** (*boolean, (optional)*) – Confirm on Release, Always confirm operation when releasing button

```
bpy.ops.mesh.rip_move(MESH_OT_rip=None, TRANSFORM_OT_translate=None)
```

Undocumented ([contribute](#))

### Parameters

- **MESH\_OT\_rip** (`MESH_OT_rip`, (optional)) – Rip, Rip selection from mesh (quads only)
- **TRANSFORM\_OT\_translate** (`TRANSFORM_OT_translate`, (optional)) – Translate, Translate selected items

`bpy.ops.mesh.screw(steps=9, turns=1, center=(0.0, 0.0, 0.0), axis=(0.0, 0.0, 0.0))`  
Extrude selected vertices in screw-shaped rotation around the cursor in indicated viewport

### Parameters

- **steps** (`int in [0, inf], (optional)`) – Steps, Steps
- **turns** (`int in [0, inf], (optional)`) – Turns, Turns
- **center** (`float array of 3 items in [-inf, inf], (optional)`) – Center, Center in global view space
- **axis** (`float array of 3 items in [-1, 1], (optional)`) – Axis, Axis in global view space

`bpy.ops.mesh.select_all(action='TOGGLE')`  
Change selection of all vertices, edges or faces

**Parameters** `action` (`enum in ['TOGGLE', 'SELECT', 'DESELECT', 'INVERT'], (optional)`) – Action, Selection action to execute

`bpy.ops.mesh.select_axis(mode='POSITIVE', axis='X_AXIS')`  
Select all data in the mesh on a single axis

### Parameters

- **mode** (`enum in ['POSITIVE', 'NEGATIVE', 'ALIGNED'], (optional)`) – Axis Mode, Axis side to use when selecting
- **axis** (`enum in ['X_AXIS', 'Y_AXIS', 'Z_AXIS'], (optional)`) – Axis, Select the axis to compare each vertex on

`bpy.ops.mesh.select_by_number_vertices(type='TRIANGLES')`  
Select vertices or faces by vertex count

**Parameters** `type` (`enum in ['TRIANGLES', 'QUADS', 'OTHER'], (optional)`) – Type, Type of elements to select.

`bpy.ops.mesh.select_inverse()`  
Select inverse of (un)selected vertices, edges or faces

`bpy.ops.mesh.select_less()`  
Select less vertices, edges or faces connected to initial selection

`bpy.ops.mesh.select_linked(limit=False)`  
Select all vertices linked to the active mesh

**Parameters** `limit` (`boolean, (optional)`) – Limit by Seams, Limit selection by seam boundaries (faces only)

`bpy.ops.mesh.select_linked_pick(deselect=False, limit=False)`  
(un)select all vertices linked to the active mesh

### Parameters

- **deselect** (`boolean, (optional)`) – Deselect
- **limit** (`boolean, (optional)`) – Limit by Seams, Limit selection by seam boundaries (faces only)

bpy.ops.mesh.select\_mirror(*extend=False*)

Select mesh items at mirrored locations

**Parameters** **extend** (*boolean, (optional)*) – Extend, Extend the existing selection

bpy.ops.mesh.select\_more()

Select more vertices, edges or faces connected to initial selection

bpy.ops.mesh.select\_non\_manifold()

Select all non-manifold vertices or edges

bpy.ops.mesh.select\_nth(*nth=2*)

Undocumented ([contribute](#))

**Parameters** **nth** (*int in [2, 100], (optional)*) – Nth Selection

bpy.ops.mesh.select\_random(*percent=50.0, extend=False*)

Randomly select vertices

#### Parameters

- **percent** (*float in [0, 100], (optional)*) – Percent, Percentage of elements to select randomly.
- **extend** (*boolean, (optional)*) – Extend Selection, Extend selection instead of deselecting everything first.

bpy.ops.mesh.select\_shortest\_path(*extend=False*)

Select shortest path between two selections

**Parameters** **extend** (*boolean, (optional)*) – Extend Select

bpy.ops.mesh.select\_similar(*type='NORMAL', threshold=0.01*)

Select similar vertices, edges or faces by property types

#### Parameters

- **type** (*enum in ['NORMAL', 'FACE', 'VGROUP', 'LENGTH', 'DIR', 'FACE', 'FACE\_ANGLE', 'CREASE', 'SEAM', 'SHARP', 'MATERIAL', 'IMAGE', 'AREA', 'PERIMETER', 'NORMAL', 'COPLANAR'], (optional)*) – Type
- **threshold** (*float in [0, inf], (optional)*) – Threshold

bpy.ops.mesh.select\_vertex\_path(*type='EDGE\_LENGTH'*)

Select shortest path between two vertices by distance type

**Parameters** **type** (*enum in ['EDGE\_LENGTH', 'TOPOLOGICAL'], (optional)*) – Type, Method to compute distance.

bpy.ops.mesh.separate(*type='SELECTED'*)

Separate selected geometry into a new mesh

**Parameters** **type** (*enum in ['SELECTED', 'MATERIAL', 'LOOSE'], (optional)*) – Type

bpy.ops.mesh.shape\_propagate\_to\_all()

Apply selected vertex locations to all other shape keys

bpy.ops.mesh.solidify(*thickness=0.01*)

Create a solid skin by extruding, compensating for sharp angles

**Parameters** **thickness** (*float in [-inf, inf], (optional)*) – Thickness

bpy.ops.mesh.sort\_faces(*type='VIEW\_AXIS'*)

The faces of the active Mesh Object are sorted, based on the current view.

**Parameters** **type** (*enum in ['VIEW\_AXIS', 'CURSOR\_DISTANCE', 'MATERIAL', 'SELECTED', 'RANDOMIZE'], (optional)*) – Type

bpy.ops.mesh.**spin**(*steps*=9, *dupli*=False, *degrees*=90.0, *center*=(0.0, 0.0, 0.0), *axis*=(0.0, 0.0, 0.0))

Extrude selected vertices in a circle around the cursor in indicated viewport

#### Parameters

- **steps** (*int in [0, inf], (optional)*) – Steps, Steps
- **dupli** (*boolean, (optional)*) – Dupli, Make Duplicates
- **degrees** (*float in [-inf, inf], (optional)*) – Degrees, Degrees
- **center** (*float array of 3 items in [-inf, inf], (optional)*) – Center, Center in global view space
- **axis** (*float array of 3 items in [-1, 1], (optional)*) – Axis, Axis in global view space

bpy.ops.mesh.**split**()

Split selected geometry into separate disconnected mesh

bpy.ops.mesh.**sticky\_add**()

Add sticky UV texture layer

bpy.ops.mesh.**sticky\_remove**()

Remove sticky UV texture layer

bpy.ops.mesh.**subdivide**(*number\_cuts*=1, *smoothness*=0.0, *fractal*=0.0, *corner\_cut\_pattern*='INNER\_VERTEX')

Subdivide selected edges

#### Parameters

- **number\_cuts** (*int in [1, inf], (optional)*) – Number of Cuts
- **smoothness** (*float in [0, inf], (optional)*) – Smoothness, Smoothness factor.
- **fractal** (*float in [0, inf], (optional)*) – Fractal, Fractal randomness factor.
- **corner\_cut\_pattern** (*enum in ['PATH', 'INNER\_VERTEX', 'FAN'], (optional)*) – Corner Cut Pattern, Topology pattern to use to fill a face after cutting across its corner

bpy.ops.mesh.**tris\_convert\_to\_quads**()

Convert selected triangles to quads

bpy.ops.mesh.**uv\_texture\_add**()

Add UV texture layer

bpy.ops.mesh.**uv\_texture\_remove**()

Remove UV texture layer

bpy.ops.mesh.**uvs\_mirror**(*axis*='X')

Mirror selected UVs

**Parameters axis** (*enum in ['X', 'Y'], (optional)*) – Axis, Axis to mirror UVs around.

bpy.ops.mesh.**uvs\_rotate**(*direction*='CW')

Rotate selected UVs

**Parameters direction** (*enum in ['CW', 'CCW'], (optional)*) – Direction, Direction to rotate UVs around.

bpy.ops.mesh.**vertex\_color\_add**()

Add vertex color layer

bpy.ops.mesh.**vertex\_color\_remove**()

Remove vertex color layer

bpy.ops.mesh.**vertices\_randomize**()

Randomize vertex order

```
bpy.ops.mesh.vertices_smooth(repeat=1, xaxis=True, yaxis=True, zaxis=True)
    Flatten angles of selected vertices
```

#### Parameters

- **repeat** (*int in [1, 100], (optional)*) – Smooth Iterations
- **xaxis** (*boolean, (optional)*) – X-Axis, Smooth along the X axis.
- **yaxis** (*boolean, (optional)*) – Y-Axis, Smooth along the Y axis.
- **zaxis** (*boolean, (optional)*) – Z-Axis, Smooth along the Z axis.

```
bpy.ops.mesh.vertices_sort()
    Sort vertex order
```

## Nla Operators

```
bpy.ops.nla.action_sync_length(active=True)
    Synchronise the length of the referenced Action with the lengths used in the strip
```

**Parameters** **active** (*boolean, (optional)*) – Active Strip Only, Only sync the active length for the active strip.

```
bpy.ops.nla.actionclip_add(action='')
    Add an Action-Clip strip (i.e. an NLA Strip referencing an Action) to the active track
```

**Parameters** **action** (*enum in [], (optional)*) – Action

```
bpy.ops.nla.apply_scale()
    Apply scaling of selected strips to their referenced Actions
```

```
bpy.ops.nla.bake(frame_start=1,           frame_end=250,           step=1,           only_selected=True,
                  clear_constraints=False, bake_types={'POSE'})
    Bake animation to an Action
```

#### Parameters

- **frame\_start** (*int in [1, 300000], (optional)*) – Start Frame, Start frame for baking
- **frame\_end** (*int in [1, 300000], (optional)*) – End Frame, End frame for baking
- **step** (*int in [1, 120], (optional)*) – Frame Step, Frame Step
- **only\_selected** (*boolean, (optional)*) – Only Selected
- **clear\_constraints** (*boolean, (optional)*) – Clear Constraints
- **bake\_types** (*enum set in {'POSE', 'OBJECT'}, (optional)*) – Bake Data

**File** startup/bl\_operators/nla.py:225

```
bpy.ops.nla.channels_click(extend=False)
    Handle clicks to select NLA channels
```

**Parameters** **extend** (*boolean, (optional)*) – Extend Select

```
bpy.ops.nla.clear_scale()
    Reset scaling of selected strips
```

```
bpy.ops.nla.click_select(extend=False)
    Handle clicks to select NLA Strips
```

**Parameters** **extend** (*boolean, (optional)*) – Extend Select

bpy.ops.nla.**delete()**

Delete selected strips

bpy.ops.nla.**delete\_tracks()**

Delete selected NLA-Tracks and the strips they contain

bpy.ops.nla.**duplicate(mode='TRANSLATION')**

Duplicate selected NLA-Strips, adding the new strips in new tracks above the originals

**Parameters mode** (*enum in* ['INIT', 'DUMMY', 'TRANSLATION', 'ROTATION', 'RESIZE', 'TOSPHERE', 'SHEAR', 'WARP', 'SHRINKFATTEN', 'TILT', 'TRACKBALL', 'PUSHPULL', 'CREASE', 'MIRROR', 'BONE\_SIZE', 'BONE\_ENVELOPE', 'CURVE\_SHRINKFATTEN', 'BONE\_ROLL', 'TIME\_TRANSLATE', 'TIME\_SLIDE', 'TIME\_SCALE', 'TIME\_EXTEND', 'BAKE\_TIME', 'BEVEL', 'BWEIGHT', 'ALIGN', 'EDGESLIDE', 'SEQSLIDE'], *(optional)*) – Mode

bpy.ops.nla.**fmodifier\_add(type='NULL', only\_active=False)**

Add F-Modifier of the specified type to the selected NLA-Strips

#### Parameters

- **type** (*enum in* ['NULL', 'GENERATOR', 'FNGENERATOR', 'ENVELOPE', 'CYCLES', 'NOISE', 'FILTER', 'LIMITS', 'STEPPED'], *(optional)*) – Type
- **only\_active** (*boolean, (optional)*) – Only Active, Only add F-Modifier of the specified type to the active strip.

bpy.ops.nla.**fmodifier\_copy()**

Copy the F-Modifier(s) of the active NLA-Strip

bpy.ops.nla.**fmodifier\_paste()**

Add copied F-Modifiers to the selected NLA-Strips

bpy.ops.nla.**meta\_add()**

Add new meta-strips incorporating the selected strips

bpy.ops.nla.**meta\_remove()**

Separate out the strips held by the selected meta-strips

bpy.ops.nla.**move\_down()**

Move selected strips down a track if there's room

bpy.ops.nla.**move\_up()**

Move selected strips up a track if there's room

bpy.ops.nla.**mute\_toggle()**

Mute or un-mute selected strips

bpy.ops.nla.**properties()**

Toggle display properties panel

bpy.ops.nla.**select\_all\_toggle(invert=False)**

(De)Select all NLA-Strips

**Parameters invert** (*boolean, (optional)*) – Invert

bpy.ops.nla.**select\_border(gesture\_mode=0, xmin=0, xmax=0, ymin=0, ymax=0, axis\_range=False)**

Use box selection to grab NLA-Strips

#### Parameters

- **gesture\_mode** (*int in* [-inf, inf], *(optional)*) – Gesture Mode
- **xmin** (*int in* [-inf, inf], *(optional)*) – X Min

- **xmax** (*int in [-inf, inf], (optional)*) – X Max
- **ymin** (*int in [-inf, inf], (optional)*) – Y Min
- **ymax** (*int in [-inf, inf], (optional)*) – Y Max
- **axis\_range** (*boolean, (optional)*) – Axis Range

bpy.ops.nla.**select\_leftright** (*mode='CHECK', extend=False*)  
Select strips to the left or the right of the current frame

#### Parameters

- **mode** (*enum in ['CHECK', 'LEFT', 'RIGHT'], (optional)*) – Mode
- **extend** (*boolean, (optional)*) – Extend Select

bpy.ops.nla.**snap** (*type='CFRA'*)  
Move start of strips to specified time

**Parameters type** (*enum in ['CFRA', 'NEAREST\_FRAME', 'NEAREST\_SECOND', 'NEAREST\_MARKER'], (optional)*) – Type

bpy.ops.nla.**split**()  
Split selected strips at their midpoints

bpy.ops.nla.**swap**()  
Swap order of selected strips within tracks

bpy.ops.nla.**tracks\_add** (*above\_selected=False*)  
Add NLA-Tracks above/after the selected tracks

**Parameters above\_selected** (*boolean, (optional)*) – Above Selected, Add a new NLA Track above every existing selected one.

bpy.ops.nla.**transition\_add**()  
Add a transition strip between two adjacent selected strips

bpy.ops.nla.**tweakmode\_enter**()  
Enter tweaking mode for the action referenced by the active strip

bpy.ops.nla.**tweakmode\_exit**()  
Exit tweaking mode for the action referenced by the active strip

## Node Operators

bpy.ops.node.**add\_file** (*filepath=""*, *filter\_blender=False*, *filter\_image=True*, *filter\_movie=False*, *filter\_python=False*, *filter\_font=False*, *filter\_sound=False*, *filter\_text=False*, *filter\_btx=False*, *filter\_collada=False*, *filter\_folder=True*, *filemode=9*, *name="Image"*)  
Add a file node to the current node editor

#### Parameters

- **filepath** (*string, (optional)*) – File Path, Path to file
- **filter\_blender** (*boolean, (optional)*) – Filter .blend files
- **filter\_image** (*boolean, (optional)*) – Filter image files
- **filter\_movie** (*boolean, (optional)*) – Filter movie files
- **filter\_python** (*boolean, (optional)*) – Filter python files
- **filter\_font** (*boolean, (optional)*) – Filter font files

- **filter\_sound** (*boolean, (optional)*) – Filter sound files
- **filter\_text** (*boolean, (optional)*) – Filter text files
- **filter\_btx** (*boolean, (optional)*) – Filter btx files
- **filter\_collada** (*boolean, (optional)*) – Filter COLLADA files
- **filter\_folder** (*boolean, (optional)*) – Filter folders
- **filemode** (*int in [1, 9], (optional)*) – File Browser Mode, The setting for the file browser mode to load a .blend file, a library or a special file
- **name** (*string, (optional)*) – Name, Datablock name to assign.

bpy.ops.node.backimage\_move()

Move Node backdrop

bpy.ops.node.backimage\_sample()

Undocumented (contribute)

bpy.ops.node.backimage\_zoom(*factor=1.2*)

Undocumented (contribute)

**Parameters** **factor** (*float in [0, 10], (optional)*) – Factor

bpy.ops.node.delete()

Delete selected nodes

bpy.ops.node.delete\_reconnect()

Delete nodes; will reconnect nodes as if deletion was muted

bpy.ops.node.duplicate(*keep\_inputs=False*)

Duplicate the nodes

**Parameters** **keep\_inputs** (*boolean, (optional)*) – Keep Inputs, Keep the input links to duplicated nodes

bpy.ops.node.duplicate\_move(*NODE\_OT\_duplicate=None, TRANSFORM\_OT\_translate=None*)

Undocumented (contribute)

**Parameters**

- **NODE\_OT\_duplicate** (*NODE\_OT\_duplicate, (optional)*) – Duplicate Nodes, Duplicate the nodes
- **TRANSFORM\_OT\_translate** (*TRANSFORM\_OT\_translate, (optional)*) – Translate, Translate selected items

bpy.ops.node.duplicate\_move\_keep\_inputs(*NODE\_OT\_duplicate=None, FORM\_OT\_translate=None*)

TRANS-

Undocumented (contribute)

**Parameters**

- **NODE\_OT\_duplicate** (*NODE\_OT\_duplicate, (optional)*) – Duplicate Nodes, Duplicate the nodes
- **TRANSFORM\_OT\_translate** (*TRANSFORM\_OT\_translate, (optional)*) – Translate, Translate selected items

bpy.ops.node.group\_edit()

Edit node group

bpy.ops.node.group\_make()

Make group from selected nodes

bpy.ops.node.**group\_socket\_add**(*in\_out*='IN', *name*=“”, *type*='VALUE')  
Add node group socket

#### Parameters

- **in\_out** (*enum in* ['IN', 'OUT'], *(optional)*) – Socket Type, Input or Output
- **name** (*string, (optional)*) – Name, Group socket name
- **type** (*enum in* ['VALUE', 'VECTOR', 'RGBA'], *(optional)*) – Type, Type of the group socket

bpy.ops.node.**group\_socket\_move\_down**(*index*=0, *in\_out*='IN')  
Move down node group socket

#### Parameters

- **index** (*int in* [0, *inf*], *(optional)*) – Index
- **in\_out** (*enum in* ['IN', 'OUT'], *(optional)*) – Socket Type, Input or Output

bpy.ops.node.**group\_socket\_move\_up**(*index*=0, *in\_out*='IN')  
Move up node group socket

#### Parameters

- **index** (*int in* [0, *inf*], *(optional)*) – Index
- **in\_out** (*enum in* ['IN', 'OUT'], *(optional)*) – Socket Type, Input or Output

bpy.ops.node.**group\_socket\_remove**(*index*=0, *in\_out*='IN')  
Removed node group socket

#### Parameters

- **index** (*int in* [0, *inf*], *(optional)*) – Index
- **in\_out** (*enum in* ['IN', 'OUT'], *(optional)*) – Socket Type, Input or Output

bpy.ops.node.**group\_ungroup**()  
Ungroup selected nodes

bpy.ops.node.**hide\_socket\_toggle**()  
Toggle unused node socket display

bpy.ops.node.**hide\_toggle**()  
Toggle hiding of selected nodes

bpy.ops.node.**link**()  
Undocumented ([contribute](#))

bpy.ops.node.**link\_make**(*replace*=False)  
Makes a link between selected output in input sockets

**Parameters** **replace** (*boolean, (optional)*) – Replace, Replace socket connections with the new links

bpy.ops.node.**link\_viewer**()  
Link to Viewer Node

bpy.ops.node.**links\_cut**(*path*=None, *cursor*=9)  
Undocumented ([contribute](#))

#### Parameters

- **path** (bpy\_prop\_collection of OperatorMousePath, *(optional)*) – path
- **cursor** (*int in* [0, *inf*], *(optional)*) – Cursor

```
bpy.ops.node.mute_toggle()  
    Toggle muting of the nodes  
  
bpy.ops.node.preview_toggle()  
    Toggle preview display for selected nodes  
  
bpy.ops.node.properties()  
    Toggles the properties panel display  
  
bpy.ops.node.read_fullsamplelayers()  
    Undocumented (contribute)  
  
bpy.ops.node.read_renderlayers()  
    Undocumented (contribute)  
  
bpy.ops.node.render_changed()  
    Undocumented (contribute)  
  
bpy.ops.node.resize()  
    Undocumented (contribute)  
  
bpy.ops.node.select(mouse_x=0, mouse_y=0, extend=False)  
    Select node under cursor
```

#### Parameters

- **mouse\_x** (int in [-inf, inf], (optional)) – Mouse X
- **mouse\_y** (int in [-inf, inf], (optional)) – Mouse Y
- **extend** (boolean, (optional)) – Extend

```
bpy.ops.node.select_all()  
    (De)select all nodes
```

```
bpy.ops.node.select_border(gesture_mode=0, xmin=0, xmax=0, ymin=0, ymax=0, tweak=False)  
    Use box selection to select nodes
```

#### Parameters

- **gesture\_mode** (int in [-inf, inf], (optional)) – Gesture Mode
- **xmin** (int in [-inf, inf], (optional)) – X Min
- **xmax** (int in [-inf, inf], (optional)) – X Max
- **ymin** (int in [-inf, inf], (optional)) – Y Min
- **ymax** (int in [-inf, inf], (optional)) – Y Max
- **tweak** (boolean, (optional)) – Tweak, Only activate when mouse is not over a node - useful for tweak gesture

```
bpy.ops.node.select_link_viewer(NODE_OT_select=None, NODE_OT_link_viewer=None)  
    Undocumented (contribute)
```

#### Parameters

- **NODE\_OT\_select** (NODE\_OT\_select, (optional)) – Select, Select node under cursor
- **NODE\_OT\_link\_viewer** (NODE\_OT\_link\_viewer, (optional)) – Link to Viewer Node, Link to Viewer Node

```
bpy.ops.node.select_linked_from()  
    Select nodes linked from the selected ones
```

```
bpy.ops.node.select_linked_to()  
    Select nodes linked to the selected ones  
  
bpy.ops.node.select_same_type()  
    Select all the same type  
  
bpy.ops.node.select_same_type_next()  
    Select the next node of the same type.  
  
bpy.ops.node.select_same_type_prev()  
    Select the prev node of the same type.  
  
bpy.ops.node.show_cyclic_dependencies()  
    Sort the nodes and show the cyclic dependencies between the nodes  
  
bpy.ops.node.view_all()  
    Resize view so you can see all nodes  
  
bpy.ops.node.visibility_toggle(mouse_x=0, mouse_y=0)  
    Handle clicks on node header buttons
```

#### Parameters

- **mouse\_x** (*int in [-inf, inf], (optional)*) – Mouse X
- **mouse\_y** (*int in [-inf, inf], (optional)*) – Mouse Y

### Object Operators

```
bpy.ops.object.add(type='EMPTY', view_align=False, enter_editmode=False, location=(0.0, 0.0, 0.0), rotation=(0.0, 0.0, 0.0), layers=(False, False, False))
```

Add an object to the scene

#### Parameters

- **type** (*enum in ['MESH', 'CURVE', 'SURFACE', 'META', 'FONT', 'ARMATURE', 'LATTICE', 'EMPTY', 'CAMERA', 'LAMP'], (optional)*) – Type
- **view\_align** (*boolean, (optional)*) – Align to View, Align the new object to the view
- **enter\_editmode** (*boolean, (optional)*) – Enter Editmode, Enter editmode when adding this object
- **location** (*float array of 3 items in [-inf, inf], (optional)*) – Location, Location for the newly added object
- **rotation** (*float array of 3 items in [-inf, inf], (optional)*) – Rotation, Rotation for the newly added object
- **layers** (*boolean array of 20 items, (optional)*) – Layer

```
bpy.ops.object.add_named(linked=False, name="Cube")
```

Add named object

#### Parameters

- **linked** (*boolean, (optional)*) – Linked, Duplicate object but not object data, linking to the original data
- **name** (*string, (optional)*) – Name, Object name to add

```
bpy.ops.object.add_named_cursor(name="Cube",      VIEW3D_OT_cursor3d=None,      OB-
                                  JECT_OT_add_named=None)
```

Undocumented ([contribute](#))

#### Parameters

- **name** (*string, (optional)*) – Name, Object name to add.
- **VIEW3D\_OT\_cursor3d** (*VIEW3D\_OT\_cursor3d, (optional)*) – Set 3D Cursor, Set the location of the 3D cursor
- **OBJECT\_OT\_add\_named** (*OBJECT\_OT\_add\_named, (optional)*) – Add Named Object, Add named object

```
bpy.ops.object.align(bb_quality=True,           align_mode='OPT_2',           relative_to='OPT_4',
                      align_axis=set())
```

Align Objects

#### Parameters

- **bb\_quality** (*boolean, (optional)*) – High Quality, Enables high quality calculation of the bounding box for perfect results on complex shape meshes with rotation/scale (Slow)
- **align\_mode** (*enum in ['OPT\_1', 'OPT\_2', 'OPT\_3'], (optional)*) – Align Mode:
- **relative\_to** (*enum in ['OPT\_1', 'OPT\_2', 'OPT\_3', 'OPT\_4'], (optional)*) – Relative To:
- **align\_axis** (*enum set in {'X', 'Y', 'Z'}, (optional)*) – Align, Align to axis

**File** [startup/bl\\_operators/object\\_align.py:387](#)

```
bpy.ops.object.armature_add(view_align=False, enter_editmode=False, location=(0.0, 0.0, 0.0),
                             rotation=(0.0, 0.0, 0.0), layers=(False, False, False, False, False,
                             False, False, False, False, False, False, False, False, False, False,
                             False, False, False, False))
```

Add an armature object to the scene

#### Parameters

- **view\_align** (*boolean, (optional)*) – Align to View, Align the new object to the view
- **enter\_editmode** (*boolean, (optional)*) – Enter Editmode, Enter editmode when adding this object
- **location** (*float array of 3 items in [-inf, inf], (optional)*) – Location, Location for the newly added object
- **rotation** (*float array of 3 items in [-inf, inf], (optional)*) – Rotation, Rotation for the newly added object
- **layers** (*boolean array of 20 items, (optional)*) – Layer

```
bpy.ops.object.bake_image()
```

Bake image textures of selected objects

```
bpy.ops.object.camera_add(view_align=False, enter_editmode=False, location=(0.0, 0.0, 0.0), ro-
                           tation=(0.0, 0.0, 0.0), layers=(False, False, False, False, False, False,
                           False, False, False, False, False, False, False, False, False, False, False,
                           False, False, False))
```

Add a camera object to the scene

#### Parameters

- **view\_align** (*boolean, (optional)*) – Align to View, Align the new object to the view

- **enter\_editmode** (*boolean, (optional)*) – Enter Editmode, Enter editmode when adding this object
- **location** (*float array of 3 items in [-inf, inf], (optional)*) – Location, Location for the newly added object
- **rotation** (*float array of 3 items in [-inf, inf], (optional)*) – Rotation, Rotation for the newly added object
- **layers** (*boolean array of 20 items, (optional)*) – Layer

bpy.ops.object.constraint\_add(type='')

Add a constraint to the active object

**Parameters** **type** (*enum in ['COPY\_LOCATION', 'COPY\_ROTATION', 'COPY\_SCALE', 'COPY\_TRANSFORMS', 'LIMIT\_DISTANCE', 'LIMIT\_LOCATION', 'LIMIT\_ROTATION', 'LIMIT\_SCALE', 'MAINTAIN\_VOLUME', 'TRANSFORM', 'CLAMP\_TO', 'DAMPED\_TRACK', 'IK', 'LOCKED\_TRACK', 'SPLINE\_IK', 'STRETCH\_TO', 'TRACK\_TO', 'ACTION', 'CHILD\_OF', 'FLOOR', 'FOLLOW\_PATH', 'PIVOT', 'RIGID\_BODY\_JOINT', 'SCRIPT', 'SHRINKWRAP'], (optional)*) – Type

bpy.ops.object.constraint\_add\_with\_targets(type='')

Add a constraint to the active object, with target (where applicable) set to the selected Objects/Bones

**Parameters** **type** (*enum in ['COPY\_LOCATION', 'COPY\_ROTATION', 'COPY\_SCALE', 'COPY\_TRANSFORMS', 'LIMIT\_DISTANCE', 'LIMIT\_LOCATION', 'LIMIT\_ROTATION', 'LIMIT\_SCALE', 'MAINTAIN\_VOLUME', 'TRANSFORM', 'CLAMP\_TO', 'DAMPED\_TRACK', 'IK', 'LOCKED\_TRACK', 'SPLINE\_IK', 'STRETCH\_TO', 'TRACK\_TO', 'ACTION', 'CHILD\_OF', 'FLOOR', 'FOLLOW\_PATH', 'PIVOT', 'RIGID\_BODY\_JOINT', 'SCRIPT', 'SHRINKWRAP'], (optional)*) – Type

bpy.ops.object.constraints\_clear()

Clear all the constraints for the active Object only

bpy.ops.object.constraints\_copy()

Copy constraints to other selected objects.

bpy.ops.object.convert(target='MESH', keep\_original=False)

Convert selected objects to another type

#### Parameters

- **target** (*enum in ['CURVE', 'MESH'], (optional)*) – Target, Type of object to convert to
- **keep\_original** (*boolean, (optional)*) – Keep Original, Keep original objects instead of replacing them

bpy.ops.object.delete()

Delete selected objects

bpy.ops.object.drop\_named\_material(name="Material")

Undocumented (contribute)

**Parameters** **name** (*string, (optional)*) – Name, Material name to assign.

bpy.ops.object.duplicate(linked=False, mode='TRANSLATION')

Duplicate selected objects

#### Parameters

- **linked** (*boolean, (optional)*) – Linked, Duplicate object but not object data, linking to the original data

- **mode** (*enum in ['INIT', 'DUMMY', 'TRANSLATION', 'ROTATION', 'RESIZE', 'TOSPHERE', 'SHEAR', 'WARP', 'SHRINKFATTEN', 'TILT', 'TRACKBALL', 'PUSHPULL', 'CREASE', 'MIRROR', 'BONE\_SIZE', 'BONE\_ENVELOPE', 'CURVE\_SHRINKFATTEN', 'BONE\_ROLL', 'TIME\_TRANSLATE', 'TIME\_SLIDE', 'TIME\_SCALE', 'TIME\_EXTEND', 'BAKE\_TIME', 'BEVEL', 'BWEIGHT', 'ALIGN', 'EDGESLIDE', 'SEQSLIDE'], (optional)*) – Mode

bpy.ops.object.**duplicate\_move**(OBJECT\_OT\_duplicate=None, FORM\_OT\_translate=None) TRANS-  
Undocumented (contribute)

#### Parameters

- **OBJECT\_OT\_duplicate** (OBJECT\_OT\_duplicate, (optional)) – Duplicate Objects, Duplicate selected objects
- **TRANSFORM\_OT\_translate** (TRANSFORM\_OT\_translate, (optional)) – Translate, Translate selected items

bpy.ops.object.**duplicate\_move\_linked**(OBJECT\_OT\_duplicate=None, FORM\_OT\_translate=None) TRANS-  
Undocumented (contribute)

#### Parameters

- **OBJECT\_OT\_duplicate** (OBJECT\_OT\_duplicate, (optional)) – Duplicate Objects, Duplicate selected objects
- **TRANSFORM\_OT\_translate** (TRANSFORM\_OT\_translate, (optional)) – Translate, Translate selected items

bpy.ops.object.**duplicates\_make\_real**()  
Make dupli objects attached to this object real

bpy.ops.object.**editmode\_toggle**()  
Toggle object's editmode

bpy.ops.object.**effector\_add**(type='FORCE', view\_align=False, enter\_editmode=False, location=(0.0, 0.0, 0.0), rotation=(0.0, 0.0, 0.0), layers=(False, False, False))  
Add an empty object with a physics effector to the scene

#### Parameters

- **type** (*enum in ['FORCE', 'WIND', 'VORTEX', 'MAGNET', 'HARMONIC', 'CHARGE', 'LENNARDJ', 'TEXTURE', 'GUIDE', 'BOID', 'TURBULENCE', 'DRAG'], (optional)*) – Type
- **view\_align** (*boolean, (optional)*) – Align to View, Align the new object to the view
- **enter\_editmode** (*boolean, (optional)*) – Enter Editmode, Enter editmode when adding this object
- **location** (*float array of 3 items in [-inf, inf], (optional)*) – Location, Location for the newly added object
- **rotation** (*float array of 3 items in [-inf, inf], (optional)*) – Rotation, Rotation for the newly added object
- **layers** (*boolean array of 20 items, (optional)*) – Layer

bpy.ops.object.**explode\_refresh**(modifier="")  
Refresh data in the Explode modifier

**Parameters** **modifier** (*string, (optional)*) – Modifier, Name of the modifier to edit

bpy.ops.object.**forcefield\_toggle**()  
Toggle object's force field

bpy.ops.object.**game\_property\_clear**()  
Undocumented (contribute)

bpy.ops.object.**game\_property\_copy** (*operation='COPY', property=''*)  
Undocumented (contribute)

#### Parameters

- **operation** (*enum in ['REPLACE', 'MERGE', 'COPY'], (optional)*) – Operation
- **property** (*enum in [], (optional)*) – Property, Properties to copy

bpy.ops.object.**game\_property\_new**()  
Create a new property available to the game engine

bpy.ops.object.**game\_property\_remove** (*index=0*)  
Remove game property

**Parameters** **index** (*int in [0, inf], (optional)*) – Index, Property index to remove

bpy.ops.object.**group\_add**()  
Add an object to a new group

bpy.ops.object.**group\_instance\_add** (*group='', view\_align=False, location=(0.0, 0.0, 0.0), rotation=(0.0, 0.0, 0.0), layers=(False, False, False)*)  
Add a dupligroup instance

#### Parameters

- **group** (*enum in [], (optional)*) – Group
- **view\_align** (*boolean, (optional)*) – Align to View, Align the new object to the view
- **location** (*float array of 3 items in [-inf, inf], (optional)*) – Location, Location for the newly added object
- **rotation** (*float array of 3 items in [-inf, inf], (optional)*) – Rotation, Rotation for the newly added object
- **layers** (*boolean array of 20 items, (optional)*) – Layer

bpy.ops.object.**group\_link** (*group=''*)  
Add an object to an existing group

**Parameters** **group** (*enum in [], (optional)*) – Group

bpy.ops.object.**group\_remove**()  
Undocumented (contribute)

bpy.ops.object.**hide\_render\_clear**()  
Reveal the render object by setting the hide render flag

bpy.ops.object.**hide\_render\_clear\_all**()  
Reveal all render objects by setting the hide render flag

**File** startup/bl\_operators/object.py:684

bpy.ops.object.**hide\_render\_set** (*unselected=False*)  
Hide the render object by setting the hide render flag

**Parameters** **unselected** (*boolean, (optional)*) – Unselected, Hide unselected rather than selected objects.

`bpy.ops.object.hide_view_clear()`  
Reveal the object by setting the hide flag

`bpy.ops.object.hide_view_set(unselected=False)`  
Hide the object by setting the hide flag

**Parameters** **unselected** (*boolean, (optional)*) – Unselected, Hide unselected rather than selected objects.

`bpy.ops.object.hook_add_newob()`  
Hook selected vertices to the first selected Object

`bpy.ops.object.hook_add_selob()`  
Hook selected vertices to the first selected Object

`bpy.ops.object.hook_assign(modifier='')`  
Assign the selected vertices to a hook

**Parameters** **modifier** (*enum in [*,*], (optional)*) – Modifier, Modifier number to assign to.

`bpy.ops.object.hook_recenter(modifier='')`  
Set hook center to cursor position

**Parameters** **modifier** (*enum in [], (optional)*) – Modifier, Modifier number to assign to.

`bpy.ops.object.hook_remove(modifier='')`  
Remove a hook from the active object

**Parameters** **modifier** (*enum in [], (optional)*) – Modifier, Modifier number to remove.

`bpy.ops.object.hook_reset(modifier='')`  
Recalculate and clear offset transformation

**Parameters** **modifier** (*enum in [ ], (optional)*) – Modifier, Modifier number to assign to.

`bpy.ops.object.hook_select(modifier='')`  
Selects effected vertices on mesh

**Parameters** **modifier** (*enum in [], (optional)*) – Modifier, Modifier number to remove.

`bpy.ops.object.isolate_type_render()`  
Hide unselected render objects of same type as

The `Startup.cs_operators.csproj.cs` file contains:

Join selected objects into

Merge selected objects to shapes of active object

`Copy UV Layout to objects with matching geometry`

**File** startup/bi\_operators/object.py:578

Add a lamp object to the scene

## Parameters

- **type** (*enum in [‘POINT’, ‘SUN’, ‘SPOT’, ‘HEMI’, ‘AREA’], (optional)*) – Type
- **view\_align** (*boolean, (optional)*) – Align to View, Align the new object to the view
- **location** (*float array of 3 items in [-inf, inf], (optional)*) – Location, Location for the newly added object
- **rotation** (*float array of 3 items in [-inf, inf], (optional)*) – Rotation, Rotation for the newly added object
- **layers** (*boolean array of 20 items, (optional)*) – Layer

bpy.ops.object.location\_clear()

Clear the object’s location

bpy.ops.object.logic\_bricks\_copy()

Copy logic bricks to other selected objects.

bpy.ops.object.make\_dupli\_face()

Make linked objects into dupli-faces

**File** startup/bl\_operators/object.py:652

bpy.ops.object.make\_links\_data(*type=‘OBDATA’*)

Make links from the active object to other selected objects

**Parameters** **type** (*enum in [‘OBDATA’, ‘MATERIAL’, ‘ANIMATION’, ‘DUPLIGROUP’, ‘MODIFIERS’], (optional)*) – Type

bpy.ops.object.make\_links\_scene(*scene=‘’*)

Link selection to another scene

**Parameters** **scene** (*enum in [], (optional)*) – Scene

bpy.ops.object.make\_local(*type=‘SELECTED\_OBJECTS’*)

Make library linked datablocks local to this file

**Parameters** **type** (*enum in [‘SELECTED\_OBJECTS’, ‘SELECTED\_OBJECTS\_DATA’, ‘ALL’], (optional)*) – Type

bpy.ops.object.make\_single\_user(*type=‘SELECTED\_OBJECTS’, object=False, obdata=False, material=False, texture=False, animation=False*)

Make linked data local to each object

**Parameters**

- **type** (*enum in [‘SELECTED\_OBJECTS’, ‘ALL’], (optional)*) – Type
- **object** (*boolean, (optional)*) – Object, Make single user objects
- **obdata** (*boolean, (optional)*) – Object Data, Make single user object data
- **material** (*boolean, (optional)*) – Materials, Make materials local to each datablock
- **texture** (*boolean, (optional)*) – Textures, Make textures local to each material
- **animation** (*boolean, (optional)*) – Object Animation, Make animation data local to each object

bpy.ops.object.material\_slot\_add()

Add a new material slot

bpy.ops.object.material\_slot\_assign()

Assign the material in the selected material slot to the selected vertices

bpy.ops.object.material\_slot\_copy()

Copies materials to other selected objects

```
bpy.ops.object.material_slot_deselect()  
    Deselect vertices assigned to the selected material slot
```

```
bpy.ops.object.material_slot_remove()  
    Remove the selected material slot
```

```
bpy.ops.object.material_slot_select()  
    Select vertices assigned to the selected material slot
```

```
bpy.ops.object.meshdeform_bind(modifier="")  
    Bind mesh to cage in mesh deform modifier
```

**Parameters** **modifier** (*string, (optional)*) – Modifier, Name of the modifier to edit

```
bpy.ops.object.metaball_add(type='BALL', view_align=False, enter_editmode=False, location=(0.0, 0.0, 0.0), rotation=(0.0, 0.0, 0.0), layers=(False, False, False))  
    Add an metaball object to the scene
```

**Parameters**

- **type** (*enum in ['BALL', 'CAPSULE', 'PLANE', 'ELLIPSOID', 'CUBE'], (optional)*) – Primitive
- **view\_align** (*boolean, (optional)*) – Align to View, Align the new object to the view
- **enter\_editmode** (*boolean, (optional)*) – Enter Editmode, Enter editmode when adding this object
- **location** (*float array of 3 items in [-inf, inf], (optional)*) – Location, Location for the newly added object
- **rotation** (*float array of 3 items in [-inf, inf], (optional)*) – Rotation, Rotation for the newly added object
- **layers** (*boolean array of 20 items, (optional)*) – Layer

```
bpy.ops.object.mode_set(mode='OBJECT', toggle=False)  
    Sets the object interaction mode
```

**Parameters**

- **mode** (*enum in ['OBJECT', 'EDIT', 'SCULPT', 'VERTEX\_PAINT', 'WEIGHT\_PAINT', 'TEXTURE\_PAINT', 'PARTICLE\_EDIT', 'POSE'], (optional)*) – Mode
- **toggle** (*boolean, (optional)*) – Toggle

```
bpy.ops.object.modifier_add(type='SUBSURF')  
    Add a modifier to the active object
```

**Parameters** **type** (*enum in ['ARRAY', 'BEVEL', 'BOOLEAN', 'BUILD', 'DECIMATE', 'EDGE\_SPLIT', 'MASK', 'MIRROR', 'MULTIRES', 'SCREW', 'SOLIDIFY', 'SUBSURF', 'UV\_PROJECT', 'ARMATURE', 'CAST', 'CURVE', 'DISPLACE', 'HOOK', 'LATTICE', 'MESH\_DEFORM', 'SHRINKWRAP', 'SIMPLE\_DEFORM', 'SMOOTH', 'WARP', 'WAVE', 'CLOTH', 'COLLISION', 'EXPLODE', 'FLUID\_SIMULATION', 'PARTICLE\_INSTANCE', 'PARTICLE\_SYSTEM', 'SMOKE', 'SOFT\_BODY', 'SURFACE'], (optional)*) – Type

```
bpy.ops.object.modifier_apply(apply_as='DATA', modifier="")  
    Apply modifier and remove from the stack
```

**Parameters**

- **apply\_as** (*enum in ['DATA', 'SHAPE'], (optional)*) – Apply as, How to apply the modifier to the geometry

- **modifier** (*string, (optional)*) – Modifier, Name of the modifier to edit

`bpy.ops.object.modifier_convert(modifier="")`  
Convert particles to a mesh object

**Parameters** **modifier** (*string, (optional)*) – Modifier, Name of the modifier to edit

`bpy.ops.object.modifier_copy(modifier="")`  
Duplicate modifier at the same position in the stack

**Parameters** **modifier** (*string, (optional)*) – Modifier, Name of the modifier to edit

`bpy.ops.object.modifier_move_down(modifier="")`  
Move modifier down in the stack

**Parameters** **modifier** (*string, (optional)*) – Modifier, Name of the modifier to edit

`bpy.ops.object.modifier_move_up(modifier="")`  
Move modifier up in the stack

**Parameters** **modifier** (*string, (optional)*) – Modifier, Name of the modifier to edit

`bpy.ops.object.modifier_remove(modifier="")`  
Remove a modifier from the active object

**Parameters** **modifier** (*string, (optional)*) – Modifier, Name of the modifier to edit

`bpy.ops.object.move_to_layer(layers=(False, False, False))`  
Move the object to different layers

**Parameters** **layers** (*boolean array of 20 items, (optional)*) – Layer

`bpy.ops.object.multires_base_apply(modifier="")`  
Modify the base mesh to conform to the displaced mesh

**Parameters** **modifier** (*string, (optional)*) – Modifier, Name of the modifier to edit

`bpy.ops.object.multires_external_pack()`  
Pack displacements from an external file

`bpy.ops.object.multires_external_save(filepath="", check_existing=True, filter_blender=False, filter_image=False, filter_movie=False, filter_python=False, filter_font=False, filter_sound=False, filter_text=False, filter_btx=True, filter_collada=False, filter_folder=True, filemode=9, relative_path=False, modifier="")`

Save displacements to an external file

#### Parameters

- **filepath** (*string, (optional)*) – File Path, Path to file
- **check\_existing** (*boolean, (optional)*) – Check Existing, Check and warn on overwriting existing files
- **filter\_blender** (*boolean, (optional)*) – Filter .blend files
- **filter\_image** (*boolean, (optional)*) – Filter image files
- **filter\_movie** (*boolean, (optional)*) – Filter movie files
- **filter\_python** (*boolean, (optional)*) – Filter python files

- **filter\_font** (*boolean, (optional)*) – Filter font files
- **filter\_sound** (*boolean, (optional)*) – Filter sound files
- **filter\_text** (*boolean, (optional)*) – Filter text files
- **filter\_btx** (*boolean, (optional)*) – Filter btx files
- **filter\_collada** (*boolean, (optional)*) – Filter COLLADA files
- **filter\_folder** (*boolean, (optional)*) – Filter folders
- **filemode** (*int in [1, 9], (optional)*) – File Browser Mode, The setting for the file browser mode to load a .blend file, a library or a special file
- **relative\_path** (*boolean, (optional)*) – Relative Path, Select the file relative to the blend file
- **modifier** (*string, (optional)*) – Modifier, Name of the modifier to edit

bpy.ops.object.**multires\_higher\_levels\_delete**(*modifier=""*)

Deletes the higher resolution mesh, potential loss of detail

**Parameters** **modifier** (*string, (optional)*) – Modifier, Name of the modifier to edit

bpy.ops.object.**multires\_reshape**(*modifier=""*)

Copy vertex coordinates from other object

**Parameters** **modifier** (*string, (optional)*) – Modifier, Name of the modifier to edit

bpy.ops.object.**multires\_subdivide**(*modifier=""*)

Add a new level of subdivision

**Parameters** **modifier** (*string, (optional)*) – Modifier, Name of the modifier to edit

bpy.ops.object.**origin\_clear**()

Clear the object's origin

bpy.ops.object.**origin\_set**(*type='GEOMETRY\_ORIGIN', center='MEDIAN'*)

Set the object's origin, by either moving the data, or set to center of data, or use 3d cursor

**Parameters**

- **type** (*enum in ['GEOMETRY\_ORIGIN', 'ORIGIN\_GEOMETRY', 'ORIGIN\_CURSOR'], (optional)*) – Type
- **center** (*enum in ['MEDIAN', 'BOUNDS'], (optional)*) – Center

bpy.ops.object.**parent\_clear**(*type='CLEAR'*)

Clear the object's parenting

**Parameters** **type** (*enum in ['CLEAR', 'CLEAR\_KEEP\_TRANSFORM', 'CLEAR\_INVERSE'], (optional)*) – Type

bpy.ops.object.**parent\_no\_inverse\_set**()

Set the object's parenting without setting the inverse parent correction

bpy.ops.object.**parent\_set**(*type='OBJECT'*)

Set the object's parenting

**Parameters** **type** (*enum in ['OBJECT', 'ARMATURE', 'ARMATURE\_NAME', 'ARMATURE\_AUTO', 'ARMATURE\_ENVELOPE', 'BONE', 'CURVE', 'FOLLOW', 'PATH\_CONST', 'LATTICE', 'VERTEX', 'TRIA'], (optional)*) – Type

bpy.ops.object.**particle\_system\_add**()

Add a particle system

```
bpy.ops.object.particle_system_remove()  
    Remove the selected particle system  
  
bpy.ops.object.paths_calculate()  
    Calculate paths for the selected bones  
  
bpy.ops.object.paths_clear()  
    Clear path caches for selected bones  
  
bpy.ops.object.posemode_toggle()  
    Enables or disables posing/selecting bones  
  
bpy.ops.object.proxy_make(object="", type='DEFAULT')  
    Add empty object to become local replacement data of a library-linked object
```

#### Parameters

- **object** (*string, (optional)*) – Proxy Object, Name of lib-linked/grouped object to make a proxy for.
- **type** (*enum in ['DEFAULT']*, *(optional)*) – Type, Group object

```
bpy.ops.object.quick_explode(style='EXPLODE', amount=100, frame_duration=50,  
                                frame_start=1, frame_end=10, velocity=1.0, fade=True)  
Undocumented (contribute)
```

#### Parameters

- **style** (*enum in ['EXPLODE', 'BLEND']*, *(optional)*) – Explode Style
- **amount** (*int in [2, 10000]*, *(optional)*) – Amount of pieces
- **frame\_duration** (*int in [1, 300000]*, *(optional)*) – Duration
- **frame\_start** (*int in [1, 300000]*, *(optional)*) – Start Frame
- **frame\_end** (*int in [1, 300000]*, *(optional)*) – End Frame
- **velocity** (*float in [0, 300000]*, *(optional)*) – Outwards Velocity
- **fade** (*boolean, (optional)*) – Fade, Fade the pieces over time.

**File** `startup/bl_operators/object_quick_effects.py:164`

```
bpy.ops.object.quick_fluid(style='BASIC', initial_velocity=(0.0, 0.0, 0.0), show_flows=False,  
                           start_baking=False)  
Undocumented (contribute)
```

#### Parameters

- **style** (*enum in ['INFLOW', 'BASIC']*, *(optional)*) – Fluid Style
- **initial\_velocity** (*float array of 3 items in [-100, 100]*, *(optional)*) – Initial Velocity, Initial velocity of the fluid
- **show\_flows** (*boolean, (optional)*) – Render Fluid Objects, Keep the fluid objects visible during rendering.
- **start\_baking** (*boolean, (optional)*) – Start Fluid Bake, Start baking the fluid immediately after creating the domain object

**File** `startup/bl_operators/object_quick_effects.py:441`

```
bpy.ops.object.quick_fur(density='MEDIUM', view_percentage=10, length=0.1)  
Undocumented (contribute)
```

#### Parameters

- **density** (*enum in [‘LIGHT’, ‘MEDIUM’, ‘HEAVY’], (optional)*) – Fur Density
- **view\_percentage** (*int in [1, 100], (optional)*) – View %
- **length** (*float in [0.001, 100], (optional)*) – Length

**File** startup/bl\_operators/object\_quick\_effects.py:74

bpy.ops.object.quick\_smoke(style='STREAM', show\_flows=False)  
Undocumented (contribute)

#### Parameters

- **style** (*enum in [‘STREAM’, ‘PUFF’, ‘FIRE’], (optional)*) – Smoke Style
- **show\_flows** (*boolean, (optional)*) – Render Smoke Objects, Keep the smoke objects visible during rendering.

**File** startup/bl\_operators/object\_quick\_effects.py:314

bpy.ops.object.randomize\_transform(random\_seed=0, use\_delta=False, use\_loc=True, loc=(0.0, 0.0, 0.0), use\_rot=True, rot=(0.0, 0.0, 0.0), use\_scale=True, scale\_even=False, scale=(0.0, 0.0, 0.0))

Randomize objects loc/rot/scale

#### Parameters

- **random\_seed** (*int in [0, 1000], (optional)*) – Random Seed, Seed value for the random generator
- **use\_delta** (*boolean, (optional)*) – Transform Delta, Randomize delta transform values instead of regular transform
- **use\_loc** (*boolean, (optional)*) – Randomize Location, Randomize the location values
- **loc** (*float array of 3 items in [-100, 100], (optional)*) – Location, Maximum distance the objects can spread over each axis
- **use\_rot** (*boolean, (optional)*) – Randomize Rotation, Randomize the rotation values
- **rot** (*float array of 3 items in [-180, 180], (optional)*) – Rotation, Maximum rotation over each axis
- **use\_scale** (*boolean, (optional)*) – Randomize Scale, Randomize the scale values
- **scale\_even** (*boolean, (optional)*) – Scale Even, Use the same scale value for all axis
- **scale** (*float array of 3 items in [-100, 100], (optional)*) – Scale, Maximum scale randomization over each axis

**File** startup/bl\_operators/object\_randomize\_transform.py:164

bpy.ops.object.rotation\_clear()  
Clear the object’s rotation

bpy.ops.object.scale\_clear()  
Clear the object’s scale

bpy.ops.object.select\_all(action='TOGGLE')  
Change selection of all visible objects in scene

**Parameters** **action** (*enum in [‘TOGGLE’, ‘SELECT’, ‘DESELECT’, ‘INVERT’], (optional)*) – Action, Selection action to execute

bpy.ops.object.select\_by\_layer(extend=False, layers=1)  
Select all visible objects on a layer

### Parameters

- **extend** (*boolean, (optional)*) – Extend, Extend selection instead of deselecting everything first.
- **layers** (*int in [1, 20], (optional)*) – Layer

bpy.ops.object.select\_by\_type(*extend=False, type='MESH'*)

Select all visible objects that are of a type

### Parameters

- **extend** (*boolean, (optional)*) – Extend, Extend selection instead of deselecting everything first.
- **type** (*enum in ['MESH', 'CURVE', 'SURFACE', 'META', 'FONT', 'ARMATURE', 'LATTICE', 'EMPTY', 'CAMERA', 'LAMP'], (optional)*) – Type

bpy.ops.object.select\_camera()

Select object matching a naming pattern

**File** startup/bl\_operators/object.py:113

bpy.ops.object.select\_grouped(*extend=False, type='CHILDREN\_RECURSIVE'*)

Select all visible objects grouped by various properties

### Parameters

- **extend** (*boolean, (optional)*) – Extend, Extend selection instead of deselecting everything first.
- **type** (*enum in ['CHILDREN\_RECURSIVE', 'CHILDREN', 'PARENT', 'SIBLINGS', 'TYPE', 'LAYER', 'GROUP', 'HOOK', 'PASS', 'COLOR', 'PROPERTIES'], (optional)*) – Type

bpy.ops.object.select\_hierarchy(*direction='PARENT', extend=False*)

Select object relative to the active objects positionin the hierarchy

### Parameters

- **direction** (*enum in ['PARENT', 'CHILD'], (optional)*) – Direction, Direction to select in the hierarchy
- **extend** (*boolean, (optional)*) – Extend, Extend the existing selection

**File** startup/bl\_operators/object.py:149

bpy.ops.object.select\_inverse()

Invert selection of all visible objects

bpy.ops.object.select\_linked(*extend=False, type='OBDATA'*)

Select all visible objects that are linked

### Parameters

- **extend** (*boolean, (optional)*) – Extend, Extend selection instead of deselecting everything first.
- **type** (*enum in ['OBDATA', 'MATERIAL', 'TEXTURE', 'DUPGROUP', 'PARTICLE', 'LIBRARY', 'LIBRARY\_OBDATA'], (optional)*) – Type

bpy.ops.object.select\_mirror(*extend=False*)

Select the Mirror objects of the selected object eg. L.sword -> R.sword

**Parameters** **extend** (*boolean, (optional)*) – Extend, Extend selection instead of deselecting everything first.

bpy.ops.object.select\_name(name=""", extend=False)

Select an object with this name

#### Parameters

- **name** (*string, (optional)*) – Name, Object name to select.
- **extend** (*boolean, (optional)*) – Extend, Extend selection instead of deselecting everything first.

bpy.ops.object.select\_pattern(pattern="\*", case\_sensitive=False, extend=True)

Select object matching a naming pattern

#### Parameters

- **pattern** (*string, (optional)*) – Pattern, Name filter using '\*' and '?' wildcard chars
- **case\_sensitive** (*boolean, (optional)*) – Case Sensitive, Do a case sensitive compare
- **extend** (*boolean, (optional)*) – Extend, Extend the existing selection

**File** [startup/bl\\_operators/object.py:49](#)

bpy.ops.object.select\_random(percent=50.0, extend=False)

Select on random visible objects

#### Parameters

- **percent** (*float in [0, 100], (optional)*) – Percent, Percentage of objects to select randomly
- **extend** (*boolean, (optional)*) – Extend Selection, Extend selection instead of deselecting everything first.

bpy.ops.object.select\_same\_group(group=""")

Select object in the same group

**Parameters** **group** (*string, (optional)*) – Group, Name of the group to select.

bpy.ops.object.shade\_flat()

Display faces ‘flat’

bpy.ops.object.shade\_smooth()

Display faces ‘smooth’ (using vertex normals)

bpy.ops.object.shape\_key\_add(from\_mix=True)

Add shape key to the object

**Parameters** **from\_mix** (*boolean, (optional)*) – From Mix, Create the new shape key from the existing mix of keys.

bpy.ops.object.shape\_key\_clear()

Clear weights for all shape keys

bpy.ops.object.shape\_key\_mirror()

Undocumented (contribute)

bpy.ops.object.shape\_key\_move(type='UP')

Undocumented (contribute)

**Parameters** **type** (*enum in ['UP', 'DOWN'], (optional)*) – Type

bpy.ops.object.shape\_key\_remove()

Remove shape key from the object

bpy.ops.object.shape\_key\_transfer(mode='OFFSET', use\_clamp=False)

Copy another selected objects active shape to this one by applying the relative offsets

## Parameters

- **mode** (*enum in ['OFFSET', 'RELATIVE\_FACE', 'RELATIVE\_EDGE']*, *(optional)*) – Transformation Mode, Relative shape positions to the new shape method
  - **use\_clamp** (*boolean, (optional)*) – Clamp Offset, Clamp the transformation to the distance each vertex moves in the original shape.

**File** startup/bl\_operators/object.py:491

`bpy.ops.object.slow_parent_clear()`  
Clear the object's slow parent

`bpy.ops.object.slow_parent_set()`  
Set the object's slow parent

`bpy.ops.object.subdivision_set(level=1, relative=False)`  
Sets a Subdivision Surface Level (1-5)

## Parameters

- **level** (*int in [-100, 100], (optional)*) – Level
  - **relative** (*boolean, (optional)*) – Relative, Apply the subsurf level as an offset relative to the current level

**File** startup/bl\_operators/object.py:217

Add a text object to the scene

## Parameters

- **view\_align** (*boolean, (optional)*) – Align to View, Align the new object to the view
  - **enter\_editmode** (*boolean, (optional)*) – Enter Editmode, Enter editmode when adding this object
  - **location** (*float array of 3 items in [-inf, inf], (optional)*) – Location, Location for the newly added object
  - **rotation** (*float array of 3 items in [-inf, inf], (optional)*) – Rotation, Rotation for the newly added object
  - **layers** (*boolean array of 20 items, (optional)*) – Layer

```
bpy.ops.object.track_clear(type='CLEAR')
```

**Clear tracking constraint or flag from object**

**Parameters** **type** (*enum in* ['CLEAR', 'CLEAR KEEP TRANSFORM'], *(optional)*) – Type

```
bpy.ops.object.track_set(type='DAMPTRACK')
```

Make the object track another object, either by constraint or old way or locked track

**Parameters** `type` (*enum in [‘DAMPTRACK’, ‘TRACKTO’, ‘LOCKTRACK’]*, *(optional)*) – Type

```
bpy.ops.object.transform_apply(location=False, rotation=False, scale=False)
```

Apply the object's transformation to its data

## Parameters

- **location** (*boolean, (optional)*) – Location
  - **rotation** (*boolean, (optional)*) – Rotation

- **scale** (*boolean, (optional)*) – Scale

bpy.ops.object.vertex\_group\_add()  
Undocumented ([contribute](#))

bpy.ops.object.vertex\_group\_assign (*new=False*)  
Undocumented ([contribute](#))

**Parameters** **new** (*boolean, (optional)*) – New, Assign vertex to new vertex group.

bpy.ops.object.vertex\_group\_blend()  
Undocumented ([contribute](#))

bpy.ops.object.vertex\_group\_clean (*limit=0.01, all\_groups=False, keep\_single=False*)  
Remove Vertex Group assignments which aren't required

#### Parameters

- **limit** (*float in [0, 1], (optional)*) – Limit, Remove weights under this limit.
- **all\_groups** (*boolean, (optional)*) – All Groups, Clean all vertex groups.
- **keep\_single** (*boolean, (optional)*) – Keep Single, Keep verts assigned to at least one group when cleaning.

bpy.ops.object.vertex\_group\_copy()  
Undocumented ([contribute](#))

bpy.ops.object.vertex\_group\_copy\_to\_linked()  
Copy Vertex Groups to all users of the same Geometry data

bpy.ops.object.vertex\_group\_copy\_to\_selected()  
Copy Vertex Groups to other selected objects with matching indices

bpy.ops.object.vertex\_group\_deselect()  
Undocumented ([contribute](#))

bpy.ops.object.vertex\_group\_invert (*auto\_assign=True, auto\_remove=True*)  
Undocumented ([contribute](#))

#### Parameters

- **auto\_assign** (*boolean, (optional)*) – Add Weights, Add verts from groups that have zero weight before inverting.
- **auto\_remove** (*boolean, (optional)*) – Remove Weights, Remove verts from groups that have zero weight after inverting.

bpy.ops.object.vertex\_group\_levels (*offset=0.0, gain=1.0*)  
Undocumented ([contribute](#))

#### Parameters

- **offset** (*float in [-1, 1], (optional)*) – Offset, Value to add to weights.
- **gain** (*float in [0, inf], (optional)*) – Gain, Value to multiply weights by.

bpy.ops.object.vertex\_group\_mirror (*mirror\_weights=True, flip\_group\_names=True*)  
Mirror all vertex groups, flip weights and/or names, editing only selected vertices, flipping when both sides are selected otherwise copy from unselected

#### Parameters

- **mirror\_weights** (*boolean, (optional)*) – Mirror Weights, Mirror weights.
- **flip\_group\_names** (*boolean, (optional)*) – Flip Groups, Flip vertex group names.

```
bpy.ops.object.vertex_group_move(direction='UP')
Undocumented (contribute)

Parameters direction (enum in ['UP', 'DOWN'], (optional)) – Direction, Direction to move, UP or DOWN

bpy.ops.object.vertex_group_normalize()
Undocumented (contribute)

bpy.ops.object.vertex_group_normalize_all(lock_active=True)
Undocumented (contribute)

Parameters lock_active (boolean, (optional)) – Lock Active, Keep the values of the active group while normalizing others.

bpy.ops.object.vertex_group_remove(all=False)
Undocumented (contribute)

Parameters all (boolean, (optional)) – All, Remove from all vertex groups.

bpy.ops.object.vertex_group_remove_from(all=False)
Undocumented (contribute)

Parameters all (boolean, (optional)) – All, Remove from all vertex groups.

bpy.ops.object.vertex_group_select()
Undocumented (contribute)

bpy.ops.object.vertex_group_set_active(group='')
Set the active vertex group

Parameters group (enum in [], (optional)) – Group, Vertex group to set as active.

bpy.ops.object.vertex_group_sort()
Sorts vertex groups alphabetically

bpy.ops.object.vertex_parent_set()
Parent selected objects to the selected vertices

bpy.ops.object.visual_transform_apply()
Apply the object's visual transformation to its data
```

## Outliner Operators

```
bpy.ops.outliner.animdata_operation(type='SET_ACT')
Undocumented (contribute)

Parameters type (enum in ['SET_ACT', 'CLEAR_ACT', 'REFRESH_DRIVERS', 'CLEAR_DRIVERS'], (optional)) – Animation Operation

bpy.ops.outliner.data_operation(type='SELECT')
Undocumented (contribute)

Parameters type (enum in ['SELECT', 'DESELECT', 'HIDE', 'UNHIDE'], (optional)) – Data Operation

bpy.ops.outliner.drivers_add_selected()
Add drivers to selected items

bpy.ops.outliner.drivers_delete_selected()
Delete drivers assigned to selected items
```

```
bpy.ops.outliner.expanded_toggle()  
    Expand/Collapse all items  
  
bpy.ops.outliner.group_operation(type='UNLINK')  
    Undocumented (contribute)  
  
        Parameters type (enum in ['UNLINK', 'LOCAL', 'LINK', 'TOGVIS', 'TOGSEL', 'TOGREN'], (optional)) – Group Operation  
  
bpy.ops.outliner.id_operation(type='UNLINK')  
    Undocumented (contribute)  
  
        Parameters type (enum in ['UNLINK', 'LOCAL', 'SINGLE', 'ADD_FAKE', 'CLEAR_FAKE'], (optional)) – ID data Operation  
  
bpy.ops.outliner.item_activate(extend=True)  
    Handle mouse clicks to activate/select items  
  
        Parameters extend (boolean, (optional)) – Extend, Extend selection for activation.  
  
bpy.ops.outliner.item_openclose(all=True)  
    Toggle whether item under cursor is enabled or closed  
  
        Parameters all (boolean, (optional)) – All, Close or open all items.  
  
bpy.ops.outliner.item_rename()  
    Rename item under cursor  
  
bpy.ops.outliner.keyingset_add_selected()  
    Add selected items (blue-grey rows) to active Keying Set  
  
bpy.ops.outliner.keyingset_remove_selected()  
    Remove selected items (blue-grey rows) from active Keying Set  
  
bpy.ops.outliner.object_operation(type='SELECT')  
    Undocumented (contribute)  
  
        Parameters type (enum in ['SELECT', 'DESELECT', 'DELETE', 'TOGVIS', 'TOGSEL', 'TOGREN'], (optional)) – Object Operation  
  
bpy.ops.outliner.operation()  
    Context menu for item operations  
  
bpy.ops.outliner.renderability_toggle()  
    Toggle the renderability of selected items  
  
bpy.ops.outliner.scroll_page(up=False)  
    Scroll page up or down  
  
        Parameters up (boolean, (optional)) – Up, Scroll up one page.  
  
bpy.ops.outliner.selectability_toggle()  
    Toggle the selectability  
  
bpy.ops.outliner.selected_toggle()  
    Toggle the Outliner selection of items  
  
bpy.ops.outliner.show_active()  
    Adjust the view so that the active Object is shown centered  
  
bpy.ops.outliner.show_hierarchy()  
    Open all object entries and close all others  
  
bpy.ops.outliner.show_one_level(open=True)  
    Expand/collapse all entries by one level
```

**Parameters** **open** (*boolean, (optional)*) – Open, Expand all entries one level deep.

bpy.ops.outliner.visibility\_toggle()  
Toggle the visibility of selected items

## Paint Operators

bpy.ops.paint.clone\_cursor\_set (*location=(0.0, 0.0, 0.0)*)  
Undocumented ([contribute](#))

**Parameters** **location** (*float array of 3 items in [-inf, inf], (optional)*) – Location, Cursor location in world space coordinates.

bpy.ops.paint.face\_select\_all (*action='TOGGLE'*)  
Change selection for all faces

**Parameters** **action** (*enum in ['TOGGLE', 'SELECT', 'DESELECT', 'INVERT'], (optional)*) – Action, Selection action to execute

bpy.ops.paint.face\_select\_hide (*unselected=False*)  
Hide selected faces

**Parameters** **unselected** (*boolean, (optional)*) – Unselected, Hide unselected rather than selected objects.

bpy.ops.paint.face\_select\_inverse()  
Invert selection of faces

bpy.ops.paint.face\_select\_linked()  
Select linked faces

bpy.ops.paint.face\_select\_linked\_pick (*extend=False*)  
Select linked faces

**Parameters** **extend** (*boolean, (optional)*) – Extend, Extend the existing selection

bpy.ops.paint.face\_select\_reveal (*unselected=False*)  
Reveal hidden faces

**Parameters** **unselected** (*boolean, (optional)*) – Unselected, Hide unselected rather than selected objects.

bpy.ops.paint.grab\_clone (*delta=(0.0, 0.0)*)  
Undocumented ([contribute](#))

**Parameters** **delta** (*float array of 2 items in [-inf, inf], (optional)*) – Delta, Delta offset of clone image in 0.0..1.0 coordinates.

bpy.ops.paint.image\_from\_view (*filepath=""*)  
Make an image from the current 3D view for re-projection

**Parameters** **filepath** (*string, (optional)*) – File Path, Name of the file

bpy.ops.paint.image\_paint (*stroke=None*)  
Undocumented ([contribute](#))

**Parameters** **stroke** (*bpy\_prop\_collection of OperatorStrokeElement, (optional)*) – Stroke

bpy.ops.paint.project\_image (*image=''*)  
Project an edited render from the active camera back onto the object

**Parameters** **image** (*enum in [], (optional)*) – Image

bpy.ops.paint.sample\_color(*location*=(0, 0))

Undocumented ([contribute](#))

**Parameters** **location** (*int array of 2 items in [0, inf], (optional)*) – Location, Cursor location in region coordinates.

bpy.ops.paint.texture\_paint\_toggle()

Undocumented ([contribute](#))

bpy.ops.paint.vertex\_color\_dirt(*blur\_strength*=1.0, *blur\_iterations*=1, *clean\_angle*=180.0, *dirt\_angle*=0.0, *dirt\_only*=*False*)

Undocumented ([contribute](#))

#### Parameters

- **blur\_strength** (*float in [0.01, 1], (optional)*) – Blur Strength, Blur strength per iteration
- **blur\_iterations** (*int in [0, 40], (optional)*) – Blur Iterations, Number times to blur the colors. (higher blurs more)
- **clean\_angle** (*float in [0, 180], (optional)*) – Highlight Angle, Less then 90 limits the angle used in the tonal range
- **dirt\_angle** (*float in [0, 180], (optional)*) – Dirt Angle, Less then 90 limits the angle used in the tonal range
- **dirt\_only** (*boolean, (optional)*) – Dirt Only, Dont calculate cleans for convex areas

**File** [startup/bl\\_operators/vertexpaint\\_dirt.py:184](#)

bpy.ops.paint.vertex\_color\_set()

Undocumented ([contribute](#))

bpy.ops.paint.vertex\_paint(*stroke*=*None*)

Undocumented ([contribute](#))

**Parameters** **stroke** (*bpy\_prop\_collection of OperatorStrokeElement, (optional)*) – Stroke

bpy.ops.paint.vertex\_paint\_toggle()

Undocumented ([contribute](#))

bpy.ops.paint.weight\_from\_bones(*type*='AUTOMATIC')

Undocumented ([contribute](#))

**Parameters** **type** (*enum in ['AUTOMATIC', 'ENVELOPES'], (optional)*) – Type, Method to use for assigning weights.

bpy.ops.paint.weight\_paint(*stroke*=*None*)

Undocumented ([contribute](#))

**Parameters** **stroke** (*bpy\_prop\_collection of OperatorStrokeElement, (optional)*) – Stroke

bpy.ops.paint.weight\_paint\_toggle()

Undocumented ([contribute](#))

bpy.ops.paint.weight\_sample()

Undocumented ([contribute](#))

bpy.ops.paint.weight\_sample\_group(*group*='DEFAULT')

Undocumented ([contribute](#))

**Parameters** **group** (*enum in ['DEFAULT'], (optional)*) – Keying Set, The Keying Set to use

```
bpy.ops.paint.weight_set()  
Undocumented (contribute)
```

## Particle Operators

```
bpy.ops.particle.brush_edit(stroke=None)  
Undocumented (contribute)
```

**Parameters** **stroke** (bpy\_prop\_collection of OperatorStrokeElement, (optional)) – Stroke

```
bpy.ops.particle.connect_hair(all=False)  
Connect hair to the emitter mesh
```

**Parameters** **all** (boolean, (optional)) – All hair, Connect all hair systems to the emitter mesh

```
bpy.ops.particle.delete(type='PARTICLE')  
Undocumented (contribute)
```

**Parameters** **type** (enum in ['PARTICLE', 'KEY'], (optional)) – Type, Delete a full particle or only keys.

```
bpy.ops.particle.disconnect_hair(all=False)  
Disconnect hair from the emitter mesh
```

**Parameters** **all** (boolean, (optional)) – All hair, Disconnect all hair systems from the emitter mesh

```
bpy.ops.particle.dupliob_copy()  
Duplicate the current dupliobject
```

```
bpy.ops.particle.dupliob_move_down()  
Move dupli object down in the list
```

```
bpy.ops.particle.dupliob_move_up()  
Move dupli object up in the list
```

```
bpy.ops.particle.dupliob_remove()  
Remove the selected dupliobject
```

```
bpy.ops.particle.edited_clear()  
Undocumented (contribute)
```

```
bpy.ops.particle.hide(unselected=False)  
Undocumented (contribute)
```

**Parameters** **unselected** (boolean, (optional)) – Unselected, Hide unselected rather than selected.

```
bpy.ops.particle.mirror()  
Undocumented (contribute)
```

```
bpy.ops.particle.new()  
Add new particle settings
```

```
bpy.ops.particle.new_target()  
Add a new particle target
```

```
bpy.ops.particle.particle_edit_toggle()  
Undocumented (contribute)
```

```
bpy.ops.particle.rekey(keys=2)  
Undocumented (contribute)
```

**Parameters** **keys** (int in [2, inf], (optional)) – Number of Keys

bpy.ops.particle.**remove\_doubles** (*threshold=0.0002*)

Undocumented ([contribute](#))

**Parameters** **threshold** (*float in [0, inf], (optional)*) – Threshold, Threshold distance withing which particles are removed

bpy.ops.particle.**reveal**()

Undocumented ([contribute](#))

bpy.ops.particle.**select\_all** (*action='TOGGLE'*)

Undocumented ([contribute](#))

**Parameters** **action** (*enum in ['TOGGLE', 'SELECT', 'DESELECT', 'INVERT'], (optional)*) – Action, Selection action to execute

bpy.ops.particle.**select\_inverse**()

Undocumented ([contribute](#))

bpy.ops.particle.**select\_less**()

Undocumented ([contribute](#))

bpy.ops.particle.**select\_linked** (*deselect=False, location=(0, 0)*)

Undocumented ([contribute](#))

#### Parameters

- **deselect** (*boolean, (optional)*) – Deselect, Deselect linked keys rather than selecting them.
- **location** (*int array of 2 items in [0, inf], (optional)*) – Location

bpy.ops.particle.**select\_more**()

Undocumented ([contribute](#))

bpy.ops.particle.**select\_roots**()

Undocumented ([contribute](#))

bpy.ops.particle.**select\_tips**()

Undocumented ([contribute](#))

bpy.ops.particle.**subdivide**()

Undocumented ([contribute](#))

bpy.ops.particle.**target\_move\_down**()

Move particle target down in the list

bpy.ops.particle.**target\_move\_up**()

Move particle target up in the list

bpy.ops.particle.**target\_remove**()

Remove the selected particle target

bpy.ops.particle.**weight\_set** (*factor=1.0*)

Undocumented ([contribute](#))

**Parameters** **factor** (*float in [0, 1], (optional)*) – Factor

## Pose Operators

bpy.ops.pose.**armature\_apply**()

Apply the current pose as the new rest pose

```
bpy.ops.pose.armature_layers(layers=(False, False, False, False, False, False, False, False,  
                                False, False, False, False, False, False, False, False, False,  
                                False, False, False, False, False, False, False, False,  
                                False, False))
```

Change the visible armature layers

**Parameters** **layers** (*boolean array of 32 items, (optional)*) – Layer, Armature layers to make visible

```
bpy.ops.pose.autoside_names(axis='XAXIS')
```

Automatically renames the selected bones according to which side of the target axis they fall on

**Parameters** **axis** (*enum in ['XAXIS', 'YAXIS', 'ZAXIS'], (optional)*) – Axis, Axis tag names with.

```
bpy.ops.pose.bone_layers(layers=(False, False, False, False, False, False, False, False,  
                            False, False, False, False, False, False, False, False, False,  
                            False, False, False, False, False, False, False, False))
```

Change the layers that the selected bones belong to

**Parameters** **layers** (*boolean array of 32 items, (optional)*) – Layer, Armature layers that bone belongs to

```
bpy.ops.pose.breakdown(prev_frame=0, next_frame=0, percentage=0.5)
```

Create a suitable breakdown pose on the current frame

#### Parameters

- **prev\_frame** (*int in [-300000, 300000], (optional)*) – Previous Keyframe, Frame number of keyframe immediately before the current frame.
- **next\_frame** (*int in [-300000, 300000], (optional)*) – Next Keyframe, Frame number of keyframe immediately after the current frame.
- **percentage** (*float in [0, 1], (optional)*) – Percentage, Weighting factor for the sliding operation

```
bpy.ops.pose.constraint_add(type='')
```

Add a constraint to the active bone

**Parameters** **type** (*enum in ['COPY\_LOCATION', 'COPY\_ROTATION', 'COPY\_SCALE',  
 'COPY\_TRANSFORMS', 'LIMIT\_DISTANCE', 'LIMIT\_LOCATION', 'LIMIT\_ROTATION',  
 'LIMIT\_SCALE', 'MAINTAIN\_VOLUME', 'TRANSFORM', 'CLAMP\_TO',  
 'DAMPED\_TRACK', 'IK', 'LOCKED\_TRACK', 'SPLINE\_IK', 'STRETCH\_TO',  
 'TRACK\_TO', 'ACTION', 'CHILD\_OF', 'FLOOR', 'FOLLOW\_PATH', 'PIVOT',  
 'RIGID\_BODY\_JOINT', 'SCRIPT', 'SHRINKWRAP'], (optional)*) – Type

```
bpy.ops.pose.constraint_add_with_targets(type='')
```

Add a constraint to the active bone, with target (where applicable) set to the selected Objects/Bones

**Parameters** **type** (*enum in ['COPY\_LOCATION', 'COPY\_ROTATION', 'COPY\_SCALE',  
 'COPY\_TRANSFORMS', 'LIMIT\_DISTANCE', 'LIMIT\_LOCATION', 'LIMIT\_ROTATION',  
 'LIMIT\_SCALE', 'MAINTAIN\_VOLUME', 'TRANSFORM', 'CLAMP\_TO',  
 'DAMPED\_TRACK', 'IK', 'LOCKED\_TRACK', 'SPLINE\_IK', 'STRETCH\_TO',  
 'TRACK\_TO', 'ACTION', 'CHILD\_OF', 'FLOOR', 'FOLLOW\_PATH', 'PIVOT',  
 'RIGID\_BODY\_JOINT', 'SCRIPT', 'SHRINKWRAP'], (optional)*) – Type

```
bpy.ops.pose.constraints_clear()
```

Clear all the constraints for the selected bones

```
bpy.ops.pose.constraints_copy()
```

Copy constraints to other selected bones.

```
bpy.ops.pose.copy()
```

Copies the current pose of the selected bones to copy/paste buffer

bpy.ops.pose.**flip\_names()**  
Flips (and corrects) the axis suffixes of the the names of selected bones

bpy.ops.pose.**group\_add()**  
Add a new bone group

bpy.ops.pose.**group\_assign**(*type=0*)  
Add selected bones to the chosen bone group

**Parameters** **type** (*int in [0, 10], (optional)*) – Bone Group Index

bpy.ops.pose.**group\_deselect()**  
Deselect bones of active Bone Group

bpy.ops.pose.**group\_remove()**  
Removes the active bone group

bpy.ops.pose.**group\_select()**  
Select bones in active Bone Group

bpy.ops.pose.**group\_unassign()**  
Remove selected bones from all bone groups

bpy.ops.pose.**hide**(*unselected=False*)  
Tag selected bones to not be visible in Pose Mode

**Parameters** **unselected** (*boolean, (optional)*) – Unselected

bpy.ops.pose.**ik\_add**(*with\_targets=True*)  
Add IK Constraint to the active Bone

**Parameters** **with\_targets** (*boolean, (optional)*) – With Targets, Assign IK Constraint with targets derived from the select bones/objects

bpy.ops.pose.**ik\_clear()**  
Remove all IK Constraints from selected bones

bpy.ops.pose.**loc\_clear()**  
Reset locations of selected bones to their default values

bpy.ops.pose.**paste**(*flipped=False, selected\_mask=False*)  
Pastes the stored pose on to the current pose

#### Parameters

- **flipped** (*boolean, (optional)*) – Flipped on X-Axis, Paste the stored pose flipped on to current pose
- **selected\_mask** (*boolean, (optional)*) – On Selected Only, Only paste the stored pose on to selected bones in the current pose

bpy.ops.pose.**paths\_calculate()**  
Calculate paths for the selected bones

bpy.ops.pose.**paths\_clear()**  
Clear path caches for selected bones

bpy.ops.pose.**propagate**(*mode='WHILE\_HELD', end\_frame=250.0*)  
Copy selected aspects of the current pose to subsequent poses already keyframed

#### Parameters

- **mode** (*enum in ['WHILE\_HELD', 'NEXT\_KEY', 'LAST\_KEY', 'BEFORE\_FRAME', 'BEFORE\_END', 'SELECTED\_MARKERS'], (optional)*) – Terminate Mode, Method used to determine when to stop propagating pose to keyframes

- **end\_frame** (*float in [1.17549e-38, inf], (optional)*) – End Frame, Frame to stop propagating frames to (for ‘Before Frame’ mode)

bpy.ops.pose.push(*prev\_frame=0, next\_frame=0, percentage=0.5*)

Exaggerate the current pose

#### Parameters

- **prev\_frame** (*int in [-300000, 300000], (optional)*) – Previous Keyframe, Frame number of keyframe immediately before the current frame.
- **next\_frame** (*int in [-300000, 300000], (optional)*) – Next Keyframe, Frame number of keyframe immediately after the current frame.
- **percentage** (*float in [0, 1], (optional)*) – Percentage, Weighting factor for the sliding operation

bpy.ops.pose.quaternions\_flip()

Flip quaternion values to achieve desired rotations, while maintaining the same orientations

bpy.ops.pose.relax(*prev\_frame=0, next\_frame=0, percentage=0.5*)

Make the current pose more similar to its surrounding ones

#### Parameters

- **prev\_frame** (*int in [-300000, 300000], (optional)*) – Previous Keyframe, Frame number of keyframe immediately before the current frame.
- **next\_frame** (*int in [-300000, 300000], (optional)*) – Next Keyframe, Frame number of keyframe immediately after the current frame.
- **percentage** (*float in [0, 1], (optional)*) – Percentage, Weighting factor for the sliding operation

bpy.ops.pose.reveal()

Unhide all bones that have been tagged to be hidden in Pose Mode

bpy.ops.pose.rot\_clear()

Reset rotations of selected bones to their default values

bpy.ops.pose.scale\_clear()

Reset scaling of selected bones to their default values

bpy.ops.pose.select\_all(*action='TOGGLE'*)

Toggle selection status of all bones

**Parameters** **action** (*enum in ['TOGGLE', 'SELECT', 'DESELECT', 'INVERT'], (optional)*) – Action, Selection action to execute

bpy.ops.pose.select\_constraint\_target()

Select bones used as targets for the currently selected bones

bpy.ops.pose.select\_flip\_active()

Activate the bone with a flipped name.

bpy.ops.pose.select\_grouped(*extend=False, type='LAYER'*)

Select all visible bones grouped by similar properties

#### Parameters

- **extend** (*boolean, (optional)*) – Extend, Extend selection instead of deselecting everything first.
- **type** (*enum in ['LAYER', 'GROUP'], (optional)*) – Type

bpy.ops.pose.select\_hierarchy(direction='PARENT', extend=False)

Select immediate parent/children of selected bones

#### Parameters

- **direction** (*enum in ['PARENT', 'CHILD'], (optional)*) – Direction
- **extend** (*boolean, (optional)*) – Add to Selection

bpy.ops.pose.select-inverse()

Flip the selection status of bones (selected -> unselected, unselected -> selected)

bpy.ops.pose.select\_linked(extend=False)

Select bones related to selected ones by parent/child relationships

**Parameters** **extend** (*boolean, (optional)*) – Extend, Extend selection instead of deselecting everything first.

bpy.ops.pose.select\_parent()

Select bones that are parents of the currently selected bones

bpy.ops.pose.transforms\_clear()

Reset location, rotation, and scaling of selected bones to their default values

bpy.ops.pose.visual\_transform\_apply()

Apply final constrained position of pose bones to their transform.

## Poselib Operators

bpy.ops.poselib.action\_sanitise()

Make action suitable for use as a Pose Library

bpy.ops.poselib.apply\_pose(pose\_index=-1)

Apply specified Pose Library pose to the rig

**Parameters** **pose\_index** (*int in [-2, inf], (optional)*) – Pose, Index of the pose to apply (-2 for no change to pose, -1 for poselib active pose)

bpy.ops.poselib.browse\_interactive(pose\_index=-1)

Interactively browse poses in 3D-View

**Parameters** **pose\_index** (*int in [-2, inf], (optional)*) – Pose, Index of the pose to apply (-2 for no change to pose, -1 for poselib active pose)

bpy.ops.poselib.new()

Add New Pose Library to active Object

bpy.ops.poselib.pose\_add(frame=1, name="Pose")

Add the current Pose to the active Pose Library

#### Parameters

- **frame** (*int in [0, inf], (optional)*) – Frame, Frame to store pose on
- **name** (*string, (optional)*) – Pose Name, Name of newly added Pose

bpy.ops.poselib.pose\_remove(pose='DEFAULT')

Remove nth pose from the active Pose Library

**Parameters** **pose** (*enum in ['DEFAULT'], (optional)*) – Pose, The pose to remove

bpy.ops.poselib.pose\_rename(name="RenamedPose", pose='')

Rename specified pose from the active Pose Library

### Parameters

- **name** (*string, (optional)*) – New Pose Name, New name for pose
- **pose** (*enum in [], (optional)*) – Pose, The pose to rename

bpy.ops.poselib.unlink()  
Remove Pose Library from active Object

## Ptcache Operators

bpy.ops.ptcache.add()  
Add new cache

bpy.ops.ptcache.bake (*bake=False*)  
Bake physics

**Parameters** **bake** (*boolean, (optional)*) – Bake

bpy.ops.ptcache.bake\_all (*bake=True*)  
Bake all physics

**Parameters** **bake** (*boolean, (optional)*) – Bake

bpy.ops.ptcache.bake\_from\_cache()  
Bake from cache

bpy.ops.ptcache.free\_bake()  
Free physics bake

bpy.ops.ptcache.free\_bake\_all()  
Undocumented (contribute)

bpy.ops.ptcache.remove()  
Delete current cache

## Render Operators

bpy.ops.render.opengl (*animation=False, write\_still=False, view\_context=True*)  
OpenGL render active viewport

### Parameters

- **animation** (*boolean, (optional)*) – Animation, Render files from the animation range of this scene
- **write\_still** (*boolean, (optional)*) – Write Image, Save rendered the image to the output path (used only when animation is disabled)
- **view\_context** (*boolean, (optional)*) – View Context, Use the current 3D view for rendering, else use scene settings.

bpy.ops.render.play\_rendered\_anim()  
Plays back rendered frames/movies using an external player.

**File** startup/bl\_operators/screen\_play\_rendered\_anim.py:74

bpy.ops.render.preset\_add (*name=""*, *remove\_active=False*)  
Add a Render Preset

**Parameters** **name** (*string, (optional)*) – Name, Name of the preset, used to make the path name

**File** startup/bl\_operators/presets.py:50

```
bpy.ops.render.render(animation=False, write_still=False, layer="", scene="")  
    Render active scene
```

#### Parameters

- **animation** (*boolean, (optional)*) – Animation, Render files from the animation range of this scene
- **write\_still** (*boolean, (optional)*) – Write Image, Save rendered the image to the output path (used only when animation is disabled)
- **layer** (*string, (optional)*) – Render Layer, Single render layer to re-render
- **scene** (*string, (optional)*) – Scene, Re-render single layer in this scene

```
bpy.ops.render.view_cancel()
```

Cancel show render view

```
bpy.ops.render.view_show()
```

Toggle show render view

## Scene Operators

```
bpy.ops.scene.delete()  
    Delete active scene
```

```
bpy.ops.scene.new(type='NEW')  
    Add new scene by type
```

**Parameters** **type** (*enum in ['NEW', 'EMPTY', 'LINK\_OBJECTS', 'LINK\_OBJECT\_DATA', 'FULL\_COPY']*, *(optional)*) – Type

```
bpy.ops.scene.render_layer_add()  
    Add a render layer
```

```
bpy.ops.scene.render_layer_remove()  
    Remove the selected render layer
```

## Screen Operators

```
bpy.ops.screen.actionzone(modifier=0)  
    Handle area action zones for mouse actions/gestures
```

**Parameters** **modifier** (*int in [0, 2]*, *(optional)*) – modifier, modifier state

```
bpy.ops.screen.animation_cancel	restore_frame=True)  
    Cancel animation, returning to the original frame
```

**Parameters** **restore\_frame** (*boolean, (optional)*) – Restore Frame, Restore the frame when animation was initialized.

```
bpy.ops.screen.animation_play(reverse=False, sync=False)  
    Play animation
```

#### Parameters

- **reverse** (*boolean, (optional)*) – Play in Reverse, Animation is played backwards
- **sync** (*boolean, (optional)*) – Sync, Drop frames to maintain framerate

```
bpy.ops.screen.animation_step()
```

Step through animation by position

bpy.ops.screen.**area\_dupli**()

Duplicate selected area into new window

bpy.ops.screen.**area\_join**(min\_x=-100, min\_y=-100, max\_x=-100, max\_y=-100)

Join selected areas into new window

#### Parameters

- **min\_x** (*int in [-inf, inf], (optional)*) – X 1
- **min\_y** (*int in [-inf, inf], (optional)*) – Y 1
- **max\_x** (*int in [-inf, inf], (optional)*) – X 2
- **max\_y** (*int in [-inf, inf], (optional)*) – Y 2

bpy.ops.screen.**area\_move**(x=0, y=0, delta=0)

Move selected area edges

#### Parameters

- **x** (*int in [-inf, inf], (optional)*) – X
- **y** (*int in [-inf, inf], (optional)*) – Y
- **delta** (*int in [-inf, inf], (optional)*) – Delta

bpy.ops.screen.**area\_options**()

Operations for splitting and merging

bpy.ops.screen.**area\_split**(direction='HORIZONTAL', factor=0.5, mouse\_x=-100, mouse\_y=-100)

Split selected area into new windows

#### Parameters

- **direction** (*enum in ['HORIZONTAL', 'VERTICAL'], (optional)*) – Direction
- **factor** (*float in [0, 1], (optional)*) – Factor
- **mouse\_x** (*int in [-inf, inf], (optional)*) – Mouse X
- **mouse\_y** (*int in [-inf, inf], (optional)*) – Mouse Y

bpy.ops.screen.**area\_swap**()

Swap selected areas screen positions

bpy.ops.screen.**back\_to\_previous**()

Revert back to the original screen layout, before fullscreen area overlay

bpy.ops.screen.**delete**()

Delete active screen

bpy.ops.screen.**frame\_jump**(end=False)

Jump to first/last frame in frame range

#### Parameters end (boolean, (optional)) – Last Frame, Jump to the last frame of the frame range.

bpy.ops.screen.**frame\_offset**(delta=0)

Undocumented (contribute)

#### Parameters delta (int in [-inf, inf], (optional)) – Delta

bpy.ops.screen.**header\_flip**()

Undocumented (contribute)

bpy.ops.screen.**header\_toolbox**()

Display header region toolbox

bpy.ops.screen.keyframe\_jump(*next=True*)

Jump to previous/next keyframe

**Parameters** **next** (*boolean, (optional)*) – Next Keyframe

bpy.ops.screen.new()

Add a new screen

bpy.ops.screen.redo\_last()

Display menu for last action performed

bpy.ops.screen.region\_flip()

Undocumented ([contribute](#))

bpy.ops.screen.region\_quadview()

Split selected area into camera, front, right & top views

bpy.ops.screen.region\_scale()

Scale selected area

bpy.ops.screen.repeat\_history(*index=0*)

Display menu for previous actions performed

**Parameters** **index** (*int in [0, inf], (optional)*) – Index

bpy.ops.screen.repeat\_last()

Repeat last action

bpy.ops.screen.screen\_full\_area()

Toggle display selected area as fullscreen

bpy.ops.screen.screen\_set(*delta=0*)

Cycle through available screens

**Parameters** **delta** (*int in [-inf, inf], (optional)*) – Delta

bpy.ops.screen.screencast(*filepath=""*, *full=True*)

Undocumented ([contribute](#))

#### Parameters

- **filepath** (*string, (optional)*) – filepath
- **full** (*boolean, (optional)*) – Full Screen

bpy.ops.screen.screenshot(*filepath=""*, *check\_existing=True*, *filter\_blender=False*, *filter\_image=True*, *filter\_movie=False*, *filter\_python=False*, *filter\_font=False*, *filter\_sound=False*, *filter\_text=False*, *filter\_btx=False*, *filter\_collada=False*, *filter\_folder=True*, *filemode=9*, *full=True*)

Undocumented ([contribute](#))

#### Parameters

- **filepath** (*string, (optional)*) – File Path, Path to file
- **check\_existing** (*boolean, (optional)*) – Check Existing, Check and warn on overwriting existing files
- **filter\_blender** (*boolean, (optional)*) – Filter .blend files
- **filter\_image** (*boolean, (optional)*) – Filter image files
- **filter\_movie** (*boolean, (optional)*) – Filter movie files
- **filter\_python** (*boolean, (optional)*) – Filter python files
- **filter\_font** (*boolean, (optional)*) – Filter font files

- **filter\_sound** (*boolean, (optional)*) – Filter sound files
- **filter\_text** (*boolean, (optional)*) – Filter text files
- **filter\_btx** (*boolean, (optional)*) – Filter btx files
- **filter\_collada** (*boolean, (optional)*) – Filter COLLADA files
- **filter\_folder** (*boolean, (optional)*) – Filter folders
- **filemode** (*int in [1, 9], (optional)*) – File Browser Mode, The setting for the file browser mode to load a .blend file, a library or a special file
- **full** (*boolean, (optional)*) – Full Screen

bpy.ops.screen.**spacedata\_cleanup()**

Remove unused settings for invisible editors

bpy.ops.screen.**userpref\_show()**

Show/hide user preferences

## Script Operators

bpy.ops.script.**execute\_preset** (*filepath=""*, *menu\_idname=""*)

Executes a preset

### Parameters

- **filepath** (*string, (optional)*) – Path, Path of the Python file to execute
- **menu\_idname** (*string, (optional)*) – Menu ID Name, ID name of the menu this was called from

**File** startup/bl\_operators/presets.py:159

bpy.ops.script.**python\_file\_run** (*filepath=""*)

Run Python file

**Parameters** **filepath** (*string, (optional)*) – Path

bpy.ops.script.**reload()**

Reload Scripts

## Sculpt Operators

bpy.ops.sculpt.**brush\_stroke** (*stroke=None*, *mode='NORMAL'*, *ignore\_background\_click=False*)

Undocumented (contribute)

### Parameters

- **stroke** (*bpy\_prop\_collection of OperatorStrokeElement, (optional)*) – Stroke
- **mode** (*enum in ['NORMAL', 'INVERT', 'SMOOTH'], (optional)*) – Sculpt Stroke Mode, Action taken when a sculpt stroke is made
- **ignore\_background\_click** (*boolean, (optional)*) – Ignore Background Click, Clicks on the background do not start the stroke

bpy.ops.sculpt.**sculptmode\_toggle()**

Undocumented (contribute)

```
bpy.ops.sculpt.set_persistent_base()  
Undocumented (contribute)
```

## Sequencer Operators

```
bpy.ops.sequencer.change_effect_input(swap='A_B')  
Undocumented (contribute)
```

**Parameters** `swap` (enum in ['A\_B', 'B\_C', 'A\_C'], (optional)) – Swap, The effect inputs to swap

```
bpy.ops.sequencer.change_effect_type(type='CROSS')  
Undocumented (contribute)
```

**Parameters** `type` (enum in ['CROSS', 'ADD', 'SUBTRACT', 'ALPHA\_OVER', 'ALPHA\_UNDER', 'GAMMA\_CROSS', 'MULTIPLY', 'OVER\_DROP', 'PLUGIN', 'WIPE', 'GLOW', 'TRANSFORM', 'COLOR', 'SPEED', 'MULTICAM', 'ADJUSTMENT'], (optional)) – Type, Sequencer effect type

```
bpy.ops.sequencer.change_path(filepath="", directory="", files=None, filter_blender=False,  
filter_image=True, filter_movie=True, filter_python=False,  
filter_font=False, filter_sound=False, filter_text=False, fil-  
ter_btx=False, filter_collada=False, filter_folder=True, file-  
mode=9, relative_path=False)
```

Undocumented ([contribute](#))

### Parameters

- `filepath` (string, (optional)) – File Path, Path to file
- `directory` (string, (optional)) – Directory, Directory of the file
- `files` (bpy\_prop\_collection of OperatorFileListElement, (optional)) – Files
- `filter_blender` (boolean, (optional)) – Filter .blend files
- `filter_image` (boolean, (optional)) – Filter image files
- `filter_movie` (boolean, (optional)) – Filter movie files
- `filter_python` (boolean, (optional)) – Filter python files
- `filter_font` (boolean, (optional)) – Filter font files
- `filter_sound` (boolean, (optional)) – Filter sound files
- `filter_text` (boolean, (optional)) – Filter text files
- `filter_btx` (boolean, (optional)) – Filter btx files
- `filter_collada` (boolean, (optional)) – Filter COLLADA files
- `filter_folder` (boolean, (optional)) – Filter folders
- `filemode` (int in [1, 9], (optional)) – File Browser Mode, The setting for the file browser mode to load a .blend file, a library or a special file
- `relative_path` (boolean, (optional)) – Relative Path, Select the file relative to the blend file

```
bpy.ops.sequencer.copy()  
Undocumented (contribute)
```

```
bpy.ops.sequencer.crossfade_sounds()
```

Do crossfading volume animation of two selected sound strips.

**File** `startup/bl_operators/sequencer.py:41`

bpy.ops.sequencer.cut(frame=0, type='SOFT', side='BOTH')  
Cut the selected strips

#### Parameters

- **frame** (*int in [-inf, inf], (optional)*) – Frame, Frame where selected strips will be cut
- **type** (*enum in ['SOFT', 'HARD'], (optional)*) – Type, The type of cut operation to perform on strips
- **side** (*enum in ['LEFT', 'RIGHT', 'BOTH'], (optional)*) – Side, The side that remains selected after cutting

bpy.ops.sequencer.cut\_multicam(camera=1)  
Cut multicam strip and select camera.

#### Parameters **camera** (*int in [1, 32], (optional)*) – Camera

**File** startup/bl\_operators/sequencer.py:99

bpy.ops.sequencer.deinterlace\_selected\_movies()  
Deinterlace all selected movie sources.

**File** startup/bl\_operators/sequencer.py:134

bpy.ops.sequencer.delete()  
Erase selected strips from the sequencer

bpy.ops.sequencer.duplicate(mode='TRANSLATION')  
Duplicate the selected strips

#### Parameters **mode** (*enum in ['INIT', 'DUMMY', 'TRANSLATION', 'ROTATION', 'RESIZE', 'TO\_SPHERE', 'SHEAR', 'WARP', 'SHRINKFATTEN', 'TILT', 'TRACKBALL', 'PUSHPULL', 'CREASE', 'MIRROR', 'BONE\_SIZE', 'BONE\_ENVELOPE', 'CURVE\_SHRINKFATTEN', 'BONE\_ROLL', 'TIME\_TRANSLATE', 'TIME\_SLIDE', 'TIME\_SCALE', 'TIME\_EXTEND', 'BAKE\_TIME', 'BEVEL', 'BWEIGHT', 'ALIGN', 'EDGESLIDE', 'SEQSLIDE'], (optional)*) – Mode

bpy.ops.sequencer.effect\_strip\_add(filepath="", filter blender=False, filter image=False, filter movie=False, filter python=False, filter font=False, filter sound=False, filter text=False, filter btx=False, filter collada=False, filter folder=False, filemode=9, relative path=False, frame start=0, frame end=0, channel=1, replace sel=True, overlap=False, type='CROSS', color=(0.0, 0.0, 0.0))

Add an effect to the sequencer, most are applied on top of existing strips

#### Parameters

- **filepath** (*string, (optional)*) – File Path, Path to file
- **filter blender** (*boolean, (optional)*) – Filter .blend files
- **filter image** (*boolean, (optional)*) – Filter image files
- **filter movie** (*boolean, (optional)*) – Filter movie files
- **filter python** (*boolean, (optional)*) – Filter python files
- **filter font** (*boolean, (optional)*) – Filter font files
- **filter sound** (*boolean, (optional)*) – Filter sound files
- **filter text** (*boolean, (optional)*) – Filter text files
- **filter btx** (*boolean, (optional)*) – Filter btx files

- **filter\_collada** (*boolean, (optional)*) – Filter COLLADA files
- **filter\_folder** (*boolean, (optional)*) – Filter folders
- **filemode** (*int in [1, 9], (optional)*) – File Browser Mode, The setting for the file browser mode to load a .blend file, a library or a special file
- **relative\_path** (*boolean, (optional)*) – Relative Path, Select the file relative to the blend file
- **frame\_start** (*int in [-inf, inf], (optional)*) – Start Frame, Start frame of the sequence strip
- **frame\_end** (*int in [-inf, inf], (optional)*) – End Frame, End frame for the color strip
- **channel** (*int in [1, 32], (optional)*) – Channel, Channel to place this strip into
- **replace\_sel** (*boolean, (optional)*) – Replace Selection, replace the current selection
- **overlap** (*boolean, (optional)*) – Allow Overlap, Don't correct overlap on new sequence strips
- **type** (*enum in ['CROSS', 'ADD', 'SUBTRACT', 'ALPHA\_OVER', 'ALPHA\_UNDER', 'GAMMA\_CROSS', 'MULTIPLY', 'OVER\_DROP', 'PLUGIN', 'WIPE', 'GLOW', 'TRANSFORM', 'COLOR', 'SPEED', 'MULTICAM', 'ADJUSTMENT'], (optional)*) – Type, Sequencer effect type
- **color** (*float array of 3 items in [0, 1], (optional)*) – Color, Initialize the strip with this color (only used when type='COLOR')

```
bpy.ops.sequencer.image_strip_add(directory="" , files=None, filter_blender=False, filter_image=True, filter_movie=False, filter_python=False, filter_font=False, filter_sound=False, filter_text=False, filter_btx=False, filter_collada=False, filter_folder=True, filemode=9, relative_path=False, frame_start=0, frame_end=0, channel=1, replace_sel=True, overlap=False)
```

Add an image or image sequence to the sequencer

#### Parameters

- **directory** (*string, (optional)*) – Directory, Directory of the file
- **files** (*bpy\_prop\_collection of OperatorFileListElement, (optional)*) – Files
- **filter\_blender** (*boolean, (optional)*) – Filter .blend files
- **filter\_image** (*boolean, (optional)*) – Filter image files
- **filter\_movie** (*boolean, (optional)*) – Filter movie files
- **filter\_python** (*boolean, (optional)*) – Filter python files
- **filter\_font** (*boolean, (optional)*) – Filter font files
- **filter\_sound** (*boolean, (optional)*) – Filter sound files
- **filter\_text** (*boolean, (optional)*) – Filter text files
- **filter\_btx** (*boolean, (optional)*) – Filter btx files
- **filter\_collada** (*boolean, (optional)*) – Filter COLLADA files
- **filter\_folder** (*boolean, (optional)*) – Filter folders
- **filemode** (*int in [1, 9], (optional)*) – File Browser Mode, The setting for the file browser mode to load a .blend file, a library or a special file
- **relative\_path** (*boolean, (optional)*) – Relative Path, Select the file relative to the blend file

- **frame\_start** (*int in [-inf, inf], (optional)*) – Start Frame, Start frame of the sequence strip
- **frame\_end** (*int in [-inf, inf], (optional)*) – End Frame, End frame for the color strip
- **channel** (*int in [1, 32], (optional)*) – Channel, Channel to place this strip into
- **replace\_sel** (*boolean, (optional)*) – Replace Selection, replace the current selection
- **overlap** (*boolean, (optional)*) – Allow Overlap, Don't correct overlap on new sequence strips

bpy.ops.sequencer.**images\_separate**(*length=1*)

On image sequences strips, it return a strip for each image

**Parameters** **length** (*int in [1, 1000], (optional)*) – Length, Length of each frame

bpy.ops.sequencer.**lock**()

Lock the active strip so that it can't be transformed

bpy.ops.sequencer.**meta\_make**()

Group selected strips into a metastrip

bpy.ops.sequencer.**meta\_separate**()

Put the contents of a metastrip back in the sequencer

bpy.ops.sequencer.**meta\_toggle**()

Toggle a metastrip (to edit enclosed strips)

bpy.ops.sequencer.**movie\_strip\_add**(*filepath=""*, *files=None*, *filter\_blender=False*, *filter\_image=False*, *filter\_movie=True*, *filter\_python=False*, *filter\_font=False*, *filter\_sound=False*, *filter\_text=False*, *filter\_btx=False*, *filter\_collada=False*, *filter\_folder=True*, *filemode=9*, *relative\_path=False*, *frame\_start=0*, *channel=1*, *replace\_sel=True*, *overlap=False*, *sound=True*)

Add a movie strip to the sequencer

#### Parameters

- **filepath** (*string, (optional)*) – File Path, Path to file
- **files** (*bpy\_prop\_collection of OperatorFileListElement, (optional)*) – Files
- **filter\_blender** (*boolean, (optional)*) – Filter .blend files
- **filter\_image** (*boolean, (optional)*) – Filter image files
- **filter\_movie** (*boolean, (optional)*) – Filter movie files
- **filter\_python** (*boolean, (optional)*) – Filter python files
- **filter\_font** (*boolean, (optional)*) – Filter font files
- **filter\_sound** (*boolean, (optional)*) – Filter sound files
- **filter\_text** (*boolean, (optional)*) – Filter text files
- **filter\_btx** (*boolean, (optional)*) – Filter btx files
- **filter\_collada** (*boolean, (optional)*) – Filter COLLADA files
- **filter\_folder** (*boolean, (optional)*) – Filter folders
- **filemode** (*int in [1, 9], (optional)*) – File Browser Mode, The setting for the file browser mode to load a .blend file, a library or a special file
- **relative\_path** (*boolean, (optional)*) – Relative Path, Select the file relative to the blend file
- **frame\_start** (*int in [-inf, inf], (optional)*) – Start Frame, Start frame of the sequence strip

- **channel** (*int in [1, 32], (optional)*) – Channel, Channel to place this strip into
- **replace\_sel** (*boolean, (optional)*) – Replace Selection, replace the current selection
- **overlap** (*boolean, (optional)*) – Allow Overlap, Don't correct overlap on new sequence strips
- **sound** (*boolean, (optional)*) – Sound, Load sound with the movie

bpy.ops.sequencer.**mute** (*unselected=False*)

Mute selected strips

**Parameters** **unselected** (*boolean, (optional)*) – Unselected, Mute unselected rather than selected strips.

bpy.ops.sequencer.**next\_edit**()

Move frame to next edit point

bpy.ops.sequencer.**offset\_clear**()

Clear strip offsets from the start and end frames

bpy.ops.sequencer.**paste**()

Undocumented ([contribute](#))

bpy.ops.sequencer.**previous\_edit**()

Move frame to previous edit point

bpy.ops.sequencer.**properties**()

Open sequencer properties panel

bpy.ops.sequencer.**reassign\_inputs**()

Reassign the inputs for the effects strip

bpy.ops.sequencer.**refresh\_all**()

Refresh the sequencer editor

bpy.ops.sequencer.**reload**()

Reload strips in the sequencer

bpy.ops.sequencer.**rendersize**()

Set render size and aspect from active sequence

bpy.ops.sequencer.**scene\_strip\_add**(*frame\_start=0, channel=1, replace\_sel=True, overlap=False, scene=''*)

Add a strip to the sequencer using a blender scene as a source

#### Parameters

- **frame\_start** (*int in [-inf, inf], (optional)*) – Start Frame, Start frame of the sequence strip
- **channel** (*int in [1, 32], (optional)*) – Channel, Channel to place this strip into
- **replace\_sel** (*boolean, (optional)*) – Replace Selection, replace the current selection
- **overlap** (*boolean, (optional)*) – Allow Overlap, Don't correct overlap on new sequence strips
- **scene** (*enum in [], (optional)*) – Scene

bpy.ops.sequencer.**select** (*extend=False, linked\_handle=False, left\_right=False, linked\_time=False*)

Select a strip (last selected becomes the “active strip”)

#### Parameters

- **extend** (*boolean, (optional)*) – Extend, Extend the selection.

- **linked\_handle** (*boolean, (optional)*) – Linked Handle, Select handles next to the active strip.
- **left\_right** (*boolean, (optional)*) – Left/Right, select based on the frame side the cursor is on.
- **linked\_time** (*boolean, (optional)*) – Linked Time, Select other strips at the same time.

bpy.ops.sequencer.**select\_active\_side**(*side='BOTH'*)

Select strips on the nominated side of the active strip

**Parameters** **side** (*enum in ['LEFT', 'RIGHT', 'BOTH'], (optional)*) – Side, The side of the handle that is selected

bpy.ops.sequencer.**select\_all\_toggle**()

Select or deselect all strips

bpy.ops.sequencer.**select\_border**(*gesture\_mode=0, xmin=0, xmax=0, ymin=0, ymax=0*)

Enable border select mode

**Parameters**

- **gesture\_mode** (*int in [-inf, inf], (optional)*) – Gesture Mode
- **xmin** (*int in [-inf, inf], (optional)*) – X Min
- **xmax** (*int in [-inf, inf], (optional)*) – X Max
- **ymin** (*int in [-inf, inf], (optional)*) – Y Min
- **ymax** (*int in [-inf, inf], (optional)*) – Y Max

bpy.ops.sequencer.**select\_handles**(*side='BOTH'*)

Select manipulator handles on the sides of the selected strip

**Parameters** **side** (*enum in ['LEFT', 'RIGHT', 'BOTH'], (optional)*) – Side, The side of the handle that is selected

bpy.ops.sequencer.**select\_inverse**()

Select unselected strips

bpy.ops.sequencer.**select\_less**()

Shrink the current selection of adjacent selected strips

bpy.ops.sequencer.**select\_linked**()

Select all strips adjacent to the current selection

bpy.ops.sequencer.**select\_linked\_pick**(*extend=False*)

Select a chain of linked strips nearest to the mouse pointer

**Parameters** **extend** (*boolean, (optional)*) – Extend, extend the selection

bpy.ops.sequencer.**select\_more**()

Select more strips adjacent to the current selection

bpy.ops.sequencer.**snap**(*frame=0*)

Frame where selected strips will be snapped

**Parameters** **frame** (*int in [-inf, inf], (optional)*) – Frame, Frame where selected strips will be snapped

bpy.ops.sequencer.**sound\_strip\_add**(*filepath=""*, *files=None*, *filter\_blender=False*, *filter\_image=False*, *filter\_movie=False*, *filter\_python=False*, *filter\_font=False*, *filter\_sound=True*, *filter\_text=False*, *filter\_btx=False*, *filter\_collada=False*, *filter\_folder=True*, *filemode=9*, *relative\_path=False*, *frame\_start=0*, *channel=1*, *replace\_sel=True*, *overlap=False*, *cache=False*)

Add a sound strip to the sequencer

#### Parameters

- **filepath** (*string, (optional)*) – File Path, Path to file
- **files** (*bpy\_prop\_collection of OperatorFileListElement, (optional)*) – Files
- **filter\_blender** (*boolean, (optional)*) – Filter .blend files
- **filter\_image** (*boolean, (optional)*) – Filter image files
- **filter\_movie** (*boolean, (optional)*) – Filter movie files
- **filter\_python** (*boolean, (optional)*) – Filter python files
- **filter\_font** (*boolean, (optional)*) – Filter font files
- **filter\_sound** (*boolean, (optional)*) – Filter sound files
- **filter\_text** (*boolean, (optional)*) – Filter text files
- **filter\_btx** (*boolean, (optional)*) – Filter btx files
- **filter\_collada** (*boolean, (optional)*) – Filter COLLADA files
- **filter\_folder** (*boolean, (optional)*) – Filter folders
- **filemode** (*int in [1, 9], (optional)*) – File Browser Mode, The setting for the file browser mode to load a .blend file, a library or a special file
- **relative\_path** (*boolean, (optional)*) – Relative Path, Select the file relative to the blend file
- **frame\_start** (*int in [-inf, inf], (optional)*) – Start Frame, Start frame of the sequence strip
- **channel** (*int in [1, 32], (optional)*) – Channel, Channel to place this strip into
- **replace\_sel** (*boolean, (optional)*) – Replace Selection, replace the current selection
- **overlap** (*boolean, (optional)*) – Allow Overlap, Don't correct overlap on new sequence strips
- **cache** (*boolean, (optional)*) – Cache, Cache the sound in memory.

`bpy.ops.sequencer.swap(side='RIGHT')`

Swap active strip with strip to the left

**Parameters** `side` (*enum in ['LEFT', 'RIGHT'], (optional)*) – Side, Side of the strip to swap

`bpy.ops.sequencer.swap_data()`

Swap 2 sequencer strips

`bpy.ops.sequencer.swap_inputs()`

Swap the first two inputs for the effects strip

`bpy.ops.sequencer.unlock()`

Unlock the active strip so that it can't be transformed

`bpy.ops.sequencer.unmute(unselected=False)`

Un-Mute unselected rather than selected strips

**Parameters** `unselected` (*boolean, (optional)*) – Unselected, UnMute unselected rather than selected strips.

`bpy.ops.sequencer.view_all()`

View all the strips in the sequencer

```
bpy.ops.sequencer.view_all_preview()
```

Zoom preview to fit in the area

```
bpy.ops.sequencer.view_ghost_border(gesture_mode=0, xmin=0, xmax=0, ymin=0, ymax=0)
```

Enable border select mode

#### Parameters

- **gesture\_mode** (*int in [-inf, inf], (optional)*) – Gesture Mode
- **xmin** (*int in [-inf, inf], (optional)*) – X Min
- **xmax** (*int in [-inf, inf], (optional)*) – X Max
- **ymin** (*int in [-inf, inf], (optional)*) – Y Min
- **ymax** (*int in [-inf, inf], (optional)*) – Y Max

```
bpy.ops.sequencer.view_selected()
```

Zoom the sequencer on the selected strips

```
bpy.ops.sequencer.view_toggle()
```

Toggle between sequencer views (sequence, preview, both)

```
bpy.ops.sequencer.view_zoom_ratio(ratio=1.0)
```

Change zoom ratio of sequencer preview

**Parameters** **ratio** (*float in [0, inf], (optional)*) – Ratio, Zoom ratio, 1.0 is 1:1, higher is zoomed in, lower is zoomed out.

## Sketch Operators

```
bpy.ops.sketch.cancel_stroke()
```

Undocumented (contribute)

```
bpy.ops.sketch.convert()
```

Undocumented (contribute)

```
bpy.ops.sketch.delete()
```

Undocumented (contribute)

```
bpy.ops.sketch.draw_preview(snap=False)
```

Undocumented (contribute)

**Parameters** **snap** (*boolean, (optional)*) – Snap

```
bpy.ops.sketch.draw_stroke(snap=False)
```

Undocumented (contribute)

**Parameters** **snap** (*boolean, (optional)*) – Snap

```
bpy.ops.sketch.finish_stroke()
```

Undocumented (contribute)

```
bpy.ops.sketch.gesture(snap=False)
```

Undocumented (contribute)

**Parameters** **snap** (*boolean, (optional)*) – Snap

```
bpy.ops.sketch.select()
```

Undocumented (contribute)

## Sound Operators

```
bpy.ops.sound.open(filepath=""", filter_blender=False, filter_image=False, filter_movie=True, filter_python=False, filter_font=False, filter_sound=True, filter_text=False, filter_btx=False, filter_collada=False, filter_folder=True, filemode=9, relative_path=False, cache=False)
```

Load a sound file

### Parameters

- **filepath** (*string, (optional)*) – File Path, Path to file
- **filter\_blender** (*boolean, (optional)*) – Filter .blend files
- **filter\_image** (*boolean, (optional)*) – Filter image files
- **filter\_movie** (*boolean, (optional)*) – Filter movie files
- **filter\_python** (*boolean, (optional)*) – Filter python files
- **filter\_font** (*boolean, (optional)*) – Filter font files
- **filter\_sound** (*boolean, (optional)*) – Filter sound files
- **filter\_text** (*boolean, (optional)*) – Filter text files
- **filter\_btx** (*boolean, (optional)*) – Filter btx files
- **filter\_collada** (*boolean, (optional)*) – Filter COLLADA files
- **filter\_folder** (*boolean, (optional)*) – Filter folders
- **filemode** (*int in [1, 9], (optional)*) – File Browser Mode, The setting for the file browser mode to load a .blend file, a library or a special file
- **relative\_path** (*boolean, (optional)*) – Relative Path, Select the file relative to the blend file
- **cache** (*boolean, (optional)*) – Cache, Cache the sound in memory.

```
bpy.ops.sound.pack()
```

Pack the sound into the current blend file

```
bpy.ops.sound.unpack(method='USE_LOCAL', id=""")
```

Unpack the sound to the samples filename

### Parameters

- **method** (*enum in ['USE\_LOCAL', 'WRITE\_LOCAL', 'USE\_ORIGINAL', 'WRITE\_ORIGINAL'], (optional)*) – Method, How to unpack.
- **id** (*string, (optional)*) – Sound Name, Sound datablock name to unpack.

## Surface Operators

```
bpy.ops.surface.primitive_nurbs_surface_circle_add(view_align=False, enter_editmode=False, location=(0.0, 0.0, 0.0), rotation=(0.0, 0.0, 0.0), layers=(False, False, False))
```

Construct a Nurbs surface Circle

## Parameters

- **view\_align** (*boolean, (optional)*) – Align to View, Align the new object to the view
- **enter\_editmode** (*boolean, (optional)*) – Enter Editmode, Enter editmode when adding this object
- **location** (*float array of 3 items in [-inf, inf], (optional)*) – Location, Location for the newly added object
- **rotation** (*float array of 3 items in [-inf, inf], (optional)*) – Rotation, Rotation for the newly added object
- **layers** (*boolean array of 20 items, (optional)*) – Layer

```
bpy.ops.surface.primitive_nurbs_surface_curve_add(view_align=False,           en-
  ter_editmode=False, location=(0.0,
  0.0, 0.0), rotation=(0.0, 0.0, 0.0),
  layers=(False, False, False, False,
  False, False, False, False, False,
  False, False, False, False, False,
  False, False, False, False, False,
  False))
```

Construct a Nurbs surface Curve

## Parameters

- **view\_align** (*boolean, (optional)*) – Align to View, Align the new object to the view
- **enter\_editmode** (*boolean, (optional)*) – Enter Editmode, Enter editmode when adding this object
- **location** (*float array of 3 items in [-inf, inf], (optional)*) – Location, Location for the newly added object
- **rotation** (*float array of 3 items in [-inf, inf], (optional)*) – Rotation, Rotation for the newly added object
- **layers** (*boolean array of 20 items, (optional)*) – Layer

```
bpy.ops.surface.primitive_nurbs_surface_cylinder_add(view_align=False,          en-
   enter_editmode=False, location=(0.0, 0.0, 0.0), rotation=(0.0, 0.0, 0.0),
   layers=(False, False, False, False, False, False, False, False, False,
   False, False, False, False, False, False, False, False, False,
   False, False, False, False))
```

Construct a Nurbs surface Cylinder

## Parameters

- **view\_align** (*boolean, (optional)*) – Align to View, Align the new object to the view
- **enter\_editmode** (*boolean, (optional)*) – Enter Editmode, Enter editmode when adding this object
- **location** (*float array of 3 items in [-inf, inf], (optional)*) – Location, Location for the newly added object
- **rotation** (*float array of 3 items in [-inf, inf], (optional)*) – Rotation, Rotation for the newly added object

- **layers** (*boolean array of 20 items, (optional)*) – Layer

```
bpy.ops.surface.primitive_nurbs_surface_sphere_add(view_align=False, enter_editmode=False, location=(0.0, 0.0, 0.0), rotation=(0.0, 0.0, 0.0), layers=(False, False, False))
```

Construct a Nurbs surface Sphere

#### Parameters

- **view\_align** (*boolean, (optional)*) – Align to View, Align the new object to the view
- **enterEditMode** (*boolean, (optional)*) – Enter Editmode, Enter editmode when adding this object
- **location** (*float array of 3 items in [-inf, inf], (optional)*) – Location, Location for the newly added object
- **rotation** (*float array of 3 items in [-inf, inf], (optional)*) – Rotation, Rotation for the newly added object
- **layers** (*boolean array of 20 items, (optional)*) – Layer

```
bpy.ops.surface.primitive_nurbs_surface_surface_add(view_align=False, enter_editmode=False, location=(0.0, 0.0, 0.0), rotation=(0.0, 0.0, 0.0), layers=(False, False, False))
```

Construct a Nurbs surface Patch

#### Parameters

- **view\_align** (*boolean, (optional)*) – Align to View, Align the new object to the view
- **enterEditMode** (*boolean, (optional)*) – Enter Editmode, Enter editmode when adding this object
- **location** (*float array of 3 items in [-inf, inf], (optional)*) – Location, Location for the newly added object
- **rotation** (*float array of 3 items in [-inf, inf], (optional)*) – Rotation, Rotation for the newly added object
- **layers** (*boolean array of 20 items, (optional)*) – Layer

```
bpy.ops.surface.primitive_nurbs_surface_torus_add(view_align=False, enter_editmode=False, location=(0.0, 0.0, 0.0), rotation=(0.0, 0.0, 0.0), layers=(False, False, False))
```

Construct a Nurbs surface Torus

## Parameters

- **view\_align** (*boolean, (optional)*) – Align to View, Align the new object to the view
- **enter\_editmode** (*boolean, (optional)*) – Enter Editmode, Enter editmode when adding this object
- **location** (*float array of 3 items in [-inf, inf], (optional)*) – Location, Location for the newly added object
- **rotation** (*float array of 3 items in [-inf, inf], (optional)*) – Rotation, Rotation for the newly added object
- **layers** (*boolean array of 20 items, (optional)*) – Layer

## Text Operators

bpy.ops.text.**comment**()

Convert selected text to comment

bpy.ops.text.**convert\_whitespace**(*type='SPACES'*)

Convert whitespaces by type

**Parameters** **type** (*enum in ['SPACES', 'TABS'], (optional)*) – type, Type of whitespace to convert to.

bpy.ops.text.**copy**()

Copy selected text to clipboard

bpy.ops.text.**cursor\_set**(*x=0, y=0*)

Set cursor position

## Parameters

- **x** (*int in [-inf, inf], (optional)*) – X
- **y** (*int in [-inf, inf], (optional)*) – Y

bpy.ops.text.**cut**()

Cut selected text to clipboard

bpy.ops.text.**delete**(*type='NEXT\_CHARACTER'*)

Delete text by cursor position

**Parameters** **type** (*enum in ['NEXT\_CHARACTER', 'PREVIOUS\_CHARACTER', 'NEXT\_WORD', 'PREVIOUS\_WORD'], (optional)*) – Type, Which part of the text to delete.

bpy.ops.text.**find**()

Find specified text

bpy.ops.text.**find\_set\_selected**()

Find specified text and set as selected

bpy.ops.text.**indent**()

Indent selected text

bpy.ops.text.**insert**(*text=""*)

Insert text at cursor position

**Parameters** **text** (*string, (optional)*) – Text, Text to insert at the cursor position.

bpy.ops.text.**jump**(*line=1*)

Jump cursor to line

**Parameters** **line** (*int in [1, inf], (optional)*) – Line, Line number to jump to.

bpy.ops.text.line\_break()  
Insert line break at cursor position

bpy.ops.text.line\_number()  
The current line number

bpy.ops.text.make\_internal()  
Make active text file internal

bpy.ops.text.mark\_all()  
Mark all specified text

bpy.ops.text.markers\_clear()  
Clear all markers

bpy.ops.text.move(type='LINE\_BEGIN')  
Move cursor to position type

**Parameters** **type** (*enum in ['LINE\_BEGIN', 'LINE\_END', 'FILE\_TOP', 'FILE\_BOTTOM', 'PREVIOUS\_CHARACTER', 'NEXT\_CHARACTER', 'PREVIOUS\_WORD', 'NEXT\_WORD', 'PREVIOUS\_LINE', 'NEXT\_LINE', 'PREVIOUS\_PAGE', 'NEXT\_PAGE'], (optional)*) – Type, Where to move cursor to.

bpy.ops.text.move\_select(type='LINE\_BEGIN')  
Make selection from current cursor position to new cursor position type

**Parameters** **type** (*enum in ['LINE\_BEGIN', 'LINE\_END', 'FILE\_TOP', 'FILE\_BOTTOM', 'PREVIOUS\_CHARACTER', 'NEXT\_CHARACTER', 'PREVIOUS\_WORD', 'NEXT\_WORD', 'PREVIOUS\_LINE', 'NEXT\_LINE', 'PREVIOUS\_PAGE', 'NEXT\_PAGE'], (optional)*) – Type, Where to move cursor to, to make a selection.

bpy.ops.text.new()  
Create a new text data block

bpy.ops.text.next\_marker()  
Move to next marker

bpy.ops.text.open(filepath="", filter\_blender=False, filter\_image=False, filter\_movie=False, filter\_python=True, filter\_font=False, filter\_sound=False, filter\_text=True, filter\_btx=False, filter\_collada=False, filter\_folder=True, filemode=9, internal=False)  
Open a new text data block

#### Parameters

- **filepath** (*string, (optional)*) – File Path, Path to file
- **filter\_blender** (*boolean, (optional)*) – Filter .blend files
- **filter\_image** (*boolean, (optional)*) – Filter image files
- **filter\_movie** (*boolean, (optional)*) – Filter movie files
- **filter\_python** (*boolean, (optional)*) – Filter python files
- **filter\_font** (*boolean, (optional)*) – Filter font files
- **filter\_sound** (*boolean, (optional)*) – Filter sound files
- **filter\_text** (*boolean, (optional)*) – Filter text files
- **filter\_btx** (*boolean, (optional)*) – Filter btx files
- **filter\_collada** (*boolean, (optional)*) – Filter COLLADA files

- **filter\_folder** (*boolean, (optional)*) – Filter folders
- **filemode** (*int in [1, 9], (optional)*) – File Browser Mode, The setting for the file browser mode to load a .blend file, a library or a special file
- **internal** (*boolean, (optional)*) – Make internal, Make text file internal after loading

bpy.ops.text.**overwrite\_toggle**()

Toggle overwrite while typing

bpy.ops.text.**paste**(*selection=False*)

Paste text from clipboard

**Parameters selection** (*boolean, (optional)*) – Selection, Paste text selected elsewhere rather than copied, X11 only.

bpy.ops.text.**previous\_marker**()

Move to previous marker

bpy.ops.text.**properties**()

Toggle text properties panel

bpy.ops.text.**refresh\_pyconstraints**()

Refresh all pyconstraints

bpy.ops.text.**reload**()

Reload active text data block from its file

bpy.ops.text.**replace**()

Replace text with the specified text

bpy.ops.text.**replace\_set\_selected**()

Replace text with specified text and set as selected

bpy.ops.text.**resolve\_conflict**(*resolution='IGNORE'*)

When external text is out of sync, resolve the conflict

**Parameters resolution** (*enum in ['IGNORE', 'RELOAD', 'SAVE', 'MAKE\_INTERNAL'], (optional)*) – Resolution, How to solve conflict due to different in internal and external text.

bpy.ops.text.**run\_script**()

Run active script

bpy.ops.text.**save**()

Save active text data block

bpy.ops.text.**save\_as**(*filepath=""*, *check\_existing=True*, *filter\_blender=False*, *filter\_image=False*, *filter\_movie=False*, *filter\_python=True*, *filter\_font=False*, *filter\_sound=False*, *filter\_text=True*, *filter\_btx=False*, *filter\_collada=False*, *filter\_folder=True*, *filemode=9*)

Save active text file with options

#### Parameters

- **filepath** (*string, (optional)*) – File Path, Path to file
- **check\_existing** (*boolean, (optional)*) – Check Existing, Check and warn on overwriting existing files
- **filter\_blender** (*boolean, (optional)*) – Filter .blend files
- **filter\_image** (*boolean, (optional)*) – Filter image files
- **filter\_movie** (*boolean, (optional)*) – Filter movie files
- **filter\_python** (*boolean, (optional)*) – Filter python files

- **filter\_font** (*boolean, (optional)*) – Filter font files
- **filter\_sound** (*boolean, (optional)*) – Filter sound files
- **filter\_text** (*boolean, (optional)*) – Filter text files
- **filter\_btx** (*boolean, (optional)*) – Filter btx files
- **filter\_collada** (*boolean, (optional)*) – Filter COLLADA files
- **filter\_folder** (*boolean, (optional)*) – Filter folders
- **filemode** (*int in [1, 9], (optional)*) – File Browser Mode, The setting for the file browser mode to load a .blend file, a library or a special file

bpy.ops.text.scroll(*lines=1*)

Scroll text screen

**Parameters** **lines** (*int in [-inf, inf], (optional)*) – Lines, Number of lines to scroll.

bpy.ops.text.scroll\_bar(*lines=1*)

Scroll text screen

**Parameters** **lines** (*int in [-inf, inf], (optional)*) – Lines, Number of lines to scroll.

bpy.ops.text.select\_all()

Select all text

bpy.ops.text.select\_line()

Select text by line

bpy.ops.text.select\_word()

Select word under cursor

bpy.ops.text.selection\_set(*select=False*)

Set cursor selection

**Parameters** **select** (*boolean, (optional)*) – Select, Set selection end rather than cursor.

bpy.ops.text.to\_3d\_object(*split\_lines=False*)

Create 3d text object from active text data block

**Parameters** **split\_lines** (*boolean, (optional)*) – Split Lines, Create one object per line in the text.

bpy.ops.text.uncomment()

Convert selected comment to text

bpy.ops.text.unindent()

Unindent selected text

bpy.ops.text.unlink()

Unlink active text data block

## Texture Operators

bpy.ops.texture.envmap\_clear()

Discard the environment map and free it from memory

bpy.ops.texture.envmap\_clear\_all()

Discard all environment maps in the .blend file and free them from memory

```
bpy.ops.texture.envmap_save(filepath="", check_existing=True, filter_blender=False, filter_image=True, filter_movie=True, filter_python=False, filter_font=False, filter_sound=False, filter_text=False, filter_btx=False, filter_collada=False, filter_folder=True, filemode=9, relative_path=False)
```

Save the current generated Environment map to an image file

#### Parameters

- **filepath** (*string, (optional)*) – File Path, Path to file
- **check\_existing** (*boolean, (optional)*) – Check Existing, Check and warn on overwriting existing files
- **filter\_blender** (*boolean, (optional)*) – Filter .blend files
- **filter\_image** (*boolean, (optional)*) – Filter image files
- **filter\_movie** (*boolean, (optional)*) – Filter movie files
- **filter\_python** (*boolean, (optional)*) – Filter python files
- **filter\_font** (*boolean, (optional)*) – Filter font files
- **filter\_sound** (*boolean, (optional)*) – Filter sound files
- **filter\_text** (*boolean, (optional)*) – Filter text files
- **filter\_btx** (*boolean, (optional)*) – Filter btx files
- **filter\_collada** (*boolean, (optional)*) – Filter COLLADA files
- **filter\_folder** (*boolean, (optional)*) – Filter folders
- **filemode** (*int in [1, 9], (optional)*) – File Browser Mode, The setting for the file browser mode to load a .blend file, a library or a special file
- **relative\_path** (*boolean, (optional)*) – Relative Path, Select the file relative to the blend file

```
bpy.ops.texture.new()
```

Add a new texture

```
bpy.ops.texture.slot_copy()
```

Copy the material texture settings and nodes

```
bpy.ops.texture.slot_move(type='UP')
```

Move texture slots up and down

**Parameters** **type** (*enum in ['UP', 'DOWN'], (optional)*) – Type

```
bpy.ops.texture.slot_paste()
```

Copy the texture settings and nodes

## Time Operators

```
bpy.ops.time.end_frame_set()
```

Set the end frame

```
bpy.ops.time.start_frame_set()
```

Set the start frame

```
bpy.ops.time.view_all()
```

Show the entire playable frame range

## Transform Operators

bpy.ops.transform.create\_orientation(*name*=““, *use*=*False*, *overwrite*=*False*)

Create transformation orientation from selection

### Parameters

- **name** (*string, (optional)*) – Name, Text to insert at the cursor position.
- **use** (*boolean, (optional)*) – Use after creation, Select orientation after its creation
- **overwrite** (*boolean, (optional)*) – Overwrite previous, Overwrite previously created orientation with same name

bpy.ops.transform.delete\_orientation()

Delete transformation orientation

bpy.ops.transform.edge\_creature(*value*=0.0, *snap*=*False*, *snap\_target*=‘CLOSEST’,  
*snap\_point*=(0.0, 0.0, 0.0), *snap\_align*=*False*, *snap\_normal*=(0.0,  
0.0, 0.0), *release\_confirm*=*False*)

Change the crease of edges

### Parameters

- **value** (*float in [-1, 1], (optional)*) – Factor
- **snap** (*boolean, (optional)*) – Use Snapping Options
- **snap\_target** (*enum in [‘CLOSEST’, ‘CENTER’, ‘MEDIAN’, ‘ACTIVE’], (optional)*) – Target
- **snap\_point** (*float array of 3 items in [-inf, inf], (optional)*) – Point
- **snap\_align** (*boolean, (optional)*) – Align with Point Normal
- **snap\_normal** (*float array of 3 items in [-inf, inf], (optional)*) – Normal
- **release\_confirm** (*boolean, (optional)*) – Confirm on Release, Always confirm operation when releasing button

bpy.ops.transform.edge\_slide(*value*=0.0, *mirror*=*False*, *snap*=*False*, *snap\_target*=‘CLOSEST’,  
*snap\_point*=(0.0, 0.0, 0.0), *snap\_align*=*False*, *snap\_normal*=(0.0,  
0.0, 0.0), *correct\_uv*=*False*, *release\_confirm*=*False*)

Slide an edge loop along a mesh

### Parameters

- **value** (*float in [-1, 1], (optional)*) – Factor
- **mirror** (*boolean, (optional)*) – Mirror Editing
- **snap** (*boolean, (optional)*) – Use Snapping Options
- **snap\_target** (*enum in [‘CLOSEST’, ‘CENTER’, ‘MEDIAN’, ‘ACTIVE’], (optional)*) – Target
- **snap\_point** (*float array of 3 items in [-inf, inf], (optional)*) – Point
- **snap\_align** (*boolean, (optional)*) – Align with Point Normal
- **snap\_normal** (*float array of 3 items in [-inf, inf], (optional)*) – Normal
- **correct\_uv** (*boolean, (optional)*) – Correct UV coords when transforming
- **release\_confirm** (*boolean, (optional)*) – Confirm on Release, Always confirm operation when releasing button

```
bpy.ops.transform.mirror(constraint_axis=(False, False, False), constraint_orientation='', proportional='DISABLED', proportional_edit_falloff='SMOOTH', proportional_size=1.0, release_confirm=False)
```

Mirror selected vertices around one or more axes

#### Parameters

- **constraint\_axis** (*boolean array of 3 items, (optional)*) – Constraint Axis
- **constraint\_orientation** (*enum in [], (optional)*) – Orientation, Transformation orientation
- **proportional** (*enum in ['DISABLED', 'ENABLED', 'CONNECTED'], (optional)*) – Proportional Editing
- **proportional\_edit\_falloff** (*enum in ['SMOOTH', 'SPHERE', 'ROOT', 'SHARP', 'LINEAR', 'CONSTANT', 'RANDOM'], (optional)*) – Proportional Editing Falloff, Falloff type for proportional editing mode.
- **proportional\_size** (*float in [1e-05, inf], (optional)*) – Proportional Size
- **release\_confirm** (*boolean, (optional)*) – Confirm on Release, Always confirm operation when releasing button

```
bpy.ops.transform.push_pull(value=0.0, mirror=False, proportional='DISABLED', proportional_edit_falloff='SMOOTH', proportional_size=1.0, snap=False, snap_target='CLOSEST', snap_point=(0.0, 0.0, 0.0), snap_align=False, snap_normal=(0.0, 0.0, 0.0), release_confirm=False)
```

Push/Pull selected items

#### Parameters

- **value** (*float in [-inf, inf], (optional)*) – Distance
- **mirror** (*boolean, (optional)*) – Mirror Editing
- **proportional** (*enum in ['DISABLED', 'ENABLED', 'CONNECTED'], (optional)*) – Proportional Editing
- **proportional\_edit\_falloff** (*enum in ['SMOOTH', 'SPHERE', 'ROOT', 'SHARP', 'LINEAR', 'CONSTANT', 'RANDOM'], (optional)*) – Proportional Editing Falloff, Falloff type for proportional editing mode.
- **proportional\_size** (*float in [1e-05, inf], (optional)*) – Proportional Size
- **snap** (*boolean, (optional)*) – Use Snapping Options
- **snap\_target** (*enum in ['CLOSEST', 'CENTER', 'MEDIAN', 'ACTIVE'], (optional)*) – Target
- **snap\_point** (*float array of 3 items in [-inf, inf], (optional)*) – Point
- **snap\_align** (*boolean, (optional)*) – Align with Point Normal
- **snap\_normal** (*float array of 3 items in [-inf, inf], (optional)*) – Normal
- **release\_confirm** (*boolean, (optional)*) – Confirm on Release, Always confirm operation when releasing button

```
bpy.ops.transform.resize(value=(1.0, 1.0, 1.0), constraint_axis=(False, False, False), constraint_orientation='', mirror=False, proportional='DISABLED', proportional_edit_falloff='SMOOTH', proportional_size=1.0, snap=False, snap_target='CLOSEST', snap_point=(0.0, 0.0, 0.0), snap_align=False, snap_normal=(0.0, 0.0, 0.0), texture_space=False, release_confirm=False)
```

Resize selected items

#### Parameters

- **value** (*float array of 3 items in [-inf, inf], (optional)*) – Vector
- **constraint\_axis** (*boolean array of 3 items, (optional)*) – Constraint Axis
- **constraint\_orientation** (*enum in [], (optional)*) – Orientation, Transformation orientation
- **mirror** (*boolean, (optional)*) – Mirror Editing
- **proportional** (*enum in ['DISABLED', 'ENABLED', 'CONNECTED'], (optional)*) – Proportional Editing
- **proportional\_edit\_falloff** (*enum in ['SMOOTH', 'SPHERE', 'ROOT', 'SHARP', 'LINEAR', 'CONSTANT', 'RANDOM'], (optional)*) – Proportional Editing Falloff, Falloff type for proportional editing mode.
- **proportional\_size** (*float in [1e-05, inf], (optional)*) – Proportional Size
- **snap** (*boolean, (optional)*) – Use Snapping Options
- **snap\_target** (*enum in ['CLOSEST', 'CENTER', 'MEDIAN', 'ACTIVE'], (optional)*) – Target
- **snap\_point** (*float array of 3 items in [-inf, inf], (optional)*) – Point
- **snap\_align** (*boolean, (optional)*) – Align with Point Normal
- **snap\_normal** (*float array of 3 items in [-inf, inf], (optional)*) – Normal
- **texture\_space** (*boolean, (optional)*) – Edit Object data texture space
- **release\_confirm** (*boolean, (optional)*) – Confirm on Release, Always confirm operation when releasing button

```
bpy.ops.transform.rotate(value=(0.0), axis=(0.0, 0.0, 0.0), constraint_axis=(False, False, False), constraint_orientation='', mirror=False, proportional='DISABLED', proportional_edit_falloff='SMOOTH', proportional_size=1.0, snap=False, snap_target='CLOSEST', snap_point=(0.0, 0.0, 0.0), snap_align=False, snap_normal=(0.0, 0.0, 0.0), release_confirm=False)
```

Rotate selected items

#### Parameters

- **value** (*float array of 1 items in [-inf, inf], (optional)*) – Angle
- **axis** (*float array of 3 items in [-inf, inf], (optional)*) – Axis, The axis around which the transformation occurs
- **constraint\_axis** (*boolean array of 3 items, (optional)*) – Constraint Axis
- **constraint\_orientation** (*enum in [], (optional)*) – Orientation, Transformation orientation
- **mirror** (*boolean, (optional)*) – Mirror Editing
- **proportional** (*enum in ['DISABLED', 'ENABLED', 'CONNECTED'], (optional)*) – Proportional Editing
- **proportional\_edit\_falloff** (*enum in ['SMOOTH', 'SPHERE', 'ROOT', 'SHARP', 'LINEAR', 'CONSTANT', 'RANDOM'], (optional)*) – Proportional Editing Falloff, Falloff type for proportional editing mode.
- **proportional\_size** (*float in [1e-05, inf], (optional)*) – Proportional Size
- **snap** (*boolean, (optional)*) – Use Snapping Options

- **snap\_target** (*enum in [‘CLOSEST’, ‘CENTER’, ‘MEDIAN’, ‘ACTIVE’], (optional)*) – Target
- **snap\_point** (*float array of 3 items in [-inf, inf], (optional)*) – Point
- **snap\_align** (*boolean, (optional)*) – Align with Point Normal
- **snap\_normal** (*float array of 3 items in [-inf, inf], (optional)*) – Normal
- **release\_confirm** (*boolean, (optional)*) – Confirm on Release, Always confirm operation when releasing button

```
bpy.ops.transform.select_orientation(orientation='')
```

Select transformation orientation

**Parameters** **orientation** (*enum in [], (optional)*) – Orientation, Transformation orientation

```
bpy.ops.transform.seq_slide(value=(1.0, 1.0), snap=False, snap_target='CLOSEST', snap_point=(0.0, 0.0, 0.0), snap_align=False, snap_normal=(0.0, 0.0, 0.0), release_confirm=False)
```

Slide a sequence strip in time

**Parameters**

- **value** (*float array of 2 items in [-inf, inf], (optional)*) – angle
- **snap** (*boolean, (optional)*) – Use Snapping Options
- **snap\_target** (*enum in [‘CLOSEST’, ‘CENTER’, ‘MEDIAN’, ‘ACTIVE’], (optional)*) – Target
- **snap\_point** (*float array of 3 items in [-inf, inf], (optional)*) – Point
- **snap\_align** (*boolean, (optional)*) – Align with Point Normal
- **snap\_normal** (*float array of 3 items in [-inf, inf], (optional)*) – Normal
- **release\_confirm** (*boolean, (optional)*) – Confirm on Release, Always confirm operation when releasing button

```
bpy.ops.transform.shear(value=0.0, mirror=False, proportional='DISABLED', proportional_edit_falloff='SMOOTH', proportional_size=1.0, snap=False, snap_target='CLOSEST', snap_point=(0.0, 0.0, 0.0), snap_align=False, snap_normal=(0.0, 0.0, 0.0), release_confirm=False)
```

Shear selected items along the horizontal screen axis

**Parameters**

- **value** (*float in [-inf, inf], (optional)*) – Offset
- **mirror** (*boolean, (optional)*) – Mirror Editing
- **proportional** (*enum in [‘DISABLED’, ‘ENABLED’, ‘CONNECTED’], (optional)*) – Proportional Editing
- **proportional\_edit\_falloff** (*enum in [‘SMOOTH’, ‘SPHERE’, ‘ROOT’, ‘SHARP’, ‘LINEAR’, ‘CONSTANT’, ‘RANDOM’], (optional)*) – Proportional Editing Falloff, Falloff type for proportional editing mode.
- **proportional\_size** (*float in [1e-05, inf], (optional)*) – Proportional Size
- **snap** (*boolean, (optional)*) – Use Snapping Options
- **snap\_target** (*enum in [‘CLOSEST’, ‘CENTER’, ‘MEDIAN’, ‘ACTIVE’], (optional)*) – Target
- **snap\_point** (*float array of 3 items in [-inf, inf], (optional)*) – Point

- **snap\_align** (*boolean, (optional)*) – Align with Point Normal
- **snap\_normal** (*float array of 3 items in [-inf, inf], (optional)*) – Normal
- **release\_confirm** (*boolean, (optional)*) – Confirm on Release, Always confirm operation when releasing button

```
bpy.ops.transform.shrink_fatten(value=0.0, mirror=False, proportional='DISABLED', proportional_edit_falloff='SMOOTH', proportional_size=1.0, snap=False, snap_target='CLOSEST', snap_point=(0.0, 0.0, 0.0), snap_align=False, snap_normal=(0.0, 0.0, 0.0), release_confirm=False)
```

Shrink/fatten selected vertices along normals

#### Parameters

- **value** (*float in [-inf, inf], (optional)*) – Offset
- **mirror** (*boolean, (optional)*) – Mirror Editing
- **proportional** (*enum in ['DISABLED', 'ENABLED', 'CONNECTED'], (optional)*) – Proportional Editing
- **proportional\_edit\_falloff** (*enum in ['SMOOTH', 'SPHERE', 'ROOT', 'SHARP', 'LINEAR', 'CONSTANT', 'RANDOM'], (optional)*) – Proportional Editing Falloff, Falloff type for proportional editing mode.
- **proportional\_size** (*float in [1e-05, inf], (optional)*) – Proportional Size
- **snap** (*boolean, (optional)*) – Use Snapping Options
- **snap\_target** (*enum in ['CLOSEST', 'CENTER', 'MEDIAN', 'ACTIVE'], (optional)*) – Target
- **snap\_point** (*float array of 3 items in [-inf, inf], (optional)*) – Point
- **snap\_align** (*boolean, (optional)*) – Align with Point Normal
- **snap\_normal** (*float array of 3 items in [-inf, inf], (optional)*) – Normal
- **release\_confirm** (*boolean, (optional)*) – Confirm on Release, Always confirm operation when releasing button

```
bpy.ops.transform.snap_type(type='INCREMENT')
```

Set the snap element type

**Parameters** **type** (*enum in ['INCREMENT', 'VERTEX', 'EDGE', 'FACE', 'VOLUME'], (optional)*)  
– Type, Set the snap element type

```
bpy.ops.transform.tilt(value=(0.0), constraint_axis=(False, False, False), constraint_orientation='', mirror=False, proportional='DISABLED', proportional_edit_falloff='SMOOTH', proportional_size=1.0, snap=False, snap_target='CLOSEST', snap_point=(0.0, 0.0, 0.0), snap_align=False, snap_normal=(0.0, 0.0, 0.0), release_confirm=False)
```

Tilt selected control vertices of 3d curve

#### Parameters

- **value** (*float array of 1 items in [-inf, inf], (optional)*) – Angle
- **constraint\_axis** (*boolean array of 3 items, (optional)*) – Constraint Axis
- **constraint\_orientation** (*enum in [], (optional)*) – Orientation, Transformation orientation
- **mirror** (*boolean, (optional)*) – Mirror Editing

- **proportional** (*enum in ['DISABLED', 'ENABLED', 'CONNECTED']*, *(optional)*) – Proportional Editing
- **proportional\_edit\_falloff** (*enum in ['SMOOTH', 'SPHERE', 'ROOT', 'SHARP', 'LINEAR', 'CONSTANT', 'RANDOM']*, *(optional)*) – Proportional Editing Falloff, Falloff type for proportional editing mode.
- **proportional\_size** (*float in [1e-05, inf]*, *(optional)*) – Proportional Size
- **snap** (*boolean*, *(optional)*) – Use Snapping Options
- **snap\_target** (*enum in ['CLOSEST', 'CENTER', 'MEDIAN', 'ACTIVE']*, *(optional)*) – Target
- **snap\_point** (*float array of 3 items in [-inf, inf]*, *(optional)*) – Point
- **snap\_align** (*boolean*, *(optional)*) – Align with Point Normal
- **snap\_normal** (*float array of 3 items in [-inf, inf]*, *(optional)*) – Normal
- **release\_confirm** (*boolean*, *(optional)*) – Confirm on Release, Always confirm operation when releasing button

```
bpy.ops.transform.tosphere(value=0.0, mirror=False, proportional='DISABLED', proportional_edit_falloff='SMOOTH', proportional_size=1.0, snap=False, snap_target='CLOSEST', snap_point=(0.0, 0.0, 0.0), snap_align=False, snap_normal=(0.0, 0.0, 0.0), release_confirm=False)
```

Move selected vertices outward in a spherical shape around mesh center

#### Parameters

- **value** (*float in [0, 1]*, *(optional)*) – Factor
- **mirror** (*boolean*, *(optional)*) – Mirror Editing
- **proportional** (*enum in ['DISABLED', 'ENABLED', 'CONNECTED']*, *(optional)*) – Proportional Editing
- **proportional\_edit\_falloff** (*enum in ['SMOOTH', 'SPHERE', 'ROOT', 'SHARP', 'LINEAR', 'CONSTANT', 'RANDOM']*, *(optional)*) – Proportional Editing Falloff, Falloff type for proportional editing mode.
- **proportional\_size** (*float in [1e-05, inf]*, *(optional)*) – Proportional Size
- **snap** (*boolean*, *(optional)*) – Use Snapping Options
- **snap\_target** (*enum in ['CLOSEST', 'CENTER', 'MEDIAN', 'ACTIVE']*, *(optional)*) – Target
- **snap\_point** (*float array of 3 items in [-inf, inf]*, *(optional)*) – Point
- **snap\_align** (*boolean*, *(optional)*) – Align with Point Normal
- **snap\_normal** (*float array of 3 items in [-inf, inf]*, *(optional)*) – Normal
- **release\_confirm** (*boolean*, *(optional)*) – Confirm on Release, Always confirm operation when releasing button

```
bpy.ops.transform.trackball(value=(1.0, 1.0), mirror=False, proportional='DISABLED', proportional_edit_falloff='SMOOTH', proportional_size=1.0, snap=False, snap_target='CLOSEST', snap_point=(0.0, 0.0, 0.0), snap_align=False, snap_normal=(0.0, 0.0, 0.0), release_confirm=False)
```

Trackball style rotation of selected items

## Parameters

- **value** (*float array of 2 items in [-inf, inf], (optional)*) – angle
- **mirror** (*boolean, (optional)*) – Mirror Editing
- **proportional** (*enum in ['DISABLED', 'ENABLED', 'CONNECTED'], (optional)*) – Proportional Editing
- **proportional\_edit\_falloff** (*enum in ['SMOOTH', 'SPHERE', 'ROOT', 'SHARP', 'LINEAR', 'CONSTANT', 'RANDOM'], (optional)*) – Proportional Editing Falloff, Falloff type for proportional editing mode.
- **proportional\_size** (*float in [1e-05, inf], (optional)*) – Proportional Size
- **snap** (*boolean, (optional)*) – Use Snapping Options
- **snap\_target** (*enum in ['CLOSEST', 'CENTER', 'MEDIAN', 'ACTIVE'], (optional)*) – Target
- **snap\_point** (*float array of 3 items in [-inf, inf], (optional)*) – Point
- **snap\_align** (*boolean, (optional)*) – Align with Point Normal
- **snap\_normal** (*float array of 3 items in [-inf, inf], (optional)*) – Normal
- **release\_confirm** (*boolean, (optional)*) – Confirm on Release, Always confirm operation when releasing button

```
bpy.ops.transform.transform(mode='TRANSLATION', value=(0.0, 0.0, 0.0, 0.0), axis=(0.0, 0.0, 0.0), constraint_axis=(False, False, False), constraint_orientation='', mirror=False, proportional='DISABLED', proportional_edit_falloff='SMOOTH', proportional_size=1.0, snap=False, snap_target='CLOSEST', snap_point=(0.0, 0.0, 0.0), snap_align=False, snap_normal=(0.0, 0.0, 0.0), release_confirm=False)
```

Transform selected items by mode type

## Parameters

- **mode** (*enum in ['INIT', 'DUMMY', 'TRANSLATION', 'ROTATION', 'RESIZE', 'TOSPHERE', 'SHEAR', 'WARP', 'SHRINKFATTEN', 'TILT', 'TRACKBALL', 'PUSHPULL', 'CREASE', 'MIRROR', 'BONE\_SIZE', 'BONE\_ENVELOPE', 'CURVE\_SHRINKFATTEN', 'BONE\_ROLL', 'TIME\_TRANSLATE', 'TIME\_SLIDE', 'TIME\_SCALE', 'TIME\_EXTEND', 'BAKE\_TIME', 'BEVEL', 'BWEIGHT', 'ALIGN', 'EDGESLIDE', 'SEQSLIDE'], (optional)*) – Mode
- **value** (*float array of 4 items in [-inf, inf], (optional)*) – Values
- **axis** (*float array of 3 items in [-inf, inf], (optional)*) – Axis, The axis around which the transformation occurs
- **constraint\_axis** (*boolean array of 3 items, (optional)*) – Constraint Axis
- **constraint\_orientation** (*enum in [], (optional)*) – Orientation, Transformation orientation
- **mirror** (*boolean, (optional)*) – Mirror Editing
- **proportional** (*enum in ['DISABLED', 'ENABLED', 'CONNECTED'], (optional)*) – Proportional Editing
- **proportional\_edit\_falloff** (*enum in ['SMOOTH', 'SPHERE', 'ROOT', 'SHARP', 'LINEAR', 'CONSTANT', 'RANDOM'], (optional)*) – Proportional Editing Falloff, Falloff type for proportional editing mode.

- **proportional\_size** (*float in [1e-05, inf], (optional)*) – Proportional Size
- **snap** (*boolean, (optional)*) – Use Snapping Options
- **snap\_target** (*enum in ['CLOSEST', 'CENTER', 'MEDIAN', 'ACTIVE'], (optional)*) – Target
- **snap\_point** (*float array of 3 items in [-inf, inf], (optional)*) – Point
- **snap\_align** (*boolean, (optional)*) – Align with Point Normal
- **snap\_normal** (*float array of 3 items in [-inf, inf], (optional)*) – Normal
- **release\_confirm** (*boolean, (optional)*) – Confirm on Release, Always confirm operation when releasing button

```
bpy.ops.transform.translate(value=(0.0, 0.0, 0.0), constraint_axis=(False, False, False), constraint_orientation='', mirror=False, proportional='DISABLED', proportional_edit_falloff='SMOOTH', proportional_size=1.0, snap=False, snap_target='CLOSEST', snap_point=(0.0, 0.0, 0.0), snap_align=False, snap_normal=(0.0, 0.0, 0.0), texture_space=False, release_confirm=False)
```

Translate selected items

#### Parameters

- **value** (*float array of 3 items in [-inf, inf], (optional)*) – Vector
- **constraint\_axis** (*boolean array of 3 items, (optional)*) – Constraint Axis
- **constraint\_orientation** (*enum in [], (optional)*) – Orientation, Transformation orientation
- **mirror** (*boolean, (optional)*) – Mirror Editing
- **proportional** (*enum in ['DISABLED', 'ENABLED', 'CONNECTED'], (optional)*) – Proportional Editing
- **proportional\_edit\_falloff** (*enum in ['SMOOTH', 'SPHERE', 'ROOT', 'SHARP', 'LINEAR', 'CONSTANT', 'RANDOM'], (optional)*) – Proportional Editing Falloff, Falloff type for proportional editing mode.
- **proportional\_size** (*float in [1e-05, inf], (optional)*) – Proportional Size
- **snap** (*boolean, (optional)*) – Use Snapping Options
- **snap\_target** (*enum in ['CLOSEST', 'CENTER', 'MEDIAN', 'ACTIVE'], (optional)*) – Target
- **snap\_point** (*float array of 3 items in [-inf, inf], (optional)*) – Point
- **snap\_align** (*boolean, (optional)*) – Align with Point Normal
- **snap\_normal** (*float array of 3 items in [-inf, inf], (optional)*) – Normal
- **texture\_space** (*boolean, (optional)*) – Edit Object data texture space
- **release\_confirm** (*boolean, (optional)*) – Confirm on Release, Always confirm operation when releasing button

```
bpy.ops.transform.warp(value=(0.0), mirror=False, proportional='DISABLED', proportional_edit_falloff='SMOOTH', proportional_size=1.0, snap=False, snap_target='CLOSEST', snap_point=(0.0, 0.0, 0.0), snap_align=False, snap_normal=(0.0, 0.0, 0.0), release_confirm=False)
```

Warp selected items around the cursor

#### Parameters

- **value** (*float array of 1 items in [-inf, inf], (optional)*) – Angle
- **mirror** (*boolean, (optional)*) – Mirror Editing
- **proportional** (*enum in ['DISABLED', 'ENABLED', 'CONNECTED'], (optional)*) – Proportional Editing
- **proportional\_edit\_falloff** (*enum in ['SMOOTH', 'SPHERE', 'ROOT', 'SHARP', 'LINEAR', 'CONSTANT', 'RANDOM'], (optional)*) – Proportional Editing Falloff, Falloff type for proportional editing mode.
- **proportional\_size** (*float in [1e-05, inf], (optional)*) – Proportional Size
- **snap** (*boolean, (optional)*) – Use Snapping Options
- **snap\_target** (*enum in ['CLOSEST', 'CENTER', 'MEDIAN', 'ACTIVE'], (optional)*) – Target
- **snap\_point** (*float array of 3 items in [-inf, inf], (optional)*) – Point
- **snap\_align** (*boolean, (optional)*) – Align with Point Normal
- **snap\_normal** (*float array of 3 items in [-inf, inf], (optional)*) – Normal
- **release\_confirm** (*boolean, (optional)*) – Confirm on Release, Always confirm operation when releasing button

## Ui Operators

bpy.ops.ui.copy\_data\_path\_button()

Copy the RNA data path for this property to the clipboard

bpy.ops.ui.copy\_to\_selected\_button(*all=True*)

Copy property from this object to selected objects or bones

**Parameters** **all** (*boolean, (optional)*) – All, Reset to default values all elements of the array.

bpy.ops.ui.eyedropper()

Sample a color from the Blender Window to store in a property

bpy.ops.ui.reports\_to\_textblock()

Write the reports

bpy.ops.ui.reset\_default\_button(*all=True*)

Reset this property's value to its default value

**Parameters** **all** (*boolean, (optional)*) – All, Reset to default values all elements of the array.

bpy.ops.ui.reset\_default\_theme()

Reset to the default theme colors

## Uv Operators

bpy.ops.uv.align(*axis='ALIGN\_AUTO'*)

Align selected UV vertices to an axis

**Parameters** **axis** (*enum in ['ALIGN\_S', 'ALIGN\_T', 'ALIGN\_U', 'ALIGN\_AUTO', 'ALIGN\_X', 'ALIGN\_Y'], (optional)*) – Axis, Axis to align UV locations on.

bpy.ops.uv.average\_islands\_scale()

Undocumented ([contribute](#))

bpy.ops.uv.**circle\_select** (*x=0, y=0, radius=0, gesture\_mode=0*)

Select UV vertices using circle selection

#### Parameters

- **x** (*int in [-inf, inf], (optional)*) – X
- **y** (*int in [-inf, inf], (optional)*) – Y
- **radius** (*int in [-inf, inf], (optional)*) – Radius
- **gesture\_mode** (*int in [-inf, inf], (optional)*) – Gesture Mode

bpy.ops.uv.**cube\_project** (*cube\_size=1.0, correct\_aspect=True, clip\_to\_bounds=False, scale\_to\_bounds=False*)

Undocumented (contribute)

#### Parameters

- **cube\_size** (*float in [0, inf], (optional)*) – Cube Size, Size of the cube to project on.
- **correct\_aspect** (*boolean, (optional)*) – Correct Aspect, Map UV's taking image aspect ratio into account.
- **clip\_to\_bounds** (*boolean, (optional)*) – Clip to Bounds, Clip UV coordinates to bounds after unwrapping.
- **scale\_to\_bounds** (*boolean, (optional)*) – Scale to Bounds, Scale UV coordinates to bounds after unwrapping.

bpy.ops.uv.**cursor\_set** (*location=(0.0, 0.0)*)

Set 2D cursor location

**Parameters** **location** (*float array of 2 items in [-inf, inf], (optional)*) – Location, Cursor location in 0.0-1.0 coordinates.

bpy.ops.uv.**cylinder\_project** (*direction='VIEW\_ON\_EQUATOR', align='POLAR\_ZX', radius=1.0, correct\_aspect=True, clip\_to\_bounds=False, scale\_to\_bounds=False*)

Undocumented (contribute)

#### Parameters

- **direction** (*enum in ['VIEW\_ON\_EQUATOR', 'VIEW\_ON\_POLES', 'ALIGN\_TO\_OBJECT'], (optional)*) – Direction, Direction of the sphere or cylinder.
- **align** (*enum in ['POLAR\_ZX', 'POLAR\_ZY'], (optional)*) – Align, How to determine rotation around the pole.
- **radius** (*float in [0, inf], (optional)*) – Radius, Radius of the sphere or cylinder.
- **correct\_aspect** (*boolean, (optional)*) – Correct Aspect, Map UV's taking image aspect ratio into account.
- **clip\_to\_bounds** (*boolean, (optional)*) – Clip to Bounds, Clip UV coordinates to bounds after unwrapping.
- **scale\_to\_bounds** (*boolean, (optional)*) – Scale to Bounds, Scale UV coordinates to bounds after unwrapping.

bpy.ops.uv.**export\_layout** (*filepath=""*, *check\_existing=True*, *export\_all=False*, *mode='PNG'*, *size=(1024, 1024)*, *opacity=0.25*)

Export UV layout to file

#### Parameters

- **filepath** (*string, (optional)*) – File Path, File path used for exporting the SVG file

- **check\_existing** (*boolean, (optional)*) – Check Existing, Check and warn on overwriting existing files
- **export\_all** (*boolean, (optional)*) – All UV’s, Export all UVs in this mesh (not just visible ones)
- **mode** (*enum in [‘SVG’, ‘EPS’, ‘PNG’], (optional)*) – Format, File format to export the UV layout to
- **size** (*int array of 2 items in [8, 32768], (optional)*) – Dimensions of the exported file
- **opacity** (*float in [0, 1], (optional)*) – Fill Opacity

**File** addons/io\_mesh\_uv\_layout/\_\_init\_\_.py:167

bpy.ops.uv.follow\_active\_quads(*mode=’LENGTH’*)

Follow UVs from active quads along continuous face loops

**Parameters** **mode** (*enum in [‘EVEN’, ‘LENGTH’], (optional)*) – Edge Length Mode, Method to space UV edge loops

**File** startup/bl\_operators/uvcalc\_follow\_active.py:246

bpy.ops.uv.hide(*unselected=False*)

Hide (un)selected UV vertices

**Parameters** **unselected** (*boolean, (optional)*) – Unselected, Hide unselected rather than selected.

bpy.ops.uv.lightmap\_pack(*PREF\_CONTEXT=’SEL\_FACES’, PREF\_NEW\_UVLAYER=False, PREF\_IMG\_PX\_SIZE=512, PREF\_MARGIN\_DIV=0.1*)

*PREF\_PACK\_IN\_ONE=True, PREF\_APPLY\_IMAGE=False, PREF\_BOX\_DIV=12,*

Follow UVs from active quads along continuous face loops

**Parameters**

- **PREF\_CONTEXT** (*enum in [‘SEL\_FACES’, ‘ALL\_FACES’, ‘ALL\_OBJECTS’], (optional)*) – Selection
- **PREF\_PACK\_IN\_ONE** (*boolean, (optional)*) – Share Tex Space, Objects Share texture space, map all objects into 1 uvmap
- **PREF\_NEW\_UVLAYER** (*boolean, (optional)*) – New UV Layer, Create a new UV layer for every mesh packed
- **PREF\_APPLY\_IMAGE** (*boolean, (optional)*) – New Image, Assign new images for every mesh (only one if shared tex space enabled)
- **PREF\_IMG\_PX\_SIZE** (*int in [64, 5000], (optional)*) – Image Size, Width and Height for the new image
- **PREF\_BOX\_DIV** (*int in [1, 48], (optional)*) – Pack Quality, Pre Packing before the complex boxpack
- **PREF\_MARGIN\_DIV** (*float in [0.001, 1], (optional)*) – Margin, Size of the margin as a division of the UV

**File** startup/bl\_operators/uvcalc\_lightmap.py:599

bpy.ops.uv.minimize\_stretch(*fill\_holes=True, blend=0.0, iterations=0*)

Reduce UV stretching by relaxing angles

**Parameters**

- **fill\_holes** (*boolean, (optional)*) – Fill Holes, Virtual fill holes in mesh before unwrapping, to better avoid overlaps and preserve symmetry.

- **blend** (*float in [0, 1], (optional)*) – Blend, Blend factor between stretch minimized and original.
- **iterations** (*int in [0, inf], (optional)*) – Iterations, Number of iterations to run, 0 is unlimited when run interactively.

bpy.ops.uv.**pack\_islands** (*margin=0.0*)

Undocumented ([contribute](#))

**Parameters** **margin** (*float in [0, 1], (optional)*) – Margin, Space between islands

bpy.ops.uv.**pin** (*clear=False*)

Set/clear selected UV vertices as anchored between multiple unwrap operations

**Parameters** **clear** (*boolean, (optional)*) – Clear, Clear pinning for the selection instead of setting it.

bpy.ops.uv.**project\_from\_view** (*orthographic=False, correct\_aspect=True, clip\_to\_bounds=False, scale\_to\_bounds=False*)

Undocumented ([contribute](#))

#### Parameters

- **orthographic** (*boolean, (optional)*) – Orthographic, Use orthographic projection.
- **correct\_aspect** (*boolean, (optional)*) – Correct Aspect, Map UV's taking image aspect ratio into account.
- **clip\_to\_bounds** (*boolean, (optional)*) – Clip to Bounds, Clip UV coordinates to bounds after unwrapping.
- **scale\_to\_bounds** (*boolean, (optional)*) – Scale to Bounds, Scale UV coordinates to bounds after unwrapping.

bpy.ops.uv.**reset** ()

Undocumented ([contribute](#))

bpy.ops.uv.**reveal** ()

Reveal all hidden UV vertices

bpy.ops.uv.**select** (*extend=False, location=(0.0, 0.0)*)

Select UV vertices

#### Parameters

- **extend** (*boolean, (optional)*) – Extend, Extend selection rather than clearing the existing selection.
- **location** (*float array of 2 items in [-inf, inf], (optional)*) – Location, Mouse location in normalized coordinates, 0.0 to 1.0 is within the image bounds.

bpy.ops.uv.**select\_all** (*action='TOGGLE'*)

Change selection of all UV vertices

**Parameters** **action** (*enum in ['TOGGLE', 'SELECT', 'DESELECT', 'INVERT'], (optional)*) – Action, Selection action to execute

bpy.ops.uv.**select\_border** (*pinned=False, gesture\_mode=0, xmin=0, xmax=0, ymin=0, ymax=0*)

Select UV vertices using border selection

#### Parameters

- **pinned** (*boolean, (optional)*) – Pinned, Border select pinned UVs only.
- **gesture\_mode** (*int in [-inf, inf], (optional)*) – Gesture Mode
- **xmin** (*int in [-inf, inf], (optional)*) – X Min

- **xmax** (*int in [-inf, inf], (optional)*) – X Max
- **ymin** (*int in [-inf, inf], (optional)*) – Y Min
- **ymax** (*int in [-inf, inf], (optional)*) – Y Max

bpy.ops.uv.**select\_linked**(*extend=False*)

Select all UV vertices linked to the active UV map

**Parameters** **extend** (*boolean, (optional)*) – Extend, Extend selection rather than clearing the existing selection.

bpy.ops.uv.**select\_linked\_pick**(*extend=False, location=(0.0, 0.0)*)

Select all UV vertices linked under the mouse

#### Parameters

- **extend** (*boolean, (optional)*) – Extend, Extend selection rather than clearing the existing selection.
- **location** (*float array of 2 items in [-inf, inf], (optional)*) – Location, Mouse location in normalized coordinates, 0.0 to 1.0 is within the image bounds.

bpy.ops.uv.**select\_loop**(*extend=False, location=(0.0, 0.0)*)

Select a loop of connected UV vertices

#### Parameters

- **extend** (*boolean, (optional)*) – Extend, Extend selection rather than clearing the existing selection.
- **location** (*float array of 2 items in [-inf, inf], (optional)*) – Location, Mouse location in normalized coordinates, 0.0 to 1.0 is within the image bounds.

bpy.ops.uv.**select\_pinned**()

Select all pinned UV vertices

bpy.ops.uv.**smart\_project**(*angle\_limit=66.0, island\_margin=0.0, user\_area\_weight=0.0*)

This script projection unwraps the selected faces of a mesh. It operates on all selected mesh objects, and can be used unwrap selected faces, or all faces.

#### Parameters

- **angle\_limit** (*float in [1, 89], (optional)*) – Angle Limit, lower for more projection groups, higher for less distortion
- **island\_margin** (*float in [0, 1], (optional)*) – Island Margin, Margin to reduce bleed from adjacent islands
- **user\_area\_weight** (*float in [0, 1], (optional)*) – Area Weight, Weight projections vector by faces with larger areas

**File** startup/bl\_operators/uvcalc\_smart\_project.py:1136

bpy.ops.uv.**snap\_cursor**(*target='PIXELS'*)

Snap cursor to target type

**Parameters** **target** (*enum in ['PIXELS', 'SELECTED'], (optional)*) – Target, Target to snap the selected UV's to.

bpy.ops.uv.**snap\_selected**(*target='PIXELS'*)

Snap selected UV vertices to target type

**Parameters** **target** (*enum in ['PIXELS', 'CURSOR', 'ADJACENT\_UNSELECTED'], (optional)*) – Target, Target to snap the selected UV's to.

bpy.ops.uv.**sphere\_project** (*direction='VIEW\_ON\_EQUATOR', align='POLAR\_ZX', correct\_aspect=True, clip\_to\_bounds=False, scale\_to\_bounds=False*)  
Undocumented (contribute)

#### Parameters

- **direction** (*enum in ['VIEW\_ON\_EQUATOR', 'VIEW\_ON\_POLES', 'ALIGN\_TO\_OBJECT']*, *(optional)*) – Direction, Direction of the sphere or cylinder.
- **align** (*enum in ['POLAR\_ZX', 'POLAR\_ZY']*, *(optional)*) – Align, How to determine rotation around the pole.
- **correct\_aspect** (*boolean, (optional)*) – Correct Aspect, Map UV's taking image aspect ratio into account.
- **clip\_to\_bounds** (*boolean, (optional)*) – Clip to Bounds, Clip UV coordinates to bounds after unwrapping.
- **scale\_to\_bounds** (*boolean, (optional)*) – Scale to Bounds, Scale UV coordinates to bounds after unwrapping.

bpy.ops.uv.**stitch** (*use\_limit=True, limit=0.01*)  
Stitch selected UV vertices by proximity

#### Parameters

- **use\_limit** (*boolean, (optional)*) – Use Limit, Stitch UVs within a specified limit distance.
- **limit** (*float in [0, inf]*, *(optional)*) – Limit, Limit distance in normalized coordinates.

bpy.ops.uv.**tile\_set** (*tile=(0, 0)*)  
Set UV image tile coordinates

**Parameters** **tile** (*int array of 2 items in [0, inf], (optional)*) – Tile, Tile coordinate.

bpy.ops.uv.**unlink\_selected**()  
Unlink selected UV vertices from active UV map

bpy.ops.uv.**unwrap** (*method='ANGLE\_BASED', fill\_holes=True, correct\_aspect=True*)  
Unwrap the mesh of the object being edited

#### Parameters

- **method** (*enum in ['ANGLE\_BASED', 'CONFORMAL']*, *(optional)*) – Method, Unwrapping method. Angle Based usually gives better results than Conformal, while being somewhat slower.
- **fill\_holes** (*boolean, (optional)*) – Fill Holes, Virtual fill holes in mesh before unwrapping, to better avoid overlaps and preserve symmetry.
- **correct\_aspect** (*boolean, (optional)*) – Correct Aspect, Map UV's taking image aspect ratio into account.

bpy.ops.uv.**weld**()  
Weld selected UV vertices together

## View2D Operators

bpy.ops.view2d.**pan** (*deltax=0, deltay=0*)  
Pan the view

#### Parameters

- **deltax** (*int in [-inf, inf]*, *(optional)*) – Delta X

- **deltay** (*int in [-inf, inf], (optional)*) – Delta Y

bpy.ops.view2d.reset()

Reset the view

bpy.ops.view2d.scroll\_down(deltax=0, deltay=0, page=False)

Scroll the view down

#### Parameters

- **deltax** (*int in [-inf, inf], (optional)*) – Delta X
- **deltay** (*int in [-inf, inf], (optional)*) – Delta Y
- **page** (*boolean, (optional)*) – Page, Scroll down one page.

bpy.ops.view2d.scroll\_left(deltax=0, deltay=0)

Scroll the view left

#### Parameters

- **deltax** (*int in [-inf, inf], (optional)*) – Delta X
- **deltay** (*int in [-inf, inf], (optional)*) – Delta Y

bpy.ops.view2d.scroll\_right(deltax=0, deltay=0)

Scroll the view right

#### Parameters

- **deltax** (*int in [-inf, inf], (optional)*) – Delta X
- **deltay** (*int in [-inf, inf], (optional)*) – Delta Y

bpy.ops.view2d.scroll\_up(deltax=0, deltay=0, page=False)

Scroll the view up

#### Parameters

- **deltax** (*int in [-inf, inf], (optional)*) – Delta X
- **deltay** (*int in [-inf, inf], (optional)*) – Delta Y
- **page** (*boolean, (optional)*) – Page, Scroll up one page.

bpy.ops.view2d.scroller\_activate()

Scroll view by mouse click and drag

bpy.ops.view2d.zoom(deltax=0.0, deltay=0.0)

Zoom in/out the view

#### Parameters

- **deltax** (*float in [-inf, inf], (optional)*) – Delta X
- **deltay** (*float in [-inf, inf], (optional)*) – Delta Y

bpy.ops.view2d.zoom\_border(gesture\_mode=0, xmin=0, xmax=0, ymin=0, ymax=0)

Zoom in the view to the nearest item contained in the border

#### Parameters

- **gesture\_mode** (*int in [-inf, inf], (optional)*) – Gesture Mode
- **xmin** (*int in [-inf, inf], (optional)*) – X Min
- **xmax** (*int in [-inf, inf], (optional)*) – X Max
- **ymin** (*int in [-inf, inf], (optional)*) – Y Min

- **ymax** (*int in [-inf, inf], (optional)*) – Y Max

bpy.ops.view2d.**zoom\_in** (zoomfacx=0.0, zoomfacy=0.0)  
Zoom in the view

#### Parameters

- **zoomfacx** (*float in [-inf, inf], (optional)*) – Zoom Factor X
- **zoomfacy** (*float in [-inf, inf], (optional)*) – Zoom Factor Y

bpy.ops.view2d.**zoom\_out** (zoomfacx=0.0, zoomfacy=0.0)  
Zoom out the view

#### Parameters

- **zoomfacx** (*float in [-inf, inf], (optional)*) – Zoom Factor X
- **zoomfacy** (*float in [-inf, inf], (optional)*) – Zoom Factor Y

## View3D Operators

bpy.ops.view3d.**background\_image\_add** (name="Image", filepath="Path")  
Add a new background image

#### Parameters

- **name** (*string, (optional)*) – Name, Image name to assign.
- **filepath** (*string, (optional)*) – Filepath, Path to image file

bpy.ops.view3d.**background\_image\_remove** (index=0)  
Remove a background image from the 3D view

**Parameters** **index** (*int in [0, inf], (optional)*) – Index, Background image index to remove

bpy.ops.view3d.**camera\_to\_view**()  
Set camera view to active view

bpy.ops.view3d.**clip\_border** (xmin=0, xmax=0, ymin=0, ymax=0)  
Set the view clipping border

#### Parameters

- **xmin** (*int in [-inf, inf], (optional)*) – X Min
- **xmax** (*int in [-inf, inf], (optional)*) – X Max
- **ymin** (*int in [-inf, inf], (optional)*) – Y Min
- **ymax** (*int in [-inf, inf], (optional)*) – Y Max

bpy.ops.view3d.**cursor3d**()  
Set the location of the 3D cursor

bpy.ops.view3d.**dolly** (delta=0, mx=0, my=0)  
Dolly in/out in the view

#### Parameters

- **delta** (*int in [-inf, inf], (optional)*) – Delta
- **mx** (*int in [0, inf], (optional)*) – Zoom Position X
- **my** (*int in [0, inf], (optional)*) – Zoom Position Y

bpy.ops.view3d.**edit\_mesh\_extrude\_individual\_move()**  
Extrude individual elements and move

File startup/bl\_ui/space\_view3d.py:1550

bpy.ops.view3d.**edit\_mesh\_extrude\_move\_normal()**  
Extrude and move along normals

File startup/bl\_ui/space\_view3d.py:1579

bpy.ops.view3d.**enable\_manipulator**(translate=False, rotate=False, scale=False)  
Enable the transform manipulator for use

#### Parameters

- **translate** (boolean, (optional)) – Translate, Enable the translate manipulator
- **rotate** (boolean, (optional)) – Rotate, Enable the rotate manipulator
- **scale** (boolean, (optional)) – Scale, Enable the scale manipulator

bpy.ops.view3d.**fly()**  
Interactively fly around the scene

bpy.ops.view3d.**game\_start()**  
Start game engine

bpy.ops.view3d.**layers**(nr=1, extend=False, toggle=True)  
Toggle layer(s) visibility

#### Parameters

- **nr** (int in [0, 20], (optional)) – Number, The layer number to set, zero for all layers
- **extend** (boolean, (optional)) – Extend, Add this layer to the current view layers
- **toggle** (boolean, (optional)) – Toggle, Toggle the layer

bpy.ops.view3d.**localview()**  
Toggle display of selected object(s) separately and centered in view

bpy.ops.view3d.**manipulator**(constraint\_axis=(False, False, False), constraint\_orientation=' ', release\_confirm=False)  
Manipulate selected item by axis

#### Parameters

- **constraint\_axis** (boolean array of 3 items, (optional)) – Constraint Axis
- **constraint\_orientation** (enum in [], (optional)) – Orientation, Transformation orientation
- **release\_confirm** (boolean, (optional)) – Confirm on Release, Always confirm operation when releasing button

bpy.ops.view3d.**move()**  
Move the view

bpy.ops.view3d.**ndof\_orbit()**  
Explore every angle of an object using the 3D mouse.

bpy.ops.view3d.**ndof\_pan()**  
Position your viewpoint with the 3D mouse.

bpy.ops.view3d.**object\_as\_camera()**  
Set the active object as the active camera for this view or scene

```
bpy.ops.view3d.properties()
```

Toggles the properties panel display

```
bpy.ops.view3d.render_border(xmin=0, xmax=0, ymin=0, ymax=0)
```

Set the boundaries of the border render and enables border render

#### Parameters

- **xmin** (*int in [-inf, inf], (optional)*) – X Min
- **xmax** (*int in [-inf, inf], (optional)*) – X Max
- **ymin** (*int in [-inf, inf], (optional)*) – Y Min
- **ymax** (*int in [-inf, inf], (optional)*) – Y Max

```
bpy.ops.view3d.rotate()
```

Rotate the view

```
bpy.ops.view3d.select(extend=False, center=False, enumerate=False, object=False)
```

Activate/select item(s)

#### Parameters

- **extend** (*boolean, (optional)*) – Extend, Extend selection instead of deselecting everything first.
- **center** (*boolean, (optional)*) – Center, Use the object center when selecting, in editmode used to extend object selection.
- **enumerate** (*boolean, (optional)*) – Enumerate, List objects under the mouse (object mode only).
- **object** (*boolean, (optional)*) – Object, Use object selection (editmode only).

```
bpy.ops.view3d.select_border(gesture_mode=0, xmin=0, xmax=0, ymin=0, ymax=0, extend=True)
```

Select items using border selection

#### Parameters

- **gesture\_mode** (*int in [-inf, inf], (optional)*) – Gesture Mode
- **xmin** (*int in [-inf, inf], (optional)*) – X Min
- **xmax** (*int in [-inf, inf], (optional)*) – X Max
- **ymin** (*int in [-inf, inf], (optional)*) – Y Min
- **ymax** (*int in [-inf, inf], (optional)*) – Y Max
- **extend** (*boolean, (optional)*) – Extend, Extend selection instead of deselecting everything first

```
bpy.ops.view3d.select_circle(x=0, y=0, radius=0, gesture_mode=0)
```

Select items using circle selection

#### Parameters

- **x** (*int in [-inf, inf], (optional)*) – X
- **y** (*int in [-inf, inf], (optional)*) – Y
- **radius** (*int in [-inf, inf], (optional)*) – Radius
- **gesture\_mode** (*int in [-inf, inf], (optional)*) – Event Type

bpy.ops.view3d.**select\_lasso**(path=None, deselect=False, extend=True)

Select items using lasso selection

#### Parameters

- **path** (bpy\_prop\_collection of OperatorMousePath, (optional)) – Path
- **deselect** (boolean, (optional)) – Deselect, Deselect rather than select items.
- **extend** (boolean, (optional)) – Extend, Extend selection instead of deselecting everything first.

bpy.ops.view3d.**smoothview**()

The time to animate the change of view (in milliseconds)

bpy.ops.view3d.**snap\_cursor\_to\_active**()

Snap cursor to active item

bpy.ops.view3d.**snap\_cursor\_to\_center**()

Snap cursor to the Center

bpy.ops.view3d.**snap\_cursor\_to\_grid**()

Snap cursor to nearest grid node

bpy.ops.view3d.**snap\_cursor\_to\_selected**()

Snap cursor to center of selected item(s)

bpy.ops.view3d.**snap\_selected\_to\_cursor**()

Snap selected item(s) to cursor

bpy.ops.view3d.**snap\_selected\_to\_grid**()

Snap selected item(s) to nearest grid node

bpy.ops.view3d.**toolshelf**()

Toggles tool shelf display

bpy.ops.view3d.**view\_all**(center=False)

View all objects in scene

#### Parameters **center** (boolean, (optional)) – Center

bpy.ops.view3d.**view\_center\_camera**()

Center the camera view

bpy.ops.view3d.**view\_center\_cursor**()

Centers the view so that the cursor is in the middle of the view

bpy.ops.view3d.**view\_orbit**(type='ORBITLEFT')

Orbit the view

#### Parameters **type** (enum in ['ORBITLEFT', 'ORBITRIGHT', 'ORBITUP', 'ORBITDOWN'], (optional)) – Orbit, Direction of View Orbit

bpy.ops.view3d.**view\_pan**(type='PANLEFT')

Pan the view

#### Parameters **type** (enum in ['PANLEFT', 'PANRIGHT', 'PANUP', 'PANDOWN'], (optional)) – Pan, Direction of View Pan

bpy.ops.view3d.**view\_persportho**()

Switch the current view from perspective/orthographic

bpy.ops.view3d.**view\_selected**()

Move the view to the selection center

```
bpy.ops.view3d.viewnumpad(type='FRONT', align_active=False)
```

Set the view

#### Parameters

- **type** (*enum in ['FRONT', 'BACK', 'LEFT', 'RIGHT', 'TOP', 'BOTTOM', 'CAMERA']*, *(optional)*) – View, The Type of view
- **align\_active** (*boolean, (optional)*) – Align Active, Align to the active objects axis

```
bpy.ops.view3d.zoom(delta=0, mx=0, my=0)
```

Zoom in/out in the view

#### Parameters

- **delta** (*int in [-inf, inf], (optional)*) – Delta
- **mx** (*int in [0, inf], (optional)*) – Zoom Position X
- **my** (*int in [0, inf], (optional)*) – Zoom Position Y

```
bpy.ops.view3d.zoom_border(xmin=0, xmax=0, ymin=0, ymax=0)
```

Zoom in the view to the nearest object contained in the border

#### Parameters

- **xmin** (*int in [-inf, inf], (optional)*) – X Min
- **xmax** (*int in [-inf, inf], (optional)*) – X Max
- **ymin** (*int in [-inf, inf], (optional)*) – Y Min
- **ymax** (*int in [-inf, inf], (optional)*) – Y Max

```
bpy.ops.view3d.zoom_camera_1_to_1()
```

Match the camera to 1:1 to the render output

## Wm Operators

```
bpy.ops.wm.addon_disable(module="")
```

Disable an addon

**Parameters** **module** (*string, (optional)*) – Module, Module name of the addon to disable

**File** [startup/bl\\_ui/space\\_userpref.py:1114](#)

```
bpy.ops.wm.addon_enable(module="")
```

Enable an addon

**Parameters** **module** (*string, (optional)*) – Module, Module name of the addon to enable

**File** [startup/bl\\_ui/space\\_userpref.py:1085](#)

```
bpy.ops.wm.addon_expand(module="")
```

Display more information on this add-on

**Parameters** **module** (*string, (optional)*) – Module, Module name of the addon to expand

**File** [startup/bl\\_ui/space\\_userpref.py:1345](#)

```
bpy.ops.wm.addon_install(overwrite=True, target='DEFAULT', filepath="", filter_folder=True, filter_python=True, filter_glob="*.py;*.zip")
```

Install an addon

#### Parameters

- **overwrite** (*boolean, (optional)*) – Overwrite, Remove existing addons with the same ID
- **target** (*enum in ['DEFAULT', 'PREFS'], (optional)*) – Target Path
- **filepath** (*string, (optional)*) – File Path, File path to write file to
- **filter\_folder** (*boolean, (optional)*) – Filter folders
- **filter\_python** (*boolean, (optional)*) – Filter python

**File** `startup/bl_ui/space_userpref.py:1167`

`bpy.ops.wm.addon_remove(module="")`  
Disable an addon

**Parameters** **module** (*string, (optional)*) – Module, Module name of the addon to remove

**File** `startup/bl_ui/space_userpref.py:1306`

`bpy.ops.wm.appconfig_activate(filepath="")`  
Undocumented (contribute)

**Parameters** **filepath** (*string, (optional)*) – File Path

**File** `startup/bl_operators/wm.py:1124`

`bpy.ops.wm.appconfig_default()`  
Undocumented (contribute)

**File** `startup/bl_operators/wm.py:1102`

`bpy.ops.wm.call_menu(name="")`  
Undocumented (contribute)

**Parameters** **name** (*string, (optional)*) – Name, Name of the menu

`bpy.ops.wm.context_collection_boolean_set(data_path_iter="", data_path_item="", type='TOGGLE')`  
Set boolean values for a collection of items

#### Parameters

- **data\_path\_iter** (*string, (optional)*) – The data path relative to the context, must point to an iterable.
- **data\_path\_item** (*string, (optional)*) – The data path from each iterable to the value (int or float)
- **type** (*enum in ['TOGGLE', 'ENABLE', 'DISABLE'], (optional)*) – Type

**File** `startup/bl_operators/wm.py:593`

`bpy.ops.wm.context_cycle_array(data_path="", reverse=False)`

**Set a context array value.** Useful for cycling the active mesh edit mode.

#### Parameters

- **data\_path** (*string, (optional)*) – Context Attributes, rna context string
- **reverse** (*boolean, (optional)*) – Reverse, Cycle backwards

**File** `startup/bl_operators/wm.py:469`

`bpy.ops.wm.context_cycle_enum(data_path="", reverse=False)`  
Toggle a context value.

#### Parameters

- **data\_path** (*string, (optional)*) – Context Attributes, rna context string
- **reverse** (*boolean, (optional)*) – Reverse, Cycle backwards

**File** startup/bl\_operators/wm.py:416

bpy.ops.wm.context\_cycle\_int(*data\_path=""*, *reverse=False*)

Set a context value. Useful for cycling active material,

#### Parameters

- **data\_path** (*string, (optional)*) – Context Attributes, rna context string
- **reverse** (*boolean, (optional)*) – Reverse, Cycle backwards

**File** startup/bl\_operators/wm.py:382

bpy.ops.wm.context\_menu\_enum(*data\_path=""*)

Undocumented (contribute)

**Parameters** **data\_path** (*string, (optional)*) – Context Attributes, rna context string

**File** startup/bl\_operators/wm.py:513

bpy.ops.wm.context\_modal\_mouse(*data\_path\_iter=""*, *data\_path\_item=""*, *input\_scale=0.01*, *invert=False*, *initial\_x=0*)

Adjust arbitrary values with mouse input

#### Parameters

- **data\_path\_iter** (*string, (optional)*) – The data path relative to the context, must point to an iterable.
- **data\_path\_item** (*string, (optional)*) – The data path from each iterable to the value (int or float)
- **input\_scale** (*float in [-inf, inf], (optional)*) – Scale the mouse movement by this value before applying the delta
- **invert** (*boolean, (optional)*) – Invert the mouse input

**File** startup/bl\_operators/wm.py:714

bpy.ops.wm.context\_scale\_int(*data\_path=""*, *value=1.0*, *always\_step=True*)

Scale an int context value.

#### Parameters

- **data\_path** (*string, (optional)*) – Context Attributes, rna context string
- **value** (*float in [-inf, inf], (optional)*) – Value, Assign value
- **always\_step** (*boolean, (optional)*) – Always Step, Always adjust the value by a minimum of 1 when ‘value’ is not 1.0.

**File** startup/bl\_operators/wm.py:225

bpy.ops.wm.context\_set\_boolean(*data\_path=""*, *value=True*)

Set a context value.

#### Parameters

- **data\_path** (*string, (optional)*) – Context Attributes, rna context string
- **value** (*boolean, (optional)*) – Value, Assignment value

**File** startup/bl\_operators/wm.py:127

bpy.ops.wm.context\_set\_enum(data\_path="", value="")

Set a context value.

#### Parameters

- **data\_path** (*string, (optional)*) – Context Attributes, rna context string
- **value** (*string, (optional)*) – Value, Assignment value (as a string)

**File** startup/bl\_operators/wm.py:127

bpy.ops.wm.context\_set\_float(data\_path="", value=0.0, relative=False)

Set a context value.

#### Parameters

- **data\_path** (*string, (optional)*) – Context Attributes, rna context string
- **value** (*float in [-inf, inf], (optional)*) – Value, Assignment value
- **relative** (*boolean, (optional)*) – Relative, Apply relative to the current value (delta)

**File** startup/bl\_operators/wm.py:127

bpy.ops.wm.context\_set\_id(data\_path="", value="")

Toggle a context value.

#### Parameters

- **data\_path** (*string, (optional)*) – Context Attributes, rna context string
- **value** (*string, (optional)*) – Value, Assign value

**File** startup/bl\_operators/wm.py:533

bpy.ops.wm.context\_set\_int(data\_path="", value=0, relative=False)

Set a context value.

#### Parameters

- **data\_path** (*string, (optional)*) – Context Attributes, rna context string
- **value** (*int in [-inf, inf], (optional)*) – Value, Assign value
- **relative** (*boolean, (optional)*) – Relative, Apply relative to the current value (delta)

**File** startup/bl\_operators/wm.py:127

bpy.ops.wm.context\_set\_string(data\_path="", value="")

Set a context value.

#### Parameters

- **data\_path** (*string, (optional)*) – Context Attributes, rna context string
- **value** (*string, (optional)*) – Value, Assign value

**File** startup/bl\_operators/wm.py:127

bpy.ops.wm.context\_set\_value(data\_path="", value="")

Set a context value.

#### Parameters

- **data\_path** (*string, (optional)*) – Context Attributes, rna context string
- **value** (*string, (optional)*) – Value, Assignment value (as a string)

**File** startup/bl\_operators/wm.py:312

bpy.ops.wm.context\_toggle(*data\_path*=““)  
Toggle a context value.

**Parameters** **data\_path** (*string, (optional)*) – Context Attributes, rna context string

**File** startup/bl\_operators/wm.py:328

bpy.ops.wm.context\_toggle\_enum(*data\_path*=““, *value\_1*=““, *value\_2*=““)  
Toggle a context value.

**Parameters**

- **data\_path** (*string, (optional)*) – Context Attributes, rna context string
- **value\_1** (*string, (optional)*) – Value, Toggle enum
- **value\_2** (*string, (optional)*) – Value, Toggle enum

**File** startup/bl\_operators/wm.py:357

bpy.ops.wm.copy\_prev\_settings()  
Copy settings from previous version

**File** startup/bl\_operators/wm.py:1152

bpy.ops.wm.debug\_menu(*debug\_value*=0)  
Open a popup to set the debug level

**Parameters** **debug\_value** (*int in [-10000, 10000], (optional)*) – Debug Value

bpy.ops.wm.doc\_edit(*doc\_id*=““, *doc\_new*=““)  
Load online reference docs

**Parameters**

- **doc\_id** (*string, (optional)*) – Doc ID
- **doc\_new** (*string, (optional)*) – Edit Description

**File** startup/bl\_operators/wm.py:857

bpy.ops.wm.doc\_view(*doc\_id*=““)  
Load online reference docs

**Parameters** **doc\_id** (*string, (optional)*) – Doc ID

**File** startup/bl\_operators/wm.py:803

bpy.ops.wm.interaction\_preset\_add(*name*=““, *remove\_active*=*False*)  
Add an Application Interaction Preset

**Parameters** **name** (*string, (optional)*) – Name, Name of the preset, used to make the path name

**File** startup/bl\_operators/presets.py:50

bpy.ops.wm.keyconfig\_activate(*filepath*=““)  
Undocumented ([contribute](#))

**Parameters** **filepath** (*string, (optional)*) – File Path

**File** startup/bl\_operators/wm.py:1093

bpy.ops.wm.keyconfig\_export(*filepath*=“keymap.py”, *filter\_folder*=*True*, *filter\_text*=*True*, *filter\_python*=*True*)  
Export key configuration to a python script

**Parameters**

- **filepath** (*string, (optional)*) – File Path, Filepath to write file to

- **filter\_folder** (*boolean, (optional)*) – Filter folders
- **filter\_text** (*boolean, (optional)*) – Filter text
- **filter\_python** (*boolean, (optional)*) – Filter python

**File** `startup/bl_ui/space_userpref_keymap.py:623`

`bpy.ops.wm.keyconfig_import(filepath="keymap.py", filter_folder=True, filter_text=True, filter_python=True, keep_original=True)`

Import key configuration from a python script

#### Parameters

- **filepath** (*string, (optional)*) – File Path, Filepath to write file to
- **filter\_folder** (*boolean, (optional)*) – Filter folders
- **filter\_text** (*boolean, (optional)*) – Filter text
- **filter\_python** (*boolean, (optional)*) – Filter python
- **keep\_original** (*boolean, (optional)*) – Keep original, Keep original file after copying to configuration folder

**File** `startup/bl_ui/space_userpref_keymap.py:562`

`bpy.ops.wm.keyconfig_preset_add(name=""", remove_active=False)`

Add a Keyconfig Preset

**Parameters** **name** (*string, (optional)*) – Name, Name of the preset, used to make the path name

**File** `startup/bl_operators/presets.py:50`

`bpy.ops.wm.keyconfig_remove()`

Remove key config

**File** `startup/bl_ui/space_userpref_keymap.py:808`

`bpy.ops.wm.keyconfig_test()`

Test keyconfig for conflicts

**File** `startup/bl_ui/space_userpref_keymap.py:510`

`bpy.ops.wm.keyitem_add()`

Add key map item

**File** `startup/bl_ui/space_userpref_keymap.py:759`

`bpy.ops.wm.keyitem_remove(item_id=0)`

Remove key map item

**Parameters** **item\_id** (*int in [-inf, inf], (optional)*) – Item Identifier, Identifier of the item to remove

**File** `startup/bl_ui/space_userpref_keymap.py:790`

`bpy.ops.wm.keyitem_restore(item_id=0)`

Restore key map item

**Parameters** **item\_id** (*int in [-inf, inf], (optional)*) – Item Identifier, Identifier of the item to remove

**File** `startup/bl_ui/space_userpref_keymap.py:744`

`bpy.ops.wm.keymap_restore(all=False)`

Restore key map(s)

**Parameters** **all** (*boolean, (optional)*) – All Keymaps, Restore all keymaps to default

**File** `startup/bl_ui/space_userpref_keymap.py:716`

```
bpy.ops.wm.link_append(filepath="", directory="", filename="", files=None, filter_blender=True,  
filter_image=False, filter_movie=False, filter_python=False, filter_font=False, filter_sound=False,  
filter_text=False, filter_btx=False, filter_collada=False, filter_folder=True, filemode=1, relative_path=False,  
link=True, autoselect=True, active_layer=True, instance_groups=True)
```

Link or Append from a Library .blend file

#### Parameters

- **filepath** (*string, (optional)*) – File Path, Path to file
- **directory** (*string, (optional)*) – Directory, Directory of the file
- **filename** (*string, (optional)*) – File Name, Name of the file
- **files** (*bpy\_prop\_collection of OperatorFileListElement, (optional)*) – Files
- **filter\_blender** (*boolean, (optional)*) – Filter .blend files
- **filter\_image** (*boolean, (optional)*) – Filter image files
- **filter\_movie** (*boolean, (optional)*) – Filter movie files
- **filter\_python** (*boolean, (optional)*) – Filter python files
- **filter\_font** (*boolean, (optional)*) – Filter font files
- **filter\_sound** (*boolean, (optional)*) – Filter sound files
- **filter\_text** (*boolean, (optional)*) – Filter text files
- **filter\_btx** (*boolean, (optional)*) – Filter btx files
- **filter\_collada** (*boolean, (optional)*) – Filter COLLADA files
- **filter\_folder** (*boolean, (optional)*) – Filter folders
- **filemode** (*int in [1, 9], (optional)*) – File Browser Mode, The setting for the file browser mode to load a .blend file, a library or a special file
- **relative\_path** (*boolean, (optional)*) – Relative Path, Select the file relative to the blend file
- **link** (*boolean, (optional)*) – Link, Link the objects or datablocks rather than appending
- **autoselect** (*boolean, (optional)*) – Select, Select the linked objects
- **active\_layer** (*boolean, (optional)*) – Active Layer, Put the linked objects on the active layer
- **instance\_groups** (*boolean, (optional)*) – Instance Groups, Create instances for each group as a DupliGroup

```
bpy.ops.wm.memory_statistics()
```

Print memory statistics to the console

```
bpy.ops.wm.ndof_sensitivity_change(decrease=True, fast=False)
```

Change NDOF sensitivity

#### Parameters

- **decrease** (*boolean, (optional)*) – Decrease NDOF sensitivity, If true then action decreases NDOF sensitivity instead of increasing
- **fast** (*boolean, (optional)*) – Fast NDOF sensitivity change, If true then sensitivity changes 50%, otherwise 10%

```
bpy.ops.wm.open_mainfile(filepath="", filter_blender=True, filter_image=False, filter_movie=False, filter_python=False, filter_font=False, filter_sound=False, filter_text=False, filter_btx=False, filter_collada=False, filter_folder=True, filemode=8, load_ui=True, use_scripts=True)
```

Open a Blender file

#### Parameters

- **filepath** (*string, (optional)*) – File Path, Path to file
- **filter\_blender** (*boolean, (optional)*) – Filter .blend files
- **filter\_image** (*boolean, (optional)*) – Filter image files
- **filter\_movie** (*boolean, (optional)*) – Filter movie files
- **filter\_python** (*boolean, (optional)*) – Filter python files
- **filter\_font** (*boolean, (optional)*) – Filter font files
- **filter\_sound** (*boolean, (optional)*) – Filter sound files
- **filter\_text** (*boolean, (optional)*) – Filter text files
- **filter\_btx** (*boolean, (optional)*) – Filter btx files
- **filter\_collada** (*boolean, (optional)*) – Filter COLLADA files
- **filter\_folder** (*boolean, (optional)*) – Filter folders
- **filemode** (*int in [1, 9], (optional)*) – File Browser Mode, The setting for the file browser mode to load a .blend file, a library or a special file
- **load\_ui** (*boolean, (optional)*) – Load UI, Load user interface setup in the .blend file
- **use\_scripts** (*boolean, (optional)*) – Trusted Source, Allow blend file execute scripts automatically, default available from system preferences

```
bpy.ops.wm.operator_preset_add(name="", remove_active=False, operator="")
```

Add an Application Interaction Preset

#### Parameters

- **name** (*string, (optional)*) – Name, Name of the preset, used to make the path name
- **operator** (*string, (optional)*) – Operator

**File** `startup/bl_operators/presets.py:50`

```
bpy.ops.wm.path_open(filepath="")
```

Open a path in a file browser

**Parameters** **filepath** (*string, (optional)*) – File Path

**File** `startup/bl_operators/wm.py:756`

```
bpy.ops.wm.properties_add(data_path="")
```

Internal use (edit a property data\_path)

**Parameters** **data\_path** (*string, (optional)*) – Property Edit, Property data\_path edit

**File** `startup/bl_operators/wm.py:1034`

```
bpy.ops.wm.properties_context_change(context="")
```

Change the context tab in a Properties Window

**Parameters** **context** (*string, (optional)*) – Context

**File** startup/bl\_operators/wm.py:1064

```
bpy.ops.wm.properties_edit(data_path=""", property=""", value=""", min=0.0, max=1.0, description="")  
Internal use (edit a property data_path)
```

#### Parameters

- **data\_path** (*string, (optional)*) – Property Edit, Property data\_path edit
- **property** (*string, (optional)*) – Property Name, Property name edit
- **value** (*string, (optional)*) – Property Value, Property value edit
- **min** (*float in [-inf, inf], (optional)*) – Min
- **max** (*float in [-inf, inf], (optional)*) – Max
- **description** (*string, (optional)*) – Tip

**File** startup/bl\_operators/wm.py:955

```
bpy.ops.wm.properties_remove(data_path=""", property="")  
Internal use (edit a property data_path)
```

#### Parameters

- **data\_path** (*string, (optional)*) – Property Edit, Property data\_path edit
- **property** (*string, (optional)*) – Property Name, Property name edit

**File** startup/bl\_operators/wm.py:1077

```
bpy.ops.wm.quit_blender()  
Quit Blender
```

```
bpy.ops.wm.radial_control(data_path=""", rotation_path=""", color_path=""", fill_color_path=""",  
                           zoom_path=""", image_id="")  
Undocumented (contribute)
```

#### Parameters

- **data\_path** (*string, (optional)*) – Data Path, Path of property to be set by the radial control.
- **rotation\_path** (*string, (optional)*) – Rotation Path, Path of property used to rotate the texture display.
- **color\_path** (*string, (optional)*) – Color Path, Path of property used to set the color of the control.
- **fill\_color\_path** (*string, (optional)*) – Fill Color Path, Path of property used to set the fill color of the control.
- **zoom\_path** (*string, (optional)*) – Zoom Path, Path of property used to set the zoom level for the control.
- **image\_id** (*string, (optional)*) – Image ID, Path of ID that is used to generate an image for the control.

```
bpy.ops.wm.read_factory_settings()  
Load default file and user preferences
```

```
bpy.ops.wm.read_homefile()  
Open the default file (doesn't save the current file)
```

```
bpy.ops.wm.recover_auto_save(filepath="", filter_blender=True, filter_image=False, filter_movie=False, filter_python=False, filter_font=False, filter_sound=False, filter_text=False, filter_btx=False, filter_collada=False, filter_folder=False, filemode=8)
```

Open an automatically saved file to recover it

#### Parameters

- **filepath** (*string, (optional)*) – File Path, Path to file
- **filter\_blender** (*boolean, (optional)*) – Filter .blend files
- **filter\_image** (*boolean, (optional)*) – Filter image files
- **filter\_movie** (*boolean, (optional)*) – Filter movie files
- **filter\_python** (*boolean, (optional)*) – Filter python files
- **filter\_font** (*boolean, (optional)*) – Filter font files
- **filter\_sound** (*boolean, (optional)*) – Filter sound files
- **filter\_text** (*boolean, (optional)*) – Filter text files
- **filter\_btx** (*boolean, (optional)*) – Filter btx files
- **filter\_collada** (*boolean, (optional)*) – Filter COLLADA files
- **filter\_folder** (*boolean, (optional)*) – Filter folders
- **filemode** (*int in [1, 9], (optional)*) – File Browser Mode, The setting for the file browser mode to load a .blend file, a library or a special file

```
bpy.ops.wm.recover_last_session()
```

Open the last closed file (“quit.blend”)

```
bpy.ops.wm.redraw_timer(type='DRAW', iterations=10)
```

Simple redraw timer to test the speed of updating the interface

#### Parameters

- **type** (*enum in ['DRAW', 'DRAW\_SWAP', 'DRAW\_WIN', 'DRAW\_WIN\_SWAP', 'ANIM\_STEP', 'ANIM\_PLAY', 'UNDO']*, *(optional)*) – Type
- **iterations** (*int in [1, inf]*, *(optional)*) – Iterations, Number of times to redraw

```
bpy.ops.wm.save_as_mainfile(filepath="", check_existing=True, filter_blender=True, filter_image=False, filter_movie=False, filter_python=False, filter_font=False, filter_sound=False, filter_text=False, filter_btx=False, filter_collada=False, filter_folder=True, filemode=8, compress=False, relative_remap=True, copy=False)
```

Save the current file in the desired location

#### Parameters

- **filepath** (*string, (optional)*) – File Path, Path to file
- **check\_existing** (*boolean, (optional)*) – Check Existing, Check and warn on overwriting existing files
- **filter\_blender** (*boolean, (optional)*) – Filter .blend files
- **filter\_image** (*boolean, (optional)*) – Filter image files
- **filter\_movie** (*boolean, (optional)*) – Filter movie files
- **filter\_python** (*boolean, (optional)*) – Filter python files

- **filter\_font** (*boolean, (optional)*) – Filter font files
- **filter\_sound** (*boolean, (optional)*) – Filter sound files
- **filter\_text** (*boolean, (optional)*) – Filter text files
- **filter\_btx** (*boolean, (optional)*) – Filter btx files
- **filter\_collada** (*boolean, (optional)*) – Filter COLLADA files
- **filter\_folder** (*boolean, (optional)*) – Filter folders
- **filemode** (*int in [1, 9], (optional)*) – File Browser Mode, The setting for the file browser mode to load a .blend file, a library or a special file
- **compress** (*boolean, (optional)*) – Compress, Write compressed .blend file
- **relative\_remap** (*boolean, (optional)*) – Remap Relative, Remap relative paths when saving in a different directory
- **copy** (*boolean, (optional)*) – Save Copy, Save a copy of the actual working state but does not make saved file active.

```
bpy.ops.wm.save_homefile()
```

Make the current file the default .blend file

```
bpy.ops.wm.save_mainfile(filepath="", check_existing=True, filter_blender=True, filter_image=False, filter_movie=False, filter_python=False, filter_font=False, filter_sound=False, filter_text=False, filter_btx=False, filter_collada=False, filter_folder=True, filemode=8, compress=False, relative_remap=False)
```

Save the current Blender file

#### Parameters

- **filepath** (*string, (optional)*) – File Path, Path to file
- **check\_existing** (*boolean, (optional)*) – Check Existing, Check and warn on overwriting existing files
- **filter\_blender** (*boolean, (optional)*) – Filter .blend files
- **filter\_image** (*boolean, (optional)*) – Filter image files
- **filter\_movie** (*boolean, (optional)*) – Filter movie files
- **filter\_python** (*boolean, (optional)*) – Filter python files
- **filter\_font** (*boolean, (optional)*) – Filter font files
- **filter\_sound** (*boolean, (optional)*) – Filter sound files
- **filter\_text** (*boolean, (optional)*) – Filter text files
- **filter\_btx** (*boolean, (optional)*) – Filter btx files
- **filter\_collada** (*boolean, (optional)*) – Filter COLLADA files
- **filter\_folder** (*boolean, (optional)*) – Filter folders
- **filemode** (*int in [1, 9], (optional)*) – File Browser Mode, The setting for the file browser mode to load a .blend file, a library or a special file
- **compress** (*boolean, (optional)*) – Compress, Write compressed .blend file
- **relative\_remap** (*boolean, (optional)*) – Remap Relative, Remap relative paths when saving in a different directory

```
bpy.ops.wm.search_menu()  
    Undocumented (contribute)  
  
bpy.ops.wm.splash()  
    Opens a blocking popup region with release info  
  
bpy.ops.wm.sysinfo()  
    Generate System Info  
  
    File startup/bl\_operators/wm.py:1141  
  
bpy.ops.wm.url_open(url="")  
    Open a website in the Webbrowser  
  
    Parameters url (string, (optional)) – URL, URL to open  
    File startup/bl\_operators/wm.py:739  
  
bpy.ops.wm.window_duplicate()  
    Duplicate the current Blender window  
  
bpy.ops.wm.window_fullscreen_toggle()  
    Toggle the current window fullscreen
```

## World Operators

```
bpy.ops.world.new()  
    Add a new world
```

## 2.4 Types (bpy.types)

### 2.4.1 Action(ID)

base classes — `bpy_struct, ID`

**class bpy.types.Action (ID)**  
A collection of F-Curves for animation

**fcurves**  
The individual F-Curves that make up the Action

**Type** `ActionFCurves bpy_prop_collection of FCurve, (readonly)`

**frame\_range**  
The final frame range of all fcurves within this action

**Type** float array of 2 items in [-inf, inf], default (0.0, 0.0), (readonly)

**groups**  
Convenient groupings of F-Curves

**Type** `ActionGroups bpy_prop_collection of ActionGroup, (readonly)`

**id\_root**  
Type of ID-block that action can be used on. DO NOT CHANGE UNLESS YOU KNOW WHAT YOU'RE DOING

**Type** enum in ['ACTION', 'ARMATURE', 'BRUSH', 'CAMERA', 'CURVE', 'FONT', 'GREASEPENCIL', 'GROUP', 'IMAGE', 'KEY', 'LAMP', 'LIBRARY', 'LATTICE', 'MATERIAL', 'META', 'MESH', 'NODETREE', 'OBJECT', 'PARTICLE', 'SCENE',

‘SCREEN’, ‘SOUND’, ‘TEXT’, ‘TEXTURE’, ‘WORLD’, ‘WINDOWMANAGER’], default ‘ACTION’

#### **pose\_markers**

Markers specific to this Action, for labeling poses

**Type** `ActionPoseMarkers bpy_prop_collection of TimelineMarker, (read-only)`

### Inherited Properties

- `bpy_struct.id_data`
- `ID.name`
- `ID.use_fake_user`
- `ID.library`
- `ID.tag`
- `ID.users`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`
- `ID.copy`
- `ID.user_clear`
- `ID.animation_data_create`
- `ID.animation_data_clear`
- `ID.update_tag`

### References

- `ActionActuator.action`
- `ActionConstraint.action`
- `AnimData.action`
- `BlendData.actions`
- `BlendDataActions.new`
- `BlendDataActions.remove`
- `NlaStrip.action`
- `NlaStrips.new`

- `Object.pose_library`
- `ShapeActionActuator.action`
- `SpaceDopeSheetEditor.action`

## 2.4.2 ActionActuator(Actuator)

base classes — `bpy_struct`, `Actuator`

**class bpy.types.ActionActuator (Actuator)**

Actuator to control the object movement

**action**

**Type** `Action`

**frame\_blend\_in**

Number of frames of motion blending

**Type** int in [0, 32767], default 0

**frame\_end**

**Type** float in [-inf, inf], default 0.0

**frame\_property**

Assign the action's current frame number to this property

**Type** string, default “”

**frame\_start**

**Type** float in [-inf, inf], default 0.0

**play\_mode**

Action playback type

**Type** enum in ['PLAY', 'PINGPONG', 'FLIPPER', 'LOOPSTOP', 'LOOPEND', 'PROPERTY'], default 'PLAY'

**priority**

Execution priority - lower numbers will override actions with higher numbers. With 2 or more actions at once, the overriding channels must be lower in the stack

**Type** int in [0, 100], default 0

**property**

Use this property to define the Action position

**Type** string, default “”

**use\_continue\_last\_frame**

Restore last frame when switching on/off, otherwise play from the start each time

**Type** boolean, default False

### Inherited Properties

- `bpy_struct.id_data`
- `Actuator.name`
- `Actuator.show_expanded`
- `Actuator.pin`
- `Actuator.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`
- `Actuator.link`
- `Actuator.unlink`

### 2.4.3 ActionConstraint(Constraint)

base classes — `bpy_struct, Constraint`

**class bpy.types.ActionConstraint (Constraint)**

Map an action to the transform axes of a bone

**action**

The constraining action

**Type** `Action`

**frame\_end**

Last frame of the Action to use

**Type** `int in [-300000, 300000], default 0`

**frame\_start**

First frame of the Action to use

**Type** `int in [-300000, 300000], default 0`

**max**

Maximum value for target channel range

**Type** `float in [-1000, 1000], default 0.0`

**min**

Minimum value for target channel range

**Type** `float in [-1000, 1000], default 0.0`

**subtarget**

**Type** `string, default “”`

**target**

Target Object

Type `Object`

**transform\_channel**

Transformation channel from the target that is used to key the Action

Type enum in ['LOCATION\_X', 'LOCATION\_Y', 'LOCATION\_Z', 'ROTATION\_X', 'ROTATION\_Y', 'ROTATION\_Z', 'SCALE\_X', 'SCALE\_Y', 'SCALE\_Z'], default 'ROTATION\_X'

### Inherited Properties

- `bpy_struct.id_data`
- `Constraint.name`
- `Constraint.active`
- `Constraint.mute`
- `Constraint.show_expanded`
- `Constraint.influence`
- `Constraint.error_location`
- `Constraint.owner_space`
- `Constraint.is_proxy_local`
- `Constraint.error_rotation`
- `Constraint.target_space`
- `Constraint.type`
- `Constraint.is_valid`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.4 ActionFCurves(`bpy_struct`)

base class — `bpy_struct`

**class bpy.types.ActionFCurves (`bpy_struct`)**

Collection of action fcurves

**new (data\_path, index=0, action\_group=""")**

Add a keyframe to the curve.

## Parameters

- **data\_path** (*string*) – Data Path, FCurve data path to use.
- **index** (*int in [0, inf], (optional)*) – Index, Array index.
- **action\_group** (*string, (optional)*) – Action Group, Action group to add this fcurve into.

**Returns** Newly created fcurve

**Return type** `FCurve`

**remove** (*fcurve*)

Remove action group.

**Parameters** **fcurve** (`FCurve`, (never None)) – FCurve to remove.

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `Action.fcurves`

## 2.4.5 ActionGroup(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.ActionGroup` (`bpy_struct`)

Groups of F-Curves

**channels**

F-Curves in this group

**Type** `bpy_prop_collection` of `FCurve`, (readonly)

**custom\_color**

Index of custom color set

**Type** int in [-inf, inf], default 0

**lock**

Action Group is locked

**Type** boolean, default False

**name**

**Type** string, default “”

**select**

Action Group is selected

**Type** boolean, default False

**show\_expanded**

Action Group is expanded

**Type** boolean, default False

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `Action.groups`
- `ActionGroups.new`
- `ActionGroups.remove`
- `FCurve.group`

## 2.4.6 ActionGroups(bpy\_struct)

base class — `bpy_struct`

**class** `bpy.types.ActionGroups` (*bpy\_struct*)

Collection of action groups

**new** (*name*)

Add a keyframe to the curve.

**Parameters** `name` (*string*) – New name for the action group.

**Returns** Newly created action group

**Return type** `ActionGroup`

**remove** (*action\_group*)

Remove action group.

**Parameters** `action_group` (`ActionGroup`, (never None)) – Action group to remove.

### Inherited Properties

- `bpy_struct.id_data`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

### References

- `Action.groups`

## 2.4.7 ActionPoseMarkers(bpy\_struct)

base class — `bpy_struct`

**class** `bpy.types.ActionPoseMarkers` (*bpy\_struct*)

Collection of timeline markers

**active**

Active pose marker for this Action

**Type** [TimelineMarker](#)

**active\_index**

Index of active pose marker

**Type** int in [-inf, inf], default 0

**new(name)**

Add a pose marker to the action.

**Parameters** **name** (string) – New name for the marker (not unique).

**Returns** Newly created marker

**Return type** [TimelineMarker](#)

**remove(marker)**

Remove a timeline marker.

**Parameters** **marker** ([TimelineMarker](#), (never None)) – Timeline marker to remove.

**Inherited Properties**

- [bpy\\_struct.id\\_data](#)

**Inherited Functions**

- [bpy\\_struct.as\\_pointer](#)
- [bpy\\_struct.callback\\_add](#)
- [bpy\\_struct.callback\\_remove](#)
- [bpy\\_struct.driver\\_add](#)
- [bpy\\_struct.driver\\_remove](#)
- [bpy\\_struct.get](#)
- [bpy\\_struct.is\\_property\\_hidden](#)
- [bpy\\_struct.is\\_property\\_set](#)
- [bpy\\_struct.items](#)
- [bpy\\_struct.keyframe\\_delete](#)
- [bpy\\_struct.keyframe\\_insert](#)
- [bpy\\_struct.keys](#)
- [bpy\\_struct.path\\_from\\_id](#)
- [bpy\\_struct.path\\_resolve](#)
- [bpy\\_struct.type\\_recast](#)
- [bpy\\_struct.values](#)

**References**

- [Action.pose\\_markers](#)

## 2.4.8 Actuator([bpy\\_struct](#))

base class — [bpy\\_struct](#)

subclasses — `ShapeActionActuator`, `VisibilityActuator`, `MessageActuator`, `RandomActuator`, `Filter2DActuator`, `GameActuator`, `CameraActuator`, `ArmatureActuator`, `SoundActuator`, `ParentActuator`, `SceneActuator`, `StateActuator`, `ActionActuator`, `ConstraintActuator`, `PropertyActuator`, `FCurveActuator`, `ObjectActuator`, `EditObjectActuator`

**class** `bpy.types.Actuator`(*bpy\_struct*)

Actuator to apply actions in the game engine

**name**

**Type** string, default “”

**pin**

Display when not linked to a visible states controller

**Type** boolean, default False

**show\_expanded**

Set actuator expanded in the user interface

**Type** boolean, default False

**type**

**Type** enum in [‘ACTION’, ‘ARMATURE’, ‘CAMERA’, ‘CONSTRAINT’, ‘EDIT\_OBJECT’, ‘FCURVE’, ‘FILTER\_2D’, ‘GAME’, ‘MESSAGE’, ‘MOTION’, ‘PARENT’, ‘PROPERTY’, ‘RANDOM’, ‘SCENE’, ‘SHAPE\_ACTION’, ‘SOUND’, ‘STATE’, ‘VISIBILITY’], default ‘MOTION’

**link**(*controller*)

Link the actuator to a controller.

**Parameters** `controller`(`Controller`) – Controller to link to.

**unlink**(*controller*)

Unlink the actuator from a controller.

**Parameters** `controller`(`Controller`) – Controller to unlink from.

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`

- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `Controller.link`
- `Controller.unlink`
- `GameObjectSettings.actuators`

## 2.4.9 ActuatorSensor(Sensor)

base classes — `bpy_struct, Sensor`

**class bpy.types.ActuatorSensor (Sensor)**  
Sensor to detect state modifications of actuators

### **actuator**

Actuator name, actuator active state modifications will be detected

**Type** string, default “”

## Inherited Properties

- `bpy_struct.id_data`
- `Sensor.name`
- `Sensor.show_expanded`
- `Sensor.frequency`
- `Sensor.invert`
- `Sensor.use_level`
- `Sensor.pin`
- `Sensor.use_pulse_false_level`
- `Sensor.use_pulse_true_level`
- `Sensor.use_tap`
- `Sensor.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`

- `bpy_struct.values`
- `Sensor.link`
- `Sensor.unlink`

## 2.4.10 Addon(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.Addon` (*bpy\_struct*)  
Python addons to be loaded automatically

**module**  
Module name

**Type** string, default “”

### Inherited Properties

- `bpy_struct.id_data`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

### References

- `Addons.new`
- `Addons.remove`
- `UserPreferences.addons`

## 2.4.11 Addons(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.Addons` (*bpy\_struct*)  
Collection of add-ons

**classmethod new()**

Add a new addon

**Returns** Addon datablock.

**Return type** Addon

**classmethod remove(addon)**

Remove addon.

**Parameters** **addon** (Addon, (never None)) – Addon to remove.

### Inherited Properties

- bpy\_struct.id\_data

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

### References

- UserPreferences.addons

## 2.4.12 AdjustmentSequence(Sequence)

base classes — bpy\_struct, Sequence

**class bpy.types.AdjustmentSequence(Sequence)**

Sequence strip to perform filter adjustments to layers below

**animation\_offset\_end**

Animation end offset (trim end)

**Type** int in [0, inf], default 0

**animation\_offset\_start**

Animation start offset (trim start)

**Type** int in [0, inf], default 0

**color\_balance**  
**Type** SequenceColorBalance, (readonly)

**color\_multiply**  
**Type** float in [0, 20], default 0.0

**color\_saturation**  
**Type** float in [0, 20], default 0.0

**crop**  
**Type** SequenceCrop, (readonly)

**proxy**  
**Type** SequenceProxy, (readonly)

**strobe**  
Only display every nth frame  
**Type** float in [1, 30], default 0.0

**transform**  
**Type** SequenceTransform, (readonly)

**use\_color\_balance**  
(3-Way color correction) on input  
**Type** boolean, default False

**use\_crop**  
Crop image before processing  
**Type** boolean, default False

**use\_deinterlace**  
For video movies to remove fields  
**Type** boolean, default False

**use\_flip\_x**  
Flip on the X axis  
**Type** boolean, default False

**use\_flip\_y**  
Flip on the Y axis  
**Type** boolean, default False

**use\_float**  
Convert input to float data  
**Type** boolean, default False

**use\_premultiply**  
Convert RGB from key alpha to premultiplied alpha  
**Type** boolean, default False

**use\_proxy**  
Use a preview proxy for this strip  
**Type** boolean, default False

```
use_proxy_custom_directory  
    Use a custom directory to store data  
        Type boolean, default False  
  
use_proxy_custom_file  
    Use a custom file to read proxy data from  
        Type boolean, default False  
  
use_reverse_frames  
    Reverse frame order  
        Type boolean, default False  
  
use_translation  
    Translate image before processing  
        Type boolean, default False
```

### Inherited Properties

- `bpy_struct.id_data`
- `Sequence.name`
- `Sequence.blend_type`
- `Sequence.blend_alpha`
- `Sequence.channel`
- `Sequence.effect_fader`
- `Sequence.frame_final_end`
- `Sequence.frame_offset_end`
- `Sequence.frame_still_end`
- `Sequence.input_1`
- `Sequence.input_2`
- `Sequence.input_3`
- `Sequence.select_left_handle`
- `Sequence.frame_final_duration`
- `Sequence.frame_duration`
- `Sequence.lock`
- `Sequence.mute`
- `Sequence.select_right_handle`
- `Sequence.select`
- `Sequence.speed_factor`
- `Sequence.frame_start`
- `Sequence.frame_final_start`
- `Sequence.frame_offset_start`
- `Sequence.frame_still_start`
- `Sequence.type`
- `Sequence.use_default_fade`
- `Sequence.input_count`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`

- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`
- `Sequence.getStripElem`
- `Sequence.swap`

## 2.4.13 AlwaysSensor(Sensor)

base classes — `bpy_struct, Sensor`

**class bpy.types.AlwaysSensor (Sensor)**  
Sensor to generate continuous pulses

### Inherited Properties

- `bpy_struct.id_data`
- `Sensor.name`
- `Sensor.show_expanded`
- `Sensor.frequency`
- `Sensor.invert`
- `Sensor.use_level`
- `Sensor.pin`
- `Sensor.use_pulse_false_level`
- `Sensor.use_pulse_true_level`
- `Sensor.use_tap`
- `Sensor.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`

- `bpy_struct.type_recast`
- `bpy_struct.values`
- `Sensor.link`
- `Sensor.unlink`

## 2.4.14 AndController(Controller)

base classes — `bpy_struct, Controller`

**class bpy.types.AndController(Controller)**  
Controller passing on events based on a logical AND operation

### Inherited Properties

- `bpy_struct.id_data`
- `Controller.name`
- `Controller.states`
- `Controller.show_expanded`
- `Controller.use_priority`
- `Controller.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`
- `Controller.link`
- `Controller.unlink`

## 2.4.15 AnimData(bpy\_struct)

base class — `bpy_struct`

**class bpy.types.AnimData(bpy\_struct)**  
Animation data for datablock

**action**  
Active Action for this datablock

**Type** `Action`

**action\_blend\_type**  
Method used for combining Active Action's result with result of NLA stack

**Type** enum in ['REPLACE', 'ADD', 'SUBTRACT', 'MULTPLY'], default 'REPLACE'

**action\_extrapolation**  
Action to take for gaps past the Active Action's range (when evaluating with NLA)

**Type** enum in ['NOTHING', 'HOLD', 'HOLD\_FORWARD'], default 'HOLD'

**action\_influence**  
Amount the Active Action contributes to the result of the NLA stack

**Type** float in [0, 1], default 1.0

**drivers**  
The Drivers/Expressions for this datablock

**Type** `AnimDataDrivers bpy_prop_collection of FCurve`, (readonly)

**nla\_tracks**  
NLA Tracks (i.e. Animation Layers)

**Type** `NlaTracks bpy_prop_collection of NlaTrack`, (readonly)

**use\_nla**  
NLA stack is evaluated when evaluating this block

**Type** boolean, default False

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- Armature.animation\_data
- Camera.animation\_data
- Curve.animation\_data
- ID.animation\_data\_create
- Key.animation\_data
- Lamp.animation\_data
- Lattice.animation\_data
- Material.animation\_data
- Mesh.animation\_data
- MetaBall.animation\_data
- NodeTree.animation\_data
- Object.animation\_data
- ParticleSettings.animation\_data
- Scene.animation\_data
- Texture.animation\_data
- World.animation\_data

### 2.4.16 AnimDataDrivers(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.AnimDataDrivers (bpy\_struct)

Collection of Driver F-Curves

**from\_existing** (src\_driver=None)

Add a new driver given an existing one

**Parameters** src\_driver (FCurve, optional) – Existing Driver F-Curve to use as template for a new one

**Returns** New Driver F-Curve.

**Return type** FCurve

#### Inherited Properties

- bpy\_struct.id\_data

#### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert

- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- AnimData.drivers

### 2.4.17 AnimViz(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.**AnimViz** (*bpy\_struct*)  
Settings for the visualisation of motion

**motion\_path**  
Motion Path settings for visualisation

**Type** AnimVizMotionPaths, (readonly, never None)

**onion\_skin\_frames**  
Onion Skinning (ghosting) settings for visualisation

**Type** AnimVizOnionSkinning, (readonly, never None)

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- `Object.animation_visualisation`
- `Pose.animation_visualisation`

### 2.4.18 AnimVizMotionPaths(`bpy_struct`)

base class — `bpy_struct`

**class bpy.types.AnimVizMotionPaths (`bpy_struct`)**

Motion Path settings for animation visualisation

#### **bake\_location**

When calculating Bone Paths, use Head or Tips

**Type** enum in ['HEADS', 'TAILS'], default 'TAILS'

#### **frame\_after**

Number of frames to show after the current frame (only for 'Around Current Frame' Onion-skinning method)

**Type** int in [1, 150000], default 0

#### **frame\_before**

Number of frames to show before the current frame (only for 'Around Current Frame' Onion-skinning method)

**Type** int in [1, 150000], default 0

#### **frame\_end**

End frame of range of paths to display/calculate (not for 'Around Current Frame' Onion-skinning method)

**Type** int in [-inf, inf], default 0

#### **frame\_start**

Starting frame of range of paths to display/calculate (not for 'Around Current Frame' Onion-skinning method)

**Type** int in [-inf, inf], default 0

#### **frame\_step**

Number of frames between paths shown (not for 'On Keyframes' Onion-skinning method)

**Type** int in [1, 100], default 0

#### **show\_frame\_numbers**

Show frame numbers on Motion Paths

**Type** boolean, default False

#### **show\_keyframe\_action\_all**

For bone motion paths, search whole Action for keyframes instead of in group with matching name only (is slower)

**Type** boolean, default False

#### **show\_keyframe\_highlight**

Emphasize position of keyframes on Motion Paths

**Type** boolean, default False

#### **show\_keyframe\_numbers**

Show frame numbers of Keyframes on Motion Paths

**Type** boolean, default False

**type**

Type of range to show for Motion Paths

**Type** enum in ['CURRENT\_FRAME', 'RANGE'], default 'RANGE'

### Inherited Properties

- bpy\_struct.id\_data

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

### References

- AnimViz.motion\_path

## 2.4.19 AnimVizOnionSkinning(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.AnimVizOnionSkinning(*bpy\_struct*)  
Onion Skinning settings for animation visualisation

**frame\_after**

Number of frames to show after the current frame (only for 'Around Current Frame' Onion-skinning method)

**Type** int in [0, 30], default 0

**frame\_before**

Number of frames to show before the current frame (only for 'Around Current Frame' Onion-skinning method)

**Type** int in [0, 30], default 0

**frame\_end**

End frame of range of Ghosts to display (not for ‘Around Current Frame’ Onion-skinning method)

**Type** int in [-inf, inf], default 0

**frame\_start**

Starting frame of range of Ghosts to display (not for ‘Around Current Frame’ Onion-skinning method)

**Type** int in [-inf, inf], default 0

**frame\_step**

Number of frames between ghosts shown (not for ‘On Keyframes’ Onion-skinning method)

**Type** int in [1, 20], default 0

**show\_only\_selected**

For Pose-Mode drawing, only draw ghosts for selected bones

**Type** boolean, default False

**type**

Method used for determining what ghosts get drawn

**Type** enum in ['NONE', 'CURRENT\_FRAME', 'RANGE', 'KEYS'], default 'NONE'

**Inherited Properties**

- bpy\_struct.id\_data

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

**References**

- AnimViz.onion\_skin\_frames

## 2.4.20 AnyType(bpy\_struct)

base class — bpy\_struct

```
class bpy.types.AnyType(bpy_struct)
    RNA type used for pointers to any possible data
```

### Inherited Properties

- `bpy_struct.id_data`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

### References

- `KeyingSetInfo.generate`
- `UILayout.context_pointer_set`
- `UILayout.prop`
- `UILayout.prop_enum`
- `UILayout.prop_menu_enum`
- `UILayout.prop_search`
- `UILayout.prop_search`
- `UILayout.props_enum`
- `UILayout.template_ID`
- `UILayout.template_ID_preview`
- `UILayout.template_any_ID`
- `UILayout.template_color_ramp`
- `UILayout.template_color_wheel`
- `UILayout.template_curve_mapping`
- `UILayout.template_histogram`
- `UILayout.template_image`
- `UILayout.template_layers`
- `UILayout.template_layers`
- `UILayout.template_list`
- `UILayout.template_list`
- `UILayout.template_path_builder`
- `UILayout.template_vectorscope`
- `UILayout.template_waveform`

## 2.4.21 Area(bpy\_struct)

base class — `bpy_struct`

**class** `bpy.types.Area` (`bpy_struct`)

Area in a subdivided screen, containing an editor

**height**

Area height

**Type** int in [0, 32767], default 0, (readonly)

**regions**

Regions this area is subdivided in

**Type** `bpy_prop_collection` of `Region`, (readonly)

**show\_menus**

Show menus in the header

**Type** boolean, default False

**spaces**

Spaces contained in this area, the first being the active space. NOTE: Useful for example to restore a previously used 3d view space in a certain area to get the old view orientation.

**Type** `AreaSpaces` `bpy_prop_collection` of `Space`, (readonly)

**type**

Space type

**Type** enum in ['EMPTY', 'VIEW\_3D', 'GRAPH\_EDITOR', 'OUTLINER', 'PROPERTIES', 'FILE\_BROWSER', 'IMAGE\_EDITOR', 'INFO', 'SEQUENCE\_EDITOR', 'TEXT\_EDITOR', 'AUDIO\_WINDOW', 'DOPESHEET\_EDITOR', 'NLA\_EDITOR', 'SCRIPTS\_WINDOW', 'TIMELINE', 'NODE\_EDITOR', 'LOGIC\_EDITOR', 'CONSOLE', 'USER\_PREFERENCES'], default 'EMPTY'

**width**

Area width

**Type** int in [0, 32767], default 0, (readonly)

**tag\_redraw()**

tag\_redraw

**header\_text\_set** (`text=""`)

Set the header text

**Parameters** `text` (`string, (optional)`) – Text, New string for the header, no argument clears the text.

### Inherited Properties

- `bpy_struct.id_data`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`

- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `Context.area`
- `Screen.areas`

## 2.4.22 AreaLamp(Lamp)

base classes — `bpy_struct, ID, Lamp`

**class bpy.types.AreaLamp (Lamp)**

Directional area lamp

**gamma**

Light gamma correction value

**Type** float in [-inf, inf], default 0.0

**shadow\_adaptive\_threshold**

Threshold for Adaptive Sampling (Raytraced shadows)

**Type** float in [0, 1], default 0.0

**shadow\_color**

Color of shadows cast by the lamp

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**shadow\_method**

Method to compute lamp shadow with

**Type** enum in ['NOSHADOW', 'RAY\_SHADOW'], default 'NOSHADOW'

**shadow\_ray\_sample\_method**

Method for generating shadow samples: Adaptive QMC is fastest, Constant QMC is less noisy but slower

**Type** enum in ['ADAPTIVE\_QMC', 'CONSTANT\_QMC', 'CONSTANT\_JITTERED'], default 'CONSTANT\_JITTERED'

**shadow\_ray\_samples\_x**

Amount of samples taken extra (samples x samples)

**Type** int in [1, 64], default 0

**shadow\_ray\_samples\_y**

Amount of samples taken extra (samples x samples)

**Type** int in [1, 64], default 0

**shadow\_soft\_size**  
Light size for ray shadow sampling (Raytraced shadows)

**Type** float in [-inf, inf], default 0.0

**shape**  
Shape of the area lamp

**Type** enum in ['SQUARE', 'RECTANGLE'], default 'SQUARE'

**size**  
Size of the area of the area Lamp, X direction size for Rectangle shapes

**Type** float in [-inf, inf], default 0.0

**size\_y**  
Size of the area of the area Lamp in the Y direction for Rectangle shapes

**Type** float in [-inf, inf], default 0.0

**use\_dither**  
Use 2x2 dithering for sampling (Constant Jittered sampling)

**Type** boolean, default False

**use\_jitter**  
Use noise for sampling (Constant Jittered sampling)

**Type** boolean, default False

**use\_only\_shadow**  
Causes light to cast shadows only without illuminating objects

**Type** boolean, default False

**use\_shadow\_layer**  
Causes only objects on the same layer to cast shadows

**Type** boolean, default False

**use\_umbra**  
Emphasize parts that are fully shadowed (Constant Jittered sampling)

**Type** boolean, default False

## Inherited Properties

- `bpy_struct.id_data`
- `ID.name`
- `ID.use_fake_user`
- `ID.library`
- `ID.tag`
- `ID.users`
- `Lamp.active_texture`
- `Lamp.active_texture_index`
- `Lamp.animation_data`
- `Lamp.color`
- `Lamp.use_diffuse`
- `Lamp.distance`
- `Lamp.energy`

- Lamp.use\_own\_layer
- Lamp.use\_negative
- Lamp.use\_specular
- Lamp.texture\_slots
- Lamp.type

#### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- ID.copy
- ID.user\_clear
- ID.animation\_data\_create
- ID.animation\_data\_clear
- ID.update\_tag

### 2.4.23 AreaSpaces(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.AreaSpaces (*bpy\_struct*)

Collection of spaces

**active**

Space currently being displayed in this area

**Type** Space, (readonly)

#### Inherited Properties

- bpy\_struct.id\_data

#### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add

- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- Area.spaces

### 2.4.24 Armature(ID)

base classes — bpy\_struct, ID

**class bpy.types.Armature (ID)**

Armature datablock containing a hierarchy of bones, usually used for rigging characters

**animation\_data**

Animation data for this datablock

**Type** AnimData, (readonly)

**bones**

**Type** ArmatureBones bpy\_prop\_collection of Bone, (readonly)

**draw\_type**

**Type** enum in ['OCTAHEDRAL', 'STICK', 'BBONE', 'ENVELOPE'], default 'OCTAHEDRAL'

**edit\_bones**

**Type** ArmatureEditBones bpy\_prop\_collection of EditBone, (readonly)

**ghost\_frame\_end**

End frame of range of Ghosts to display (not for 'Around Current Frame' Onion-skinning method)

**Type** int in [-inf, inf], default 0

**ghost\_frame\_start**

Starting frame of range of Ghosts to display (not for 'Around Current Frame' Onion-skinning method)

**Type** int in [-inf, inf], default 0

**ghost\_size**

Frame step for Ghosts (not for 'On Keyframes' Onion-skinning method)

**Type** int in [1, 20], default 0

**ghost\_step**

Number of frame steps on either side of current frame to show as ghosts (only for 'Around Current Frame' Onion-skinning method)

**Type** int in [0, 30], default 0

**ghost\_type**  
Method of Onion-skinning for active Action

**Type** enum in ['CURRENT\_FRAME', 'RANGE', 'KEYS'], default 'CURRENT\_FRAME'

**layers**  
Armature layer visibility

**Type** boolean array of 32 items, default (False, False, False)

**layers\_protected**  
Protected layers in Proxy Instances are restored to Proxy settings on file reload and undo

**Type** boolean array of 32 items, default (False, False, False)

**pose\_position**  
Show armature in binding pose or final posed state

**Type** enum in ['POSE', 'REST'], default 'POSE'

**show\_axes**  
Draw bone axes

**Type** boolean, default False

**show\_bone\_custom\_shapes**  
Draw bones with their custom shapes

**Type** boolean, default False

**show\_group\_colors**  
Draw bone group colors

**Type** boolean, default False

**show\_names**  
Draw bone names

**Type** boolean, default False

**show\_only\_ghost\_selected**

**Type** boolean, default False

**use\_auto\_ik**  
Add temporaral IK constraints while grabbing bones in Pose Mode

**Type** boolean, default False

**use\_deform\_delay**  
Don't deform children when manipulating bones in Pose Mode

**Type** boolean, default False

**use\_deform\_envelopes**  
Enable Bone Envelopes when defining deform

**Type** boolean, default False

**use\_deform\_preserve\_volume**  
Enable deform rotation with Quaternions

**Type** boolean, default False

**use\_deform\_vertex\_groups**  
Enable Vertex Groups when defining deform

**Type** boolean, default False

**use\_mirror\_x**  
Apply changes to matching bone on opposite side of X-Axis

**Type** boolean, default False

## Inherited Properties

- bpy\_struct.id\_data
- ID.name
- ID.use\_fake\_user
- ID.library
- ID.tag
- ID.users

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- ID.copy
- ID.user\_clear
- ID.animation\_data\_create
- ID.animation\_data\_clear
- ID.update\_tag

## References

- BlendData.armatures
- BlendDataArmatures.new
- BlendDataArmatures.remove

## 2.4.25 ArmatureActuator(*Actuator*)

base classes — `bpy_struct`, `Actuator`

**class** `bpy.types.ArmatureActuator` (*Actuator*)  
Actuator to ..

**bone**  
Bone on which the constraint is defined  
**Type** `string`, default “”

**constraint**  
Name of the constraint you want to control  
**Type** `string`, default “”

**mode**  
**Type** `enum` in [‘RUN’, ‘ENABLE’, ‘DISABLE’, ‘SETTARGET’, ‘SETWEIGHT’], default ‘RUN’

**secondary\_target**  
Set this object as the secondary target of the constraint (only IK polar target at the moment)  
**Type** `Object`

**target**  
Set this object as the target of the constraint  
**Type** `Object`

**weight**  
Set weight of this constraint  
**Type** `float` in [0, 1], default 0.0

### Inherited Properties

- `bpy_struct.id_data`
- `Actuator.name`
- `Actuator.show_expanded`
- `Actuator.pin`
- `Actuator.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`

- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`
- `Actuator.link`
- `Actuator.unlink`

## 2.4.26 ArmatureBones(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.ArmatureBones` (`bpy_struct`)  
Collection of armature bones  
  
**active**  
Armatures active bone  
  
**Type** `Bone`

### Inherited Properties

- `bpy_struct.id_data`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

### References

- `Armature.bones`

## 2.4.27 ArmatureEditBones(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.ArmatureEditBones` (`bpy_struct`)  
Collection of armature edit bones

**active**

Armatures active edit bone

**Type** `EditBone`

**new(name)**

Add a new bone.

**Parameters** `name (string)` – New name for the bone

**Returns** Newly created edit bone

**Return type** `EditBone`

**remove(bone)**

Remove an existing bone from the armature

**Parameters** `bone (EditBone, (never None))` – EditBone to remove

**Inherited Properties**

- `bpy_struct.id_data`

**Inherited Functions**

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

**References**

- `Armature.edit_bones`

## 2.4.28 ArmatureModifier(Modifier)

base classes — `bpy_struct, Modifier`

**class** `bpy.types.ArmatureModifier (Modifier)`

Armature deformation modifier

**invert\_vertex\_group**

Invert vertex group influence

**Type** boolean, default False

**object**

Armature object to deform with

**Type** Object

**use\_bone\_envelopes**

Binds Bone envelope to armature modifier

**Type** boolean, default False

**use\_deform\_preserve\_volume**

Deform rotation interpolation with quaternions

**Type** boolean, default False

**use\_multi\_modifier**

Use same input as previous modifier, and mix results using overall vgroup

**Type** boolean, default False

**use\_vertex\_groups**

Binds vertex group to armature modifier

**Type** boolean, default False

**vertex\_group**

Name of Vertex Group which determines influence of modifier per point

**Type** string, default “”

## Inherited Properties

- bpy\_struct.id\_data
- Modifier.name
- Modifier.use\_apply\_on\_spline
- Modifier.show\_in\_editmode
- Modifier.show\_expanded
- Modifier.show\_on\_cage
- Modifier.show\_viewport
- Modifier.show\_render
- Modifier.type

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys

- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.29 ArmatureSensor(Sensor)

base classes — `bpy_struct, Sensor`

**class bpy.types.ArmatureSensor (Sensor)**

Sensor to detect values and changes in values of IK solver

**bone**

Identify the bone to check value from

**Type** string, default “”

**constraint**

Identify the bone constraint to check value from

**Type** string, default “”

**test\_type**

Type of value and test

**Type** enum in ['STATECHG', 'LINERRORBELOW', 'LINERRORABOVE', 'ROTERRORBELOW', 'ROTERRORABOVE'], default 'STATECHG'

**value**

Specify value to be used in comparison

**Type** float in [-inf, inf], default 0.0

### Inherited Properties

- `bpy_struct.id_data`
- `Sensor.name`
- `Sensor.show_expanded`
- `Sensor.frequency`
- `Sensor.invert`
- `Sensor.use_level`
- `Sensor.pin`
- `Sensor.use_pulse_false_level`
- `Sensor.use_pulse_true_level`
- `Sensor.use_tap`
- `Sensor.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`

- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- Sensor.link
- Sensor.unlink

#### 2.4.30 ArrayModifier(Modifier)

base classes — `bpy_struct, Modifier`

**class bpy.types.ArrayModifier(*Modifier*)**

Array duplication modifier

**constant\_offset\_displace**

Value for the distance between arrayed items

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**count**

Number of duplicates to make

**Type** int in [1, inf], default 0

**curve**

Curve object to fit array length to

**Type** Object

**end\_cap**

Mesh object to use as an end cap

**Type** Object

**fit\_length**

Length to fit array within

**Type** float in [0, inf], default 0.0

**fit\_type**

Array length calculation method

**Type** enum in ['FIXED\_COUNT', 'FIT\_LENGTH', 'FIT\_CURVE'], default 'FIXED\_COUNT'

**merge\_threshold**

Limit below which to merge vertices

**Type** float in [0, inf], default 0.0

**offset\_object**

Uses the location and rotation of another object to determine the distance and rotational change between arrayed items

**Type** Object

**relative\_offset\_displace**

The size of the geometry will determine the distance between arrayed items

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**start\_cap**

Mesh object to use as a start cap

**Type** Object

**use\_constant\_offset**

Add a constant offset

**Type** boolean, default False

**use\_merge\_vertices**

Merge vertices in adjacent duplicates

**Type** boolean, default False

**use\_merge\_vertices\_cap**

Merge vertices in first and last duplicates

**Type** boolean, default False

**use\_object\_offset**

Add another object's transformation to the total offset

**Type** boolean, default False

**use\_relative\_offset**

Add an offset relative to the object's bounding box

**Type** boolean, default False

## Inherited Properties

- bpy\_struct.id\_data
- Modifier.name
- Modifier.use\_apply\_on\_spline
- Modifier.show\_in\_editmode
- Modifier.show\_expanded
- Modifier.show\_on\_cage
- Modifier.show\_viewport
- Modifier.show\_render
- Modifier.type

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete

- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

### 2.4.31 `BackgroundImage(bpy_struct)`

base class — `bpy_struct`

**class** `bpy.types.BackgroundImage` (`bpy_struct`)  
Image and settings for display in the 3d View background

**image**

Image displayed and edited in this space

**Type** `Image`

**image\_user**

Parameters defining which layer, pass and frame of the image is displayed

**Type** `ImageUser`, (readonly, never None)

**offset\_x**

Offsets image horizontally from the world origin

**Type** float in [-inf, inf], default 0.0

**offset\_y**

Offsets image vertically from the world origin

**Type** float in [-inf, inf], default 0.0

**opacity**

Image opacity to blend the image against the background color

**Type** float in [0, 1], default 0.0

**show\_expanded**

Show the expanded in the user interface

**Type** boolean, default False

**size**

Scaling factor for the background image

**Type** float in [0, inf], default 0.0

**view\_axis**

The axis to display the image on

**Type** enum in ['LEFT', 'RIGHT', 'BACK', 'FRONT', 'BOTTOM', 'TOP', 'ALL', 'CAMERA'], default 'ALL'

#### Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `SpaceView3D.background_images`

### 2.4.32 BevelModifier(Modifier)

base classes — `bpy_struct, Modifier`

**class bpy.types.BevelModifier(*Modifier*)**

Bevel modifier to make edges and vertices more rounded

**angle\_limit**

Angle above which to bevel edges

**Type** float in [0, 3.14159], default 0.0

**edge\_weight\_method**

What edge weight to use for weighting a vertex

**Type** enum in ['AVERAGE', 'SHARPEST', 'LARGEST'], default 'AVERAGE'

**limit\_method**

**Type** enum in ['NONE', 'ANGLE', 'WEIGHT'], default 'NONE'

**use\_only\_vertices**

Bevel verts/corners, not edges

**Type** boolean, default False

**width**

Bevel value/amount

**Type** float in [0, inf], default 0.0

## Inherited Properties

- `bpy_struct.id_data`
- `Modifier.name`
- `Modifier.use_apply_on_spline`
- `Modifier.show_in_editmode`
- `Modifier.show_expanded`
- `Modifier.show_on_cage`
- `Modifier.show_viewport`
- `Modifier.show_render`
- `Modifier.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.33 BezierSplinePoint(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.BezierSplinePoint` (`bpy_struct`)

Bezier curve point with two handles

**co**

Coordinates of the control point

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**handle\_left**

Coordinates of the first handle

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**handle\_left\_type**

Handle types

**Type** enum in ['FREE', 'AUTO', 'VECTOR', 'ALIGNED'], default 'FREE'

**handle\_right**

Coordinates of the second handle

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**handle\_right\_type**  
Handle types  
**Type** enum in ['FREE', 'AUTO', 'VECTOR', 'ALIGNED'], default 'FREE'

**hide**  
Visibility status  
**Type** boolean, default False

**radius**  
Radius for bevelling  
**Type** float in [0, inf], default 0.0

**select\_control\_point**  
Control point selection status  
**Type** boolean, default False

**select\_left\_handle**  
Handle 1 selection status  
**Type** boolean, default False

**select\_right\_handle**  
Handle 2 selection status  
**Type** boolean, default False

**tilt**  
Tilt in 3D View  
**Type** float in [-inf, inf], default 0.0

**weight**  
Softbody goal weight  
**Type** float in [0.01, 100], default 0.0

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`

- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `Spline.bezier_points`

### 2.4.34 BlendData(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.BlendData(bpy_struct)`

Main data structure representing a .blend file and all its datablocks

#### **actions**

Action datablocks.

**Type** `BlendDataActions bpy_prop_collection of Action, (readonly)`

#### **armatures**

Armature datablocks.

**Type** `BlendDataArmatures bpy_prop_collection of Armature, (readonly)`

#### **brushes**

Brush datablocks.

**Type** `BlendDataBrushes bpy_prop_collection of Brush, (readonly)`

#### **cameras**

Camera datablocks.

**Type** `BlendDataCameras bpy_prop_collection of Camera, (readonly)`

#### **curves**

Curve datablocks.

**Type** `BlendDataCurves bpy_prop_collection of Curve, (readonly)`

#### **filepath**

Path to the .blend file

**Type** `string, default "", (readonly)`

#### **fonts**

Vector font datablocks.

**Type** `BlendDataFonts bpy_prop_collection of VectorFont, (readonly)`

#### **grease\_pencil**

Grease Pencil datablocks.

**Type** `BlendDataGreasePencils bpy_prop_collection of GreasePencil, (readonly)`

#### **groups**

Group datablocks.

**Type** `BlendDataGroups bpy_prop_collection of Group, (readonly)`

**images**

Image datablocks.

**Type** BlendDataImages bpy\_prop\_collection of [Image](#), (readonly)

**is\_dirty**

Have recent edits been saved to disk

**Type** boolean, default False, (readonly)

**is\_saved**

Has the current session been saved to disk as a .blend file

**Type** boolean, default False, (readonly)

**lamps**

Lamp datablocks.

**Type** BlendDataLamps bpy\_prop\_collection of [Lamp](#), (readonly)

**lattices**

Lattice datablocks.

**Type** BlendDataLattices bpy\_prop\_collection of [Lattice](#), (readonly)

**libraries**

Library datablocks.

**Type** BlendDataLibraries bpy\_prop\_collection of [Library](#), (readonly)

**materials**

Material datablocks.

**Type** BlendDataMaterials bpy\_prop\_collection of [Material](#), (readonly)

**meshes**

Mesh datablocks.

**Type** BlendDataMeshes bpy\_prop\_collection of [Mesh](#), (readonly)

**metaballs**

Metaball datablocks.

**Type** BlendDataMetaBalls bpy\_prop\_collection of [MetaBall](#), (readonly)

**node\_groups**

Node group datablocks.

**Type** BlendDataNodeTrees bpy\_prop\_collection of [NodeTree](#), (readonly)

**objects**

Object datablocks.

**Type** BlendDataObjects bpy\_prop\_collection of [Object](#), (readonly)

**particles**

Particle datablocks.

**Type** BlendDataParticles bpy\_prop\_collection of [ParticleSettings](#), (readonly)

**scenes**

Scene datablocks.

**Type** BlendDataScenes bpy\_prop\_collection of [Scene](#), (readonly)

**screens**

Screen datablocks.

**Type** `BlendDataScreens bpy_prop_collection of Screen`, (readonly)

**scripts**

Script datablocks (DEPRECATED).

**Type** `bpy_prop_collection of ID`, (readonly)

**shape\_keys**

Shape Key datablocks.

**Type** `bpy_prop_collection of Key`, (readonly)

**sounds**

Sound datablocks.

**Type** `BlendDataSounds bpy_prop_collection of Sound`, (readonly)

**texts**

Text datablocks.

**Type** `BlendDataTexts bpy_prop_collection of Text`, (readonly)

**textures**

Texture datablocks.

**Type** `BlendDataTextures bpy_prop_collection of Texture`, (readonly)

**window\_managers**

Window manager datablocks.

**Type** `BlendDataWindowManagers bpy_prop_collection of WindowManager`, (readonly)

**worlds**

World datablocks.

**Type** `BlendDataWorlds bpy_prop_collection of World`, (readonly)

**Inherited Properties**

- `bpy_struct.id_data`

**Inherited Functions**

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`

- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- Context.blend\_data

### 2.4.35 BlendDataActions(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.BlendDataActions (*bpy\_struct*)

Collection of actions

**new** (*name*)

Add a new action to the main database

**Parameters** *name* (*string*) – New name for the datablock.

**Returns** New action datablock.

**Return type** Action

**remove** (*action*)

Remove a action from the current blendfile.

**Parameters** *action* (Action, (never None)) – Action to remove.

**tag** (*value*)

tag

**Parameters** *value* (*boolean*) – Value

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast

- `bpy_struct.values`

## References

- `BlendData.actions`

### 2.4.36 BlendDataArmatures(`bpy_struct`)

base class — `bpy_struct`

`class bpy.types.BlendDataArmatures (bpy_struct)`

Collection of armatures

`new(name)`

Add a new armature to the main database

**Parameters** `name (string)` – New name for the datablock.

**Returns** New armature datablock.

**Return type** `Armature`

`remove(armature)`

Remove a armature from the current blendfile.

**Parameters** `armature (Armature, (never None))` – Armature to remove.

`tag(value)`

tag

**Parameters** `value (boolean)` – Value

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- BlendData.armatures

### 2.4.37 BlendDataBrushes(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.**BlendDataBrushes** (*bpy\_struct*)

Collection of brushes

**new** (*name*)

Add a new brush to the main database

**Parameters** **name** (*string*) – New name for the datablock.

**Returns** New brush datablock.

**Return type** [Brush](#)

**remove** (*brush*)

Remove a brush from the current blendfile.

**Parameters** **brush** ([Brush](#), (never None)) – Brush to remove.

**tag** (*value*)

tag

**Parameters** **value** (*boolean*) – Value

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- BlendData.brushes

### 2.4.38 BlendDataCameras(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.**BlendDataCameras** (*bpy\_struct*)

Collection of cameras

**new** (*name*)

Add a new camera to the main database

**Parameters** *name* (*string*) – New name for the datablock.

**Returns** New camera datablock.

**Return type** Camera

**remove** (*camera*)

Remove a camera from the current blendfile.

**Parameters** *camera* (Camera, (never None)) – Camera to remove.

**tag** (*value*)

tag

**Parameters** *value* (*boolean*) – Value

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- BlendData.cameras

### 2.4.39 BlendDataCurves(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.**BlendDataCurves** (*bpy\_struct*)

Collection of curves

**new** (*name*, *type*)

Add a new curve to the main database

#### Parameters

- **name** (*string*) – New name for the datablock.
- **type** (*enum in* ['CURVE', 'SURFACE', 'FONT']) – Type, The type of curve to add

**Returns** New curve datablock.

**Return type** *Curve*

**remove** (*curve*)

Remove a curve from the current blendfile.

**Parameters** **curve** (*Curve*, (never None)) – Curve to remove.

**tag** (*value*)

tag

**Parameters** **value** (*boolean*) – Value

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- BlendData.curves

### 2.4.40 BlendDataFonts(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.BlendDataFonts (bpy\_struct)

Collection of fonts

**load** (filepath)

Load a new font into the main database

**Parameters** filepath (string) – path of the font to load.

**Returns** New font datablock.

**Return type** VectorFont

**remove** (vfont)

Remove a font from the current blendfile.

**Parameters** vfont (VectorFont, (never None)) – Font to remove.

**tag** (value)

tag

**Parameters** value (boolean) – Value

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- BlendData.fonts

### 2.4.41 BlendDataGreasePencils(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.**BlendDataGreasePencils** (*bpy\_struct*)  
Collection of grease pencils

**tag** (*value*)  
tag

**Parameters** **value** (boolean) – Value

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- BlendData.grease\_pencil

### 2.4.42 BlendDataGroups(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.**BlendDataGroups** (*bpy\_struct*)  
Collection of groups

**new** (*name*)  
Add a new group to the main database

**Parameters** `name` (*string*) – New name for the datablock.

**Returns** New group datablock.

**Return type** `Group`

**remove** (`group`)

Remove a group from the current blendfile.

**Parameters** `group` (`Group`, (never None)) – Group to remove.

**tag** (`value`)

tag

**Parameters** `value` (*boolean*) – Value

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `BlendData.groups`

## 2.4.43 BlendDataImages(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.BlendDataImages` (`bpy_struct`)

Collection of images

**new** (`name, width, height, alpha=False, float_buffer=False`)

Add a new image to the main database

**Parameters**

- **name** (*string*) – New name for the datablock.
- **width** (*int in [1, inf]*) – Width of the image.
- **height** (*int in [1, inf]*) – Height of the image.
- **alpha** (*boolean, (optional)*) – Alpha, Use alpha channel
- **float\_buffer** (*boolean, (optional)*) – Float Buffer, Create an image with floating point color

**Returns** New image datablock.

**Return type** [Image](#)

**load** (*filepath*)

Load a new image into the main database

**Parameters** **filepath** (*string*) – path of the file to load.

**Returns** New image datablock.

**Return type** [Image](#)

**remove** (*image*)

Remove an image from the current blendfile.

**Parameters** **image** ([Image](#), (never None)) – Image to remove.

**tag** (*value*)

tag

**Parameters** **value** (*boolean*) – Value

## Inherited Properties

- [bpy\\_struct.id\\_data](#)

## Inherited Functions

- [bpy\\_struct.as\\_pointer](#)
- [bpy\\_struct.callback\\_add](#)
- [bpy\\_struct.callback\\_remove](#)
- [bpy\\_struct.driver\\_add](#)
- [bpy\\_struct.driver\\_remove](#)
- [bpy\\_struct.get](#)
- [bpy\\_struct.is\\_property\\_hidden](#)
- [bpy\\_struct.is\\_property\\_set](#)
- [bpy\\_struct.items](#)
- [bpy\\_struct.keyframe\\_delete](#)
- [bpy\\_struct.keyframe\\_insert](#)
- [bpy\\_struct.keys](#)
- [bpy\\_struct.path\\_from\\_id](#)
- [bpy\\_struct.path\\_resolve](#)
- [bpy\\_struct.type\\_recast](#)
- [bpy\\_struct.values](#)

## References

- BlendData.images

### 2.4.44 BlendDataLamps(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.**BlendDataLamps** (*bpy\_struct*)  
Collection of lamps

**new** (*name*, *type*)

Add a new lamp to the main database

#### Parameters

- **name** (*string*) – New name for the datablock.
- **type** (*enum in* ['POINT', 'SUN', 'SPOT', 'HEMI', 'AREA']) – Type, The type of texture to add

**Returns** New lamp datablock.

**Return type** Lamp

**remove** (*lamp*)

Remove a lamp from the current blendfile.

**Parameters** **lamp** (Lamp, (never None)) – Lamp to remove.

**tag** (*value*)

tag

**Parameters** **value** (*boolean*) – Value

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast

- `bpy_struct.values`

## References

- `BlendData.lamps`

### 2.4.45 BlendDataLattices(`bpy_struct`)

base class — `bpy_struct`

`class bpy.types.BlendDataLattices (bpy_struct)`

Collection of lattices

`new(name)`

Add a new lattice to the main database

**Parameters** `name (string)` – New name for the datablock.

**Returns** New lattices datablock.

**Return type** `Lattice`

`remove(lattice)`

Remove a lattice from the current blendfile.

**Parameters** `lattice (Lattice, (never None))` – Lattice to remove.

`tag(value)`

tag

**Parameters** `value (boolean)` – Value

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- BlendData.lattices

### 2.4.46 BlendDataLibraries(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.**BlendDataLibraries** (*bpy\_struct*)

Collection of libraries

**tag** (*value*)

tag

**Parameters** **value** (*boolean*) – Value

**load** (*filepath*, *link=False*, *relative=False*)

Returns a context manager which exposes 2 library objects on entering. Each object has attributes matching bpy.data which are lists of strings to be linked.

**Parameters**

- **filepath** (*string*) – The path to a blend file.
- **link** (*bool*) – When False reference to the original file is lost.
- **relative** (*bool*) – When True the path is stored relative to the open blend file.

```
import bpy
```

```
filepath = "//link_library.blend"
```

```
# load a single scene we know the name of.
```

```
with bpy.data.libraries.load(filepath) as (data_from, data_to):  
    data_to.scenes = ["Scene"]
```

```
# load all meshes
```

```
with bpy.data.libraries.load(filepath) as (data_from, data_to):  
    data_to.meshes = data_from.meshes
```

```
# link all objects starting with 'A'
```

```
with bpy.data.libraries.load(filepath, link=True) as (data_from, data_to):  
    data_to.objects = [name for name in data_from.objects if name.startswith("A")]
```

```
# append everything
```

```
with bpy.data.libraries.load(filepath) as (data_from, data_to):  
    for attr in dir(data_to):  
        setattr(data_to, attr, getattr(data_from, attr))
```

```
# the loaded objects can be accessed from 'data_to' outside of the context  
# since loading the data replaces the strings for the datablocks or None  
# if the datablock could not be loaded.
```

```
with bpy.data.libraries.load(filepath) as (data_from, data_to):  
    data_to.meshes = data_from.meshes  
    # now operate directly on the loaded data
```

```
for mesh in data_to.meshes:  
    if mesh is not None:  
        print(mesh.name)
```

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- BlendData.libraries

### 2.4.47 BlendDataMaterials(bpy\_struct)

base class — bpy\_struct

class bpy.types.**BlendDataMaterials** (bpy\_struct)

Collection of materials

**new** (name)

Add a new material to the main database

**Parameters** name (string) – New name for the datablock.

**Returns** New material datablock.

**Return type** Material

**remove** (material)

Remove a material from the current blendfile.

**Parameters** material (Material, (never None)) – Material to remove.

**tag** (value)

tag

**Parameters** `value (boolean)` – Value

### Inherited Properties

- `bpy_struct.id_data`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

### References

- `BlendData.materials`

## 2.4.48 BlendDataMeshes(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.BlendDataMeshes (bpy_struct)`

Collection of meshes

**new** (`name`)

Add a new mesh to the main database

**Parameters** `name (string)` – New name for the datablock.

**Returns** New mesh datablock.

**Return type** `Mesh`

**remove** (`mesh`)

Remove a mesh from the current blendfile.

**Parameters** `mesh (Mesh, (never None))` – Mesh to remove.

**tag** (`value`)

tag

**Parameters** `value (boolean)` – Value

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- BlendData.meshes

### 2.4.49 BlendDataMetaBalls(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.**BlendDataMetaBalls** (*bpy\_struct*)

Collection of metaballs

**new** (*name*)

Add a new metaball to the main database

**Parameters** **name** (*string*) – New name for the datablock.

**Returns** New metaball datablock.

**Return type** MetaBall

**remove** (*metaball*)

Remove a metaball from the current blendfile.

**Parameters** **metaball** (MetaBall, (never None)) – MetaBall to remove.

**tag** (*value*)

tag

**Parameters** **value** (*boolean*) – Value

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- BlendData.metaballs

### 2.4.50 BlendDataNodeTrees(bpy\_struct)

base class — bpy\_struct  
class bpy.types.**BlendDataNodeTrees** (*bpy\_struct*)  
Collection of node trees  
**new** (*name*, *type*)  
Add a new node tree to the main database

#### Parameters

- **name** (*string*) – New name for the datablock.
- **type** (*enum in* [‘SHADER’, ‘COMPOSITE’, ‘TEXTURE’]) – Type, The type of node\_group to add

**Returns** New node tree datablock.

**Return type** NodeTree

**remove** (*tree*)  
Remove a node tree from the current blendfile.

**Parameters** **tree** (NodeTree, (never None)) – Node tree to remove.

**tag** (*value*)  
tag

**Parameters** `value (boolean)` – Value

### Inherited Properties

- `bpy_struct.id_data`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

### References

- `BlendData.node_groups`

## 2.4.51 BlendDataObjects(bpy\_struct)

base class — `bpy_struct`

**class** `bpy.types.BlendDataObjects (bpy_struct)`

Collection of objects

**new (name, object\_data)**

Add a new object to the main database

#### Parameters

- `name (string)` – New name for the datablock.
- `object_data (ID)` – Object data or None for an empty object.

**Returns** New object datablock.

**Return type** `Object`

**remove (object)**

Remove a object from the current blendfile.

**Parameters** `object (Object, (never None))` – Object to remove.

**tag** (*value*)  
tag

**Parameters** *value* (boolean) – Value

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- BlendData.objects

## 2.4.52 BlendDataParticles(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.**BlendDataParticles** (*bpy\_struct*)

Collection of particle settings

**new** (*name*)

Add a new particle settings instance to the main database

**Parameters** *name* (string) – New name for the datablock.

**Returns** New particle settings datablock.

**Return type** ParticleSettings

**remove** (*particle*)

Remove a particle settings instance from the current blendfile.

**Parameters** *particle* (ParticleSettings, (never None)) – Particle Settings to remove.

**tag** (*value*)

tag

**Parameters** `value (boolean)` – Value

#### Inherited Properties

- `bpy_struct.id_data`

#### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

#### References

- `BlendData.particles`

### 2.4.53 BlendDataScenes(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.BlendDataScenes (bpy_struct)`

Collection of scenes

**new (name)**

Add a new scene to the main database

**Parameters** `name (string)` – New name for the datablock.

**Returns** New scene datablock.

**Return type** `Scene`

**remove (scene)**

Remove a scene from the current blendfile.

**Parameters** `scene (Scene, (never None))` – Scene to remove.

#### Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `BlendData.scenes`

## 2.4.54 BlendDataScreens(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.BlendDataScreens (bpy_struct)`  
Collection of screens

**tag** (*value*)  
tag

**Parameters** `value (boolean)` – Value

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`

- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- BlendData.screens

### 2.4.55 BlendDataSounds(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.**BlendDataSounds** (*bpy\_struct*)  
Collection of sounds

**tag** (*value*)  
tag

**Parameters** **value** (*boolean*) – Value

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- BlendData.sounds

## 2.4.56 BlendDataTexts(bpy\_struct)

base class — `bpy_struct`

`class bpy.types.BlendDataTexts (bpy_struct)`

Collection of texts

`new (name)`

Add a new text to the main database

**Parameters** `name (string)` – New name for the datablock.

**Returns** New text datablock.

**Return type** `Text`

`remove (text)`

Remove a text from the current blendfile.

**Parameters** `text (Text, (never None))` – Text to remove.

`load (filepath)`

Add a new text to the main database from a file

**Parameters** `filepath (string)` – path for the datablock.

**Returns** New text datablock.

**Return type** `Text`

`tag (value)`

tag

**Parameters** `value (boolean)` – Value

### Inherited Properties

- `bpy_struct.id_data`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- BlendData.texts

### 2.4.57 BlendDataTextures(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.**BlendDataTextures** (bpy\_struct)  
Collection of groups

**new** (name, type)

Add a new texture to the main database

#### Parameters

- **name** (string) – New name for the datablock.
- **type** (enum in ['NONE', 'BLEND', 'CLOUDS', 'DISTORTED\_NOISE', 'ENVIRONMENT\_MAP', 'IMAGE', 'MAGIC', 'MARBLE', 'MUSGRAVE', 'NOISE', 'POINT\_DENSITY', 'STUCCI', 'VORONOI', 'VOXEL\_DATA', 'WOOD']) – Type, The type of texture to add

**Returns** New texture datablock.

**Return type** Texture

**remove** (texture)

Remove a texture from the current blendfile.

**Parameters** **texture** (Texture, (never None)) – Texture to remove.

**tag** (value)

tag

**Parameters** **value** (boolean) – Value

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id

- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `BlendData.textures`

### 2.4.58 BlendDataWindowManagers(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.BlendDataWindowManagers` (`bpy_struct`)  
Collection of window managers

**tag** (*value*)  
tag

**Parameters** `value` (`boolean`) – Value

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `BlendData.window_managers`

## 2.4.59 BlendDataWorlds(bpy\_struct)

base class — `bpy_struct`

**class** `bpy.types.BlendDataWorlds` (`bpy_struct`)

Collection of worlds

**new** (`name`)

Add a new world to the main database

**Parameters** `name` (`string`) – New name for the datablock.

**Returns** New world datablock.

**Return type** `World`

**remove** (`world`)

Remove a world from the current blendfile.

**Parameters** `world` (`World`, (never None)) – World to remove.

**tag** (`value`)

tag

**Parameters** `value` (`boolean`) – Value

### Inherited Properties

- `bpy_struct.id_data`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

### References

- `BlendData.worlds`

## 2.4.60 BlendTexture(Texture)

base classes — `bpy_struct`, `ID`, `Texture`

**class bpy.types.BlendTexture (Texture)**

Procedural color blending texture

**progression**

Sets the style of the color blending

**Type** enum in ['LINEAR', 'QUADRATIC', 'EASING', 'DIAGONAL', 'SPHERICAL', 'QUADRATIC\_SPHERE', 'RADIAL'], default 'LINEAR'

**use\_flip\_axis**

Flips the texture's X and Y axis

**Type** enum in ['HORIZONTAL', 'VERTICAL'], default 'HORIZONTAL'

**users\_material**

Materials that use this texture (readonly)

**users\_object\_modifier**

Object modifiers that use this texture (readonly)

### Inherited Properties

- `bpy_struct.id_data`
- `ID.name`
- `ID.use_fake_user`
- `ID.library`
- `ID.tag`
- `ID.users`
- `Texture.animation_data`
- `Texture.intensity`
- `Texture.color_ramp`
- `Texture.contrast`
- `Texture.factor_blue`
- `Texture.factor_green`
- `Texture.factor_red`
- `Texture.node_tree`
- `Texture.saturation`
- `Texture.use_preview_alpha`
- `Texture.type`
- `Texture.use_color_ramp`
- `Texture.use_nodes`
- `Texture.users_material`
- `Texture.users_object_modifier`
- `Texture.users_material`
- `Texture.users_object_modifier`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`

- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`
- `ID.copy`
- `ID.user_clear`
- `ID.animation_data_create`
- `ID.animation_data_clear`
- `ID.update_tag`

## 2.4.61 BlenderRNA(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.BlenderRNA` (`bpy_struct`)

Blender RNA structure definitions

**structs**

**Type** `bpy_prop_collection` of `Struct`, (readonly)

### Inherited Properties

- `bpy_struct.id_data`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.62 BoidRule(bpy\_struct)

base class — bpy\_struct  
subclasses — BoidRuleAvoidCollision, BoidRuleAverageSpeed, BoidRuleAvoid, BoidRuleFight, BoidRuleFollowLeader, BoidRuleGoal

```
class bpy.types.BoidRule(bpy_struct)
```

**name**

Boid rule name

**Type** string, default “”

**type**

**Type** enum in ['GOAL', 'AVOID', 'AVOID\_COLLISION', 'SEPARATE', 'FLOCK', 'FOLLOW\_LEADER', 'AVERAGE\_SPEED', 'FIGHT'], default 'GOAL', (readonly)

**use\_in\_air**

Use rule when boid is flying

**Type** boolean, default False

**use\_on\_land**

Use rule when boid is on land

**Type** boolean, default False

**Inherited Properties**

- bpy\_struct.id\_data

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

**References**

- BoidSettings.active\_boid\_state

- `BoidState.active_boid_rule`
- `BoidState.rules`

## 2.4.63 `BoidRuleAverageSpeed(BoidRule)`

base classes — `bpy_struct, BoidRule`

`class bpy.types.BoidRuleAverageSpeed(BoidRule)`

### **level**

How much velocity's z-component is kept constant

**Type** float in [0, 1], default 0.0

### **speed**

Percentage of maximum speed

**Type** float in [0, 1], default 0.0

### **wander**

How fast velocity's direction is randomized

**Type** float in [0, 1], default 0.0

## Inherited Properties

- `bpy_struct.id_data`
- `BoidRule.name`
- `BoidRule.use_in_air`
- `BoidRule.use_on_land`
- `BoidRule.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.64 BoidRuleAvoid(BoidRule)

base classes — `bpy_struct`, `BoidRule`

`class bpy.types.BoidRuleAvoid(BoidRule)`

**fear\_factor**

Avoid object if danger from it is above this threshold

**Type** float in [0, 100], default 0.0

**object**

Object to avoid

**Type** `Object`

**use\_predict**

Predict target movement

**Type** boolean, default False

### Inherited Properties

- `bpy_struct.id_data`
- `BoidRule.name`
- `BoidRule.use_in_air`
- `BoidRule.use_on_land`
- `BoidRule.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.65 BoidRuleAvoidCollision(BoidRule)

base classes — `bpy_struct`, `BoidRule`

`class bpy.types.BoidRuleAvoidCollision(BoidRule)`

**look\_ahead**

Time to look ahead in seconds

**Type** float in [0, 100], default 0.0

**use\_avoid**

Avoid collision with other boids

**Type** boolean, default False

**use\_avoid\_collision**

Avoid collision with deflector objects

**Type** boolean, default False

**Inherited Properties**

- bpy\_struct.id\_data
- BoidRule.name
- BoidRule.use\_in\_air
- BoidRule.use\_on\_land
- BoidRule.type

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.66 BoidRuleFight(BoidRule)

base classes — bpy\_struct, BoidRule

**class** bpy.types.BoidRuleFight (*BoidRule*)

**distance**

Attack boids at max this distance

**Type** float in [0, 100], default 0.0

**flee\_distance**

Flee to this distance

**Type** float in [0, 100], default 0.0

#### Inherited Properties

- bpy\_struct.id\_data
- BoidRule.name
- BoidRule.use\_in\_air
- BoidRule.use\_on\_land
- BoidRule.type

#### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

### 2.4.67 BoidRuleFollowLeader(BoidRule)

base classes — bpy\_struct, BoidRule

**class** bpy.types.BoidRuleFollowLeader (BoidRule)

#### **distance**

Distance behind leader to follow

**Type** float in [0, 100], default 0.0

#### **object**

Follow this object instead of a boid

**Type** Object

#### **queue\_count**

How many boids in a line

**Type** int in [0, 100], default 0

#### **use\_line**

Follow leader in a line

**Type** boolean, default False

## Inherited Properties

- bpy\_struct.id\_data
- BoidRule.name
- BoidRule.use\_in\_air
- BoidRule.use\_on\_land
- BoidRule.type

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.68 BoidRuleGoal(BoidRule)

base classes — bpy\_struct, BoidRule

**class** bpy.types.BoidRuleGoal (*BoidRule*)

**object**  
Goal object

**Type** Object

**use\_predict**  
Predict target movement

**Type** boolean, default False

## Inherited Properties

- bpy\_struct.id\_data
- BoidRule.name
- BoidRule.use\_in\_air
- BoidRule.use\_on\_land
- BoidRule.type

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.69 BoidSettings(`bpy_struct`)

base class — `bpy_struct`

```
class bpy.types.BoidSettings (bpy_struct)
    Settings for boid physics

    accuracy
        Accuracy of attack
        Type float in [0, 1], default 0.0

    active_boid_state
        Type BoidRule, (readonly)

    active_boid_state_index
        Type int in [0, inf], default 0

    aggression
        Boid will fight this times stronger enemy
        Type float in [0, 100], default 0.0

    air_acc_max
        Maximum acceleration in air (relative to maximum speed)
        Type float in [0, 1], default 0.0

    air_ave_max
        Maximum angular velocity in air (relative to 180 degrees)
        Type float in [0, 1], default 0.0

    air_personal_space
        Radius of boids personal space in air (% of particle size)
        Type float in [0, 10], default 0.0

    air_speed_max
        Maximum speed in air
```

**Type** float in [0, 100], default 0.0

**air\_speed\_min**  
Minimum speed in air (relative to maximum speed)

**Type** float in [0, 1], default 0.0

**bank**  
Amount of rotation around velocity vector on turns

**Type** float in [0, 2], default 0.0

**health**  
Initial boid health when born

**Type** float in [0, 100], default 0.0

**height**  
Boid height relative to particle size

**Type** float in [0, 2], default 0.0

**land\_acc\_max**  
Maximum acceleration on land (relative to maximum speed)

**Type** float in [0, 1], default 0.0

**land\_ave\_max**  
Maximum angular velocity on land (relative to 180 degrees)

**Type** float in [0, 1], default 0.0

**land\_jump\_speed**  
Maximum speed for jumping

**Type** float in [0, 100], default 0.0

**land\_personal\_space**  
Radius of boids personal space on land (% of particle size)

**Type** float in [0, 10], default 0.0

**land\_smooth**  
How smoothly the boids land

**Type** float in [0, 10], default 0.0

**land\_speed\_max**  
Maximum speed on land

**Type** float in [0, 100], default 0.0

**land\_stick\_force**  
How strong a force must be to start effecting a boid on land

**Type** float in [0, 1000], default 0.0

**pitch**  
Amount of rotation around side vector

**Type** float in [0, 2], default 0.0

**range**  
The maximum distance from which a boid can attack

**Type** float in [0, 100], default 0.0

**states**

**Type** bpy\_prop\_collection of BoidState, (readonly)

**strength**

Maximum caused damage on attack per second

**Type** float in [0, 100], default 0.0

**use\_climb**

Allow boids to climb goal objects

**Type** boolean, default False

**use\_flight**

Allow boids to move in air

**Type** boolean, default False

**use\_land**

Allow boids to move on land

**Type** boolean, default False

**Inherited Properties**

- bpy\_struct.id\_data

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

**References**

- ParticleSettings.boids

## 2.4.70 BoidState(bpy\_struct)

base class — bpy\_struct

```
class bpy.types.BoidState(bpy_struct)
    Boid state for boid physics

    active_boid_rule
        Type BoidRule, (readonly)

    active_boid_rule_index
        Type int in [0, inf], default 0

    falloff
        Type float in [0, 10], default 0.0

    name
        Boid state name
        Type string, default ""

    rule_fuzzy
        Type float in [0, 1], default 0.0

    rules
        Type bpy_prop_collection of BoidRule, (readonly)

    ruleset_type
        How the rules in the list are evaluated
        Type enum in ['FUZZY', 'RANDOM', 'AVERAGE'], default 'FUZZY'

    volume
        Type float in [0, 100], default 0.0
```

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- `BoidSettings.states`

### 2.4.71 Bone(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.Bone` (`bpy_struct`)

Bone in an Armature datablock

**bbone\_in**

Length of first Bezier Handle (for B-Bones only)

**Type** float in [0, 2], default 0.0

**bbone\_out**

Length of second Bezier Handle (for B-Bones only)

**Type** float in [0, 2], default 0.0

**bbone\_segments**

Number of subdivisions of bone (for B-Bones only)

**Type** int in [1, 32], default 0

**bbone\_x**

B-Bone X size

**Type** float in [0, 1000], default 0.0

**bbone\_z**

B-Bone Z size

**Type** float in [0, 1000], default 0.0

**children**

Bones which are children of this bone

**Type** `bpy_prop_collection` of `Bone`, (readonly)

**envelope\_distance**

Bone deformation distance (for Envelope deform only)

**Type** float in [0, 1000], default 0.0

**envelope\_weight**

Bone deformation weight (for Envelope deform only)

**Type** float in [0, 1000], default 0.0

**head**

Location of head end of the bone relative to its parent

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**head\_local**

Location of head end of the bone relative to armature

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**head\_radius**

Radius of head of bone (for Envelope deform only)

**Type** float in [0, inf], default 0.0

**hide**  
Bone is not visible when it is not in Edit Mode (i.e. in Object or Pose Modes)

**Type** boolean, default False

**hide\_select**  
Bone is able to be selected

**Type** boolean, default False

**layers**  
Layers bone exists in

**Type** boolean array of 32 items, default (False, False, False)

**matrix**  
3x3 bone matrix

**Type** float array of 9 items in [-inf, inf], default (0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0)

**matrix\_local**  
4x4 bone matrix relative to armature

**Type** float array of 16 items in [-inf, inf], default (0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0)

**name**

**Type** string, default “”

**parent**  
Parent bone (in same Armature)

**Type** [Bone](#), (readonly)

**select**

**Type** boolean, default False

**select\_head**

**Type** boolean, default False

**select\_tail**

**Type** boolean, default False

**show\_wire**  
Bone is always drawn as Wireframe regardless of viewport draw mode. Useful for non-obstructive custom bone shapes

**Type** boolean, default False

**tail**  
Location of tail end of the bone

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**tail\_local**  
Location of tail end of the bone relative to armature

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**tail\_radius**

Radius of tail of bone (for Envelope deform only)

**Type** float in [0, inf], default 0.0

**use\_connect**

When bone has a parent, bone's head is struck to the parent's tail

**Type** boolean, default False, (readonly)

**use\_cyclic\_offset**

When bone doesn't have a parent, it receives cyclic offset effects

**Type** boolean, default False

**use\_deform**

Bone does not deform any geometry

**Type** boolean, default False

**use\_envelope\_multiply**

When deforming bone, multiply effects of Vertex Group weights with Envelope influence

**Type** boolean, default False

**use\_inherit\_rotation**

Bone inherits rotation or scale from parent bone

**Type** boolean, default False

**use\_inherit\_scale**

Bone inherits scaling from parent bone

**Type** boolean, default False

**use\_local\_location**

Bone location is set in local space

**Type** boolean, default False

**basename**

The name of this bone before any '.' character (readonly)

**center**

The midpoint between the head and the tail. (readonly)

**children**

A list of all the bones children. (readonly)

**children\_recursive**

a list of all children from this bone. (readonly)

**children\_recursive\_basename**

Returns a chain of children with the same base name as this bone Only direct chains are supported, forks caused by multiple children with matching basenames will terminate the function and not be returned. (readonly)

**length**

The distance from head to tail, when set the head is moved to fit the length.

**parent\_recursive**

A list of parents, starting with the immediate parent (readonly)

**vector**

The direction this bone is pointing. Utility function for (tail - head) (readonly)

**x\_axis**

Vector pointing down the x-axis of the bone. (readonly)

**y\_axis**

Vector pointing down the x-axis of the bone. (readonly)

**z\_axis**

Vector pointing down the x-axis of the bone. (readonly)

**evaluate\_envelope (point)**

Calculate bone envelope at given point.

**Parameters** `point` (*float array of 3 items in [-inf, inf]*) – Point, Position in 3d space to evaluate

**Returns** Factor, Envelope factor

**Return type** float in [-inf, inf]

**parent\_index (parent\_test)**

The same as ‘bone in other\_bone.parent\_recursive’ but saved generating a list.

**translate (vec)**

Utility function to add `vec` to the head and tail of this bone.

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `Armature.bones`
- `ArmatureBones.active`
- `Bone.children`
- `Bone.parent`
- `PoseBone.bone`

## 2.4.72 BoneGroup(bpy\_struct)

base class — `bpy_struct`

**class** `bpy.types.BoneGroup(bpy_struct)`

Groups of Pose Channels (Bones)

**color\_set**

Custom color set to use

**Type** enum in ['DEFAULT', 'THEME01', 'THEME02', 'THEME03', 'THEME04', 'THEME05', 'THEME06', 'THEME07', 'THEME08', 'THEME09', 'THEME10', 'THEME11', 'THEME12', 'THEME13', 'THEME14', 'THEME15', 'THEME16', 'THEME17', 'THEME18', 'THEME19', 'THEME20', 'CUSTOM'], default 'DEFAULT'

**colors**

Copy of the colors associated with the group's color set

**Type** `ThemeBoneColorSet`, (readonly, never None)

**name**

**Type** string, default ""

### Inherited Properties

- `bpy_struct.id_data`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

### References

- `BoneGroups.active`
- `Pose.bone_groups`
- `PoseBone.bone_group`

## 2.4.73 BoneGroups(bpy\_struct)

base class — `bpy_struct`

**class bpy.types.BoneGroups (bpy\_struct)**

Collection of bone groups

**active**

Active bone group for this pose

**Type** `BoneGroup`

**active\_index**

Active index in bone groups array

**Type** int in [-inf, inf], default 0

### Inherited Properties

- `bpy_struct.id_data`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

### References

- `Pose.bone_groups`

## 2.4.74 BooleanModifier(Modifier)

base classes — `bpy_struct, Modifier`

**class bpy.types.BooleanModifier (Modifier)**

Boolean operations modifier

**object**

Mesh object to use for Boolean operation

**Type** `Object`

**operation**

**Type** enum in ['INTERSECT', 'UNION', 'DIFFERENCE'], default 'INTERSECT'

### Inherited Properties

- `bpy_struct.id_data`
- `Modifier.name`
- `Modifier.use_apply_on_spline`
- `Modifier.show_in_editmode`
- `Modifier.show_expanded`
- `Modifier.show_on_cage`
- `Modifier.show_viewport`
- `Modifier.show_render`
- `Modifier.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.75 BooleanProperty(Property)

base classes — `bpy_struct, Property`

**class** `bpy.types.BooleanProperty(Property)`

RNA boolean property definition

#### **array\_length**

Maximum length of the array, 0 means unlimited

**Type** int in [0, inf], default 0, (readonly)

#### **default**

Default value for this number

**Type** boolean, default False, (readonly)

**default\_array**

Default value for this array

**Type** boolean array of 3 items, default (False, False, False), (readonly)**Inherited Properties**

- bpy\_struct.id\_data
- Property.name
- Property.srna
- Property.description
- Property.is\_enum\_flag
- Property.is\_hidden
- Property.identifier
- Property.is\_never\_none
- Property.is\_readonly
- Property.is\_registered
- Property.is\_registered\_optional
- Property.is\_required
- Property.is\_output
- Property.is\_runtime
- Property.is\_skip\_save
- Property.subtype
- Property.type
- Property.unit

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.76 Brush(ID)

base classes — bpy\_struct, ID

**class bpy.types.Brush (ID)**

Brush datablock for storing brush settings for painting and sculpting

**auto\_smooth\_factor**

Amount of smoothing to automatically apply to each stroke

**Type** float in [0, 1], default 0.0

**blend**

Brush blending mode

**Type** enum in ['MIX', 'ADD', 'SUB', 'MUL', 'LIGHTEN', 'DARKEN', 'ERASE\_ALPHA', 'ADD\_ALPHA'], default 'MIX'

**clone\_alpha**

Opacity of clone image display

**Type** float in [0, 1], default 0.0

**clone\_image**

Image for clone tool

**Type** Image

**clone\_offset**

**Type** float array of 2 items in [-inf, inf], default (0.0, 0.0)

**color**

**Type** float array of 3 items in [0, 1], default (0.0, 0.0, 0.0)

**crease\_pinch\_factor**

How much the crease brush pinches

**Type** float in [0, 1], default 0.666667

**cursor\_color\_add**

Color of cursor when adding

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**cursor\_color\_subtract**

Color of cursor when subtracting

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**curve**

Editable falloff curve

**Type** CurveMapping, (readonly, never None)

**direction**

**Type** enum in ['ADD', 'SUBTRACT'], default 'ADD'

**height**

Affectable height of brush (layer height for layer tool, i.e.)

**Type** float in [0, 1], default 0.5

**icon\_filepath**

File path to brush icon

**Type** string, default ""

**image\_tool**

**Type** enum in ['DRAW', 'SOFTEN', 'SMEAR', 'CLONE'], default 'DRAW'

**jitter**

Jitter the position of the brush while painting

**Type** float in [0, 1], default 0.0

**normal\_weight**

How much grab will pull vertexes out of surface during a grab

**Type** float in [0, 1], default 0.0

**plane\_offset**

Adjusts plane on which the brush acts towards or away from the object surface

**Type** float in [-2, 2], default 0.0

**plane\_trim**

If a vertex is further from offset plane than this then it is not affected

**Type** float in [0, 1], default 0.5

**rate**

Interval between paints for Airbrush

**Type** float in [0.0001, 10000], default 0.0

**sculpt\_plane**

**Type** enum in ['AREA', 'VIEW', 'X', 'Y', 'Z'], default 'AREA'

**sculpt\_tool**

**Type** enum in ['BLOB', 'CLAY', 'CREASE', 'DRAW', 'FILL', 'FLATTEN', 'GRAB', 'INFLATE', 'LAYER', 'NUDGE', 'PINCH', 'ROTATE', 'SCRAPE', 'SMOOTH', 'SNAKE\_HOOK', 'THUMB'], default 'BLOB'

**size**

Radius of the brush in pixels

**Type** int in [1, 2000], default 0

**smooth\_stroke\_factor**

Higher values give a smoother stroke

**Type** float in [0.5, 0.99], default 0.0

**smooth\_stroke\_radius**

Minimum distance from last point before stroke continues

**Type** int in [10, 200], default 0

**spacing**

Spacing between brush daubs as a percentage of brush diameter

**Type** int in [1, 1000], default 0

**strength**

How powerful the effect of the brush is when applied

**Type** float in [0, 10], default 0.5

**stroke\_method**

**Type** enum in ['DOTS', 'DRAG\_DOT', 'SPACE', 'ANCHORED', 'AIRBRUSH'], default 'DOTS'

**texture**

**Type** `Texture`

**texture\_angle\_source\_no\_random**

**Type** enum in ['USER', 'RAKE'], default 'USER'

**texture\_angle\_source\_random**

**Type** enum in ['USER', 'RAKE', 'RANDOM'], default 'USER'

**texture\_overlay\_alpha**

**Type** int in [1, 100], default 0

**texture\_sample\_bias**

Value added to texture samples

**Type** float in [-1, 1], default 0.0

**texture\_slot**

**Type** `BrushTextureSlot`, (readonly)

**unprojected\_radius**

Radius of brush in Blender units

**Type** float in [0.001, inf], default 0.0

**use\_accumulate**

Accumulate stroke dabs on top of each other

**Type** boolean, default False

**use\_adaptive\_space**

Space daubs according to surface orientation instead of screen space

**Type** boolean, default False

**use\_airbrush**

Keep applying paint effect while holding mouse (spray)

**Type** boolean, default False

**use\_alpha**

When this is disabled, lock alpha while painting

**Type** boolean, default False

**use\_anchor**

Keep the brush anchored to the initial location

**Type** boolean, default False

**use\_custom\_icon**

Set the brush icon from an image file

**Type** boolean, default False

**use\_edge\_to\_edge**

Drag anchor brush from edge-to-edge

**Type** boolean, default False

**use\_fixed\_texture**

Keep texture origin in fixed position

**Type** boolean, default False

**use\_frontface**

Brush only affects vertexes that face the viewer

**Type** boolean, default False

**use\_inverse\_smooth\_pressure**

Lighter pressure causes more smoothing to be applied

**Type** boolean, default False

**use\_locked\_size**

When locked brush stays same size relative to object; when unlocked brush size is given in pixels

**Type** boolean, default False

**use\_offset\_pressure**

Enable tablet pressure sensitivity for offset

**Type** boolean, default False

**use\_original\_normal**

When locked keep using normal of surface where stroke was initiated

**Type** boolean, default False

**use\_paint\_image**

Use this brush in texture paint mode

**Type** boolean, default False

**use\_paint\_sculpt**

Use this brush in sculpt mode

**Type** boolean, default False

**use\_paint\_vertex**

Use this brush in vertex paint mode

**Type** boolean, default False

**use\_paint\_weight**

Use this brush in weight paint mode

**Type** boolean, default False

**use\_persistent**

Sculpts on a persistent layer of the mesh

**Type** boolean, default False

**use\_plane\_trim**

Enable Plane Trim

**Type** boolean, default False

**use\_pressure\_jitter**

Enable tablet pressure sensitivity for jitter

**Type** boolean, default False

**use\_pressure\_size**

Enable tablet pressure sensitivity for size

**Type** boolean, default False

**use\_pressure\_spacing**

Enable tablet pressure sensitivity for spacing

**Type** boolean, default False

**use\_pressure\_strength**  
Enable tablet pressure sensitivity for strength

**Type** boolean, default False

**use\_rake**  
Rotate the brush texture to match the stroke direction

**Type** boolean, default False

**use\_random\_rotation**  
Rotate the brush texture at random

**Type** boolean, default False

**use\_restore\_mesh**  
Allows a single dot to be carefully positioned

**Type** boolean, default False

**use\_smooth\_stroke**  
Brush lags behind mouse and follows a smoother path

**Type** boolean, default False

**use\_space**  
Limit brush application to the distance specified by spacing

**Type** boolean, default False

**use\_space\_atten**  
Automatically adjusts strength to give consistent results for different spacings

**Type** boolean, default False

**use\_texture\_overlay**  
Show texture in viewport

**Type** boolean, default False

**use\_wrap**  
Enable torus wrapping while painting

**Type** boolean, default False

**vertex\_tool**

**Type** enum in ['MIX', 'ADD', 'SUB', 'MUL', 'BLUR', 'LIGHTEN', 'DARKEN'], default 'MIX'

### Inherited Properties

- `bpy_struct.id_data`
- `ID.name`
- `ID.use_fake_user`
- `ID.library`
- `ID.tag`
- `ID.users`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`
- `ID.copy`
- `ID.user_clear`
- `ID.animation_data_create`
- `ID.animation_data_clear`
- `ID.update_tag`

## References

- `BlendData.brushes`
- `BlendDataBrushes.new`
- `BlendDataBrushes.remove`
- `Paint.brush`

## 2.4.77 BrushTextureSlot(TextureSlot)

base classes — `bpy_struct, TextureSlot`

**class bpy.types.BrushTextureSlot (TextureSlot)**  
Texture slot for textures in a Brush datablock

**angle**

Defines brush texture rotation

**Type** float in [0, 6.28319], default 0.0

**map\_mode**

**Type** enum in ['FIXED', 'TILED', '3D'], default 'FIXED'

## Inherited Properties

- `bpy_struct.id_data`
- `TextureSlot.name`
- `TextureSlot.blend_type`
- `TextureSlot.color`

- `TextureSlot.default_value`
- `TextureSlot.invert`
- `TextureSlot.offset`
- `TextureSlot.output_node`
- `TextureSlot.use_rgb_to_intensity`
- `TextureSlot.scale`
- `TextureSlot.use_stencil`
- `TextureSlot.texture`

#### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

#### References

- `Brush.texture_slot`

### 2.4.78 BuildModifier(Modifier)

base classes — `bpy_struct, Modifier`

**class bpy.types.BuildModifier (Modifier)**

Build effect modifier

**frame\_duration**

Specify the total time the build effect requires

**Type** float in [1, 300000], default 0.0

**frame\_start**

Specify the start frame of the effect

**Type** float in [-300000, 300000], default 0.0

**seed**

Specify the seed for random if used

**Type** int in [1, 300000], default 0

**use\_random\_order**

Randomize the faces or edges during build

**Type** boolean, default False

**Inherited Properties**

- bpy\_struct.id\_data
- Modifier.name
- Modifier.use\_apply\_on\_spline
- Modifier.show\_in\_editmode
- Modifier.show\_expanded
- Modifier.show\_on\_cage
- Modifier.show\_viewport
- Modifier.show\_render
- Modifier.type

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.79 Camera(ID)

base classes — [bpy\\_struct](#), [ID](#)

**class bpy.types.Camera (ID)**

Camera datablock for storing camera settings

**angle**

Perspective Camera lens field of view in degrees

**Type** float in [0.00640536, 3.01675], default 0.0

**animation\_data**

Animation data for this datablock

**Type** [AnimData](#), (readonly)

**clip\_end**

Camera far clipping distance

**Type** float in [1, inf], default 0.0

**clip\_start**  
Camera near clipping distance

**Type** float in [0.001, inf], default 0.0

**dof\_distance**  
Distance to the focus point for depth of field

**Type** float in [0, 5000], default 0.0

**dof\_object**  
Use this object to define the depth of field focal point

**Type** Object

**draw\_size**  
Apparent size of the Camera object in the 3D View

**Type** float in [0.01, 1000], default 0.0

**lens**  
Perspective Camera lens value in millimeters

**Type** float in [1, 5000], default 0.0

**lens\_unit**  
Unit to edit lens in for the user interface

**Type** enum in ['MILLIMETERS', 'DEGREES'], default 'MILLIMETERS'

**ortho\_scale**  
Orthographic Camera scale (similar to zoom)

**Type** float in [0.01, 4000], default 0.0

**passepaprtout\_alpha**  
Opacity (alpha) of the darkened overlay in Camera view

**Type** float in [0, 1], default 0.0

**shift\_x**  
Perspective Camera horizontal shift

**Type** float in [-10, 10], default 0.0

**shift\_y**  
Perspective Camera vertical shift

**Type** float in [-10, 10], default 0.0

**show\_guide**  
Draw overlay

**Type** enum set in {'CENTER', 'CENTER\_DIAGONAL', 'THIRDS', 'GOLDEN', 'GOLDEN\_TRIANGLE\_A', 'GOLDEN\_TRIANGLE\_B', 'HARMONY\_TRIANGLE\_A', 'HARMONY\_TRIANGLE\_B'}, default {'CENTER'}

**show\_limits**  
Draw the clipping range and focus point on the camera

**Type** boolean, default False

**show\_mist**  
Draw a line from the Camera to indicate the mist area

**Type** boolean, default False  
**show\_name**  
Show the active Camera's name in Camera view  
**Type** boolean, default False  
**show\_passepartout**  
Show a darkened overlay outside the image area in Camera view  
**Type** boolean, default False  
**show\_title\_safe**  
Show indicators for the title safe zone in Camera view  
**Type** boolean, default False  
**type**  
Camera types  
**Type** enum in ['PERSP', 'ORTHO'], default 'PERSP'  
**use\_panorama**  
Render the scene with a cylindrical camera for pseudo-fisheye lens effects  
**Type** boolean, default False

## Inherited Properties

- bpy\_struct.id\_data
- ID.name
- ID.use\_fake\_user
- ID.library
- ID.tag
- ID.users

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- ID.copy
- ID.user\_clear
- ID.animation\_data\_create

- `ID.animation_data_clear`
- `ID.update_tag`

## References

- `BlendData.cameras`
- `BlendDataCameras.new`
- `BlendDataCameras.remove`

## 2.4.80 CameraActuator(Actuator)

base classes — `bpy_struct, Actuator`

**class bpy.types.CameraActuator (Actuator)**  
Actuator to ..

### **axis**

Specify the axis the Camera will try to get behind

**Type** enum in ['X', 'Y'], default 'X'

### **damping**

Specify the strength of the constraint that drive the camera behind the target

**Type** float in [0, 10], default 0.0

### **height**

**Type** float in [-inf, inf], default 0.0

### **max**

**Type** float in [-inf, inf], default 0.0

### **min**

**Type** float in [-inf, inf], default 0.0

### **object**

Look at this Object

**Type** Object

## Inherited Properties

- `bpy_struct.id_data`
- `Actuator.name`
- `Actuator.show_expanded`
- `Actuator.pin`
- `Actuator.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`

- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- Actuator.link
- Actuator.unlink

## 2.4.81 CastModifier(Modifier)

base classes — bpy\_struct, Modifier

**class** bpy.types.CastModifier (*Modifier*)

Cast modifier to cast to other shapes

**cast\_type**

Target object shape

**Type** enum in ['SPHERE', 'CYLINDER', 'CUBOID'], default 'SPHERE'

**factor**

**Type** float in [-inf, inf], default 0.0

**object**

Control object: if available, its location determines the center of the effect

**Type** Object

**radius**

Only deform vertices within this distance from the center of the effect (leave as 0 for infinite.)

**Type** float in [0, inf], default 0.0

**size**

Size of projection shape (leave as 0 for auto.)

**Type** float in [0, inf], default 0.0

**use\_radius\_as\_size**

Use radius as size of projection shape (0 = auto)

**Type** boolean, default False

**use\_transform**

Use object transform to control projection shape

**Type** boolean, default False

**use\_x**

**Type** boolean, default False

**use\_y**

**Type** boolean, default False

**use\_z**

**Type** boolean, default False

**vertex\_group**

Vertex group name

**Type** string, default “”

**Inherited Properties**

- bpy\_struct.id\_data
- Modifier.name
- Modifier.use\_apply\_on\_spline
- Modifier.show\_in\_editmode
- Modifier.show\_expanded
- Modifier.show\_on\_cage
- Modifier.show\_viewport
- Modifier.show\_render
- Modifier.type

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.82 ChannelDriverVariables(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.ChannelDriverVariables (*bpy\_struct*)

Collection of channel driver Variables

**new()**

Add a new variable for the driver.

**Returns** Newly created Driver Variable.

**Return type** DriverVariable

**remove**(*variable*)

Remove an existing variable from the driver.

**Parameters** **variable**([DriverVariable](#), (never None)) – Variable to remove from the driver.

**Inherited Properties**

- [bpy\\_struct.id\\_data](#)

**Inherited Functions**

- [bpy\\_struct.as\\_pointer](#)
- [bpy\\_struct.callback\\_add](#)
- [bpy\\_struct.callback\\_remove](#)
- [bpy\\_struct.driver\\_add](#)
- [bpy\\_struct.driver\\_remove](#)
- [bpy\\_struct.get](#)
- [bpy\\_struct.is\\_property\\_hidden](#)
- [bpy\\_struct.is\\_property\\_set](#)
- [bpy\\_struct.items](#)
- [bpy\\_struct.keyframe\\_delete](#)
- [bpy\\_struct.keyframe\\_insert](#)
- [bpy\\_struct.keys](#)
- [bpy\\_struct.path\\_from\\_id](#)
- [bpy\\_struct.path\\_resolve](#)
- [bpy\\_struct.type\\_recast](#)
- [bpy\\_struct.values](#)

**References**

- [Driver.variables](#)

## 2.4.83 ChildOfConstraint(Constraint)

base classes — [bpy\\_struct](#), [Constraint](#)

**class** [bpy.types.ChildOfConstraint](#)(*Constraint*)

Creates constraint-based parent-child relationship

**inverse\_matrix**

Transformation matrix to apply before

**Type** float array of 16 items in [-inf, inf], default (0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0)

**subtarget**

**Type** string, default “”

**target**

Target Object

**Type** [Object](#)

**use\_location\_x**

Use X Location of Parent

**Type** boolean, default False

**use\_location\_y**

Use Y Location of Parent

**Type** boolean, default False

**use\_location\_z**

Use Z Location of Parent

**Type** boolean, default False

**use\_rotation\_x**

Use X Rotation of Parent

**Type** boolean, default False

**use\_rotation\_y**

Use Y Rotation of Parent

**Type** boolean, default False

**use\_rotation\_z**

Use Z Rotation of Parent

**Type** boolean, default False

**use\_scale\_x**

Use X Scale of Parent

**Type** boolean, default False

**use\_scale\_y**

Use Y Scale of Parent

**Type** boolean, default False

**use\_scale\_z**

Use Z Scale of Parent

**Type** boolean, default False

## Inherited Properties

- bpy\_struct.id\_data
- Constraint.name
- Constraint.active
- Constraint.mute
- Constraint.show\_expanded
- Constraint.influence
- Constraint.error\_location
- Constraint.owner\_space
- Constraint.is\_proxy\_local
- Constraint.error\_rotation
- Constraint.target\_space
- Constraint.type
- Constraint.is\_valid

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.84 ChildParticle(`bpy_struct`)

base class — `bpy_struct`

`class bpy.types.ChildParticle(bpy_struct)`

Child particle interpolated from simulated or edited particles

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `ParticleSystem.child_particles`

### 2.4.85 ClampToConstraint(Constraint)

base classes — `bpy_struct, Constraint`

```
class bpy.types.ClampToConstraint (Constraint)
    Constrains an object's location to the nearest point along the target path

    main_axis
        Main axis of movement
        Type enum in ['CLAMPTO_AUTO', 'CLAMPTO_X', 'CLAMPTO_Y', 'CLAMPTO_Z'], de-
            fault 'CLAMPTO_AUTO'

    target
        Target Object
        Type Object

    use_cyclic
        Treat curve as cyclic curve (no clamping to curve bounding box
        Type boolean, default False
```

## Inherited Properties

- `bpy_struct.id_data`
- `Constraint.name`
- `Constraint.active`
- `Constraint.mute`
- `Constraint.show_expanded`
- `Constraint.influence`
- `Constraint.error_location`
- `Constraint.owner_space`
- `Constraint.is_proxy_local`
- `Constraint.error_rotation`
- `Constraint.target_space`
- `Constraint.type`
- `Constraint.is_valid`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`

- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.86 ClothCollisionSettings(bpy\_struct)

base class — bpy\_struct

**class bpy.types.ClothCollisionSettings (bpy\_struct)**

    Cloth simulation settings for self collision and collision with other objects

**collision\_quality**

    How many collision iterations should be done. (higher is better quality but slower)

**Type** int in [1, 20], default 0

**distance\_min**

    Minimum distance between collision objects before collision response takes in

**Type** float in [0.001, 1], default 0.0

**distance\_repel**

    Maximum distance to apply repulsion force, must be greater than minimum distance

**Type** float in [0.001, 10], default 0.005

**friction**

    Friction force if a collision happened. (higher = less movement)

**Type** float in [0, 80], default 0.0

**group**

    Limit colliders to this Group

**Type** Group

**repel\_force**

    Repulsion force to apply on cloth when close to colliding

**Type** float in [0, 20], default 1.0

**self\_collision\_quality**

    How many self collision iterations should be done. (higher is better quality but slower)

**Type** int in [1, 10], default 0

**self\_distance\_min**

    0.5 means no distance at all, 1.0 is maximum distance

**Type** float in [0.5, 1], default 0.0

**self\_friction**

    Friction/damping with self contact

**Type** float in [0, 80], default 0.0

**use\_collision**

    Enable collisions with other objects

**Type** boolean, default False

**use\_self\_collision**

Enable self collisions

**Type** boolean, default False

**Inherited Properties**

- bpy\_struct.id\_data

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

**References**

- ClothModifier.collision\_settings

## 2.4.87 ClothModifier(Modifier)

base classes — bpy\_struct, Modifier

**class bpy.types.ClothModifier (Modifier)**

Cloth simulation modifier

**collision\_settings**

**Type** ClothCollisionSettings, (readonly, never None)

**point\_cache**

**Type** PointCache, (readonly, never None)

**settings**

**Type** ClothSettings, (readonly, never None)

## Inherited Properties

- bpy\_struct.id\_data
- Modifier.name
- Modifier.use\_apply\_on\_spline
- Modifier.show\_in\_editmode
- Modifier.show\_expanded
- Modifier.show\_on\_cage
- Modifier.show\_viewport
- Modifier.show\_render
- Modifier.type

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- ParticleSystem.cloth

### 2.4.88 ClothSettings(bpy\_struct)

base class — bpy\_struct

**class bpy.types.ClothSettings (bpy\_struct)**

Cloth simulation settings for an object

**air\_damping**

Air has normally some thickness which slows falling things down

**Type** float in [0, 10], default 0.0

**bending\_stiffness**

Wrinkle coefficient. (higher = less smaller but more big wrinkles)

**Type** float in [0, 10000], default 0.0

**bending\_stiffness\_max**

Maximum bending stiffness value

**Type** float in [0, 10000], default 0.0

**collider\_friction**

**Type** float in [0, 1], default 0.0

**effector\_weights**

**Type** [EffectorWeights](#), (readonly)

**goal\_default**

Default Goal (vertex target position) value, when no Vertex Group used

**Type** float in [0, 1], default 0.0

**goal\_friction**

Goal (vertex target position) friction

**Type** float in [0, 50], default 0.0

**goal\_max**

Goal maximum, vertex group weights are scaled to match this range

**Type** float in [0, 1], default 0.0

**goal\_min**

Goal minimum, vertex group weights are scaled to match this range

**Type** float in [0, 1], default 0.0

**goal\_spring**

Goal (vertex target position) spring stiffness

**Type** float in [0, 0.999], default 0.0

**gravity**

Gravity or external force vector

**Type** float array of 3 items in [-100, 100], default (0.0, 0.0, 0.0)

**internal\_friction**

**Type** float in [0, 1], default 0.0

**mass**

Mass of cloth material

**Type** float in [0, 10], default 0.0

**pin\_stiffness**

Pin (vertex target position) spring stiffness

**Type** float in [0, 50], default 0.0

**pre\_roll**

Simulation starts on this frame

**Type** int in [0, 200], default 0

**quality**

Quality of the simulation in steps per frame. (higher is better quality but slower)

**Type** int in [4, 80], default 0

**rest\_shape\_key**

Shape key to use the rest spring lengths from

**Type** [ShapeKey](#)

**spring\_damping**

Damping of cloth velocity. (higher = more smooth, less jiggling)

**Type** float in [0, 50], default 0.0

**structural\_stiffness**

Overall stiffness of structure

**Type** float in [0, 10000], default 0.0

**structural\_stiffness\_max**

Maximum structural stiffness value

**Type** float in [0, 10000], default 0.0

**use\_pin\_cloth**

Enable pinning of cloth vertices to other objects/positions

**Type** boolean, default False

**use\_stiffness\_scale**

If enabled, stiffness can be scaled along a weight painted vertex group

**Type** boolean, default False

**vertex\_group\_bending**

Vertex group for fine control over bending stiffness

**Type** string, default “”

**vertex\_group\_mass**

Vertex Group for pinning of vertices

**Type** string, default “”

**vertex\_group\_structural\_stiffness**

Vertex group for fine control over structural stiffness

**Type** string, default “”

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`

- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `ClothModifier.settings`

### 2.4.89 CloudsTexture(Texture)

base classes — `bpy_struct, ID, Texture`

**class bpy.types.CloudsTexture (Texture)**

Procedural noise texture

**cloud\_type**

Determines whether Noise returns grayscale or RGB values

**Type** enum in ['GREYSCALE', 'COLOR'], default 'GREYSCALE'

**nabla**

Size of derivative offset used for calculating normal

**Type** float in [0.001, 0.1], default 0.0

**noise\_basis**

Sets the noise basis used for turbulence

**Type** enum in ['BLENDER\_ORIGINAL', 'ORIGINAL\_PERLIN', 'IMPROVED\_PERLIN', 'VORONOI\_F1', 'VORONOI\_F2', 'VORONOI\_F3', 'VORONOI\_F4', 'VORONOI\_F2\_F1', 'VORONOI\_CRACKLE', 'CELL\_NOISE'], default 'BLENDER\_ORIGINAL'

**noise\_depth**

Sets the depth of the cloud calculation

**Type** int in [0, 30], default 0

**noise\_scale**

Sets scaling for noise input

**Type** float in [0.0001, inf], default 0.0

**noise\_type**

**Type** enum in ['SOFT\_NOISE', 'HARD\_NOISE'], default 'SOFT\_NOISE'

**users\_material**

Materials that use this texture (readonly)

**users\_object\_modifier**

Object modifiers that use this texture (readonly)

## Inherited Properties

- `bpy_struct.id_data`
- `ID.name`
- `ID.use_fake_user`
- `ID.library`
- `ID.tag`

- `ID.users`
- `Texture.animation_data`
- `Texture.intensity`
- `Texture.color_ramp`
- `Texture.contrast`
- `Texture.factor_blue`
- `Texture.factor_green`
- `Texture.factor_red`
- `Texture.node_tree`
- `Texture.saturation`
- `Texture.use_preview_alpha`
- `Texture.type`
- `Texture.use_color_ramp`
- `Texture.use_nodes`
- `Texture.users_material`
- `Texture.users_object_modifier`
- `Texture.users_material`
- `Texture.users_object_modifier`

#### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`
- `ID.copy`
- `ID.user_clear`
- `ID.animation_data_create`
- `ID.animation_data_clear`
- `ID.update_tag`

### 2.4.90 CollectionProperty(Property)

base classes — `bpy_struct, Property`

**class bpy.types.CollectionProperty(*Property*)**  
RNA collection property to define lists, arrays and mappings

**fixed\_type**

Fixed pointer type, empty if variable type

**Type** `Struct`, (readonly)

## Inherited Properties

- bpy\_struct.id\_data
- Property.name
- Property.srna
- Property.description
- Property.is\_enum\_flag
- Property.is\_hidden
- Property.identifier
- Property.is\_never\_none
- Property.is\_readonly
- Property.is\_registered
- Property.is\_registered\_optional
- Property.is\_required
- Property.is\_output
- Property.is\_runtime
- Property.is\_skip\_save
- Property.subtype
- Property.type
- Property.unit

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.91 CollisionModifier(Modifier)

base classes — bpy\_struct, Modifier

**class bpy.types.CollisionModifier (Modifier)**

Collision modifier defining modifier stack position used for collision

**settings**

Type CollisionSettings, (readonly, never None)

## Inherited Properties

- bpy\_struct.id\_data
- Modifier.name
- Modifier.use\_apply\_on\_spline
- Modifier.show\_in\_editmode
- Modifier.show\_expanded
- Modifier.show\_on\_cage
- Modifier.show\_viewport
- Modifier.show\_render
- Modifier.type

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.92 CollisionSensor(Sensor)

base classes — bpy\_struct, Sensor

**class bpy.types.CollisionSensor(*Sensor*)**

Sensor to detect objects colliding with the current object, with more settings than the Touch sensor

**material**

Only look for Objects with this material (blank = all objects)

**Type** string, default “”

**property**

Only look for Objects with this property (blank = all objects)

**Type** string, default “”

**use\_material**

Toggle collision on material or property

**Type** boolean, default False

**use\_pulse**

Changes to the set of colliding objects generates pulse

**Type** boolean, default False

### Inherited Properties

- bpy\_struct.id\_data
- Sensor.name
- Sensor.show\_expanded
- Sensor.frequency
- Sensor.invert
- Sensor.use\_level
- Sensor.pin
- Sensor.use\_pulse\_false\_level
- Sensor.use\_pulse\_true\_level
- Sensor.use\_tap
- Sensor.type

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- Sensor.link
- Sensor.unlink

## 2.4.93 CollisionSettings(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.CollisionSettings (*bpy\_struct*)

Collision settings for object in physics simulation

#### **absorption**

How much of effector force gets lost during collision with this object (in percent)

**Type** float in [0, 1], default 0.0

#### **damping**

Amount of damping during collision

**Type** float in [0, 1], default 0.0

**damping\_factor**

Amount of damping during particle collision

**Type** float in [0, 1], default 0.0

**damping\_random**

Random variation of damping

**Type** float in [0, 1], default 0.0

**friction\_factor**

Amount of friction during particle collision

**Type** float in [0, 1], default 0.0

**friction\_random**

Random variation of friction

**Type** float in [0, 1], default 0.0

**permeability**

Chance that the particle will pass through the mesh

**Type** float in [0, 1], default 0.0

**stickiness**

Amount of stickiness to surface collision

**Type** float in [0, 10], default 0.0

**thickness\_inner**

Inner face thickness

**Type** float in [0.001, 1], default 0.0

**thickness\_outer**

Outer face thickness

**Type** float in [0.001, 1], default 0.0

**use**

Enable this objects as a collider for physics systems

**Type** boolean, default False

**use\_particle\_kill**

Kill collided particles

**Type** boolean, default False

**Inherited Properties**

- bpy\_struct.id\_data

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get

- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- CollisionModifier.settings
- Object.collision

### 2.4.94 ColorRamp(bpy\_struct)

base class — bpy\_struct

**class bpy.types.ColorRamp(bpy\_struct)**  
Color ramp mapping a scalar value to a color

#### elements

**Type** ColorRampElements bpy\_prop\_collection of ColorRampElement, (read-only)

#### interpolation

**Type** enum in ['EASE', 'CARDINAL', 'LINEAR', 'B\_SPLINE', 'CONSTANT'], default 'LINEAR'

#### evaluate(position)

Evaluate ColorRamp

**Parameters** position (float in [0, 1]) – Position, Evaluate ColorRamp at position

**Returns** Color, Color at given position

**Return type** float array of 4 items in [-inf, inf]

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden

- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- CompositorNodeValToRGB.color\_ramp
- Material.diffuse\_ramp
- Material.specular\_ramp
- PointDensity.color\_ramp
- ShaderNodeValToRGB.color\_ramp
- Texture.color\_ramp
- TextureNodeValToRGB.color\_ramp
- UserPreferencesSystem.weight\_color\_range

## 2.4.95 ColorRampElement(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.ColorRampElement (bpy\_struct)  
Element defining a color at a position in the color ramp

**color**  
Set color of selected color stop  
**Type** float array of 4 items in [-inf, inf], default (0.0, 0.0, 0.0, 0.0)

**position**  
Set position of selected color stop  
**Type** float in [0, 1], default 0.0

### Inherited Properties

- bpy\_struct.id\_data

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items

- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `ColorRamp.elements`
- `ColorRampElements.new`
- `ColorRampElements.remove`

## 2.4.96 ColorRampElements(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.ColorRampElements` (`bpy_struct`)

Collection of Color Ramp Elements

**new** (*position*)

Add element to ColorRamp

**Parameters** *position* (*float in [0, 1]*) – Position, Position to add element

**Returns** New element.

**Return type** `ColorRampElement`

**remove** (*element*)

Delete element from ColorRamp

**Parameters** *element* (`ColorRampElement`, (never None)) – Element to remove.

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`

- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `ColorRamp.elements`

### 2.4.97 ColorSequence(EffectSequence)

base classes — `bpy_struct`, `Sequence`, `EffectSequence`

**class bpy.types.ColorSequence(EffectSequence)**  
Sequence strip creating an image filled with a single g  
**color**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

## Inherited Properties

- `bpy_struct.id_data`
- `Sequence.name`
- `Sequence.blend_type`
- `Sequence.blend_alpha`
- `Sequence.channel`
- `Sequence.effect_fader`
- `Sequence.frame_final_end`
- `Sequence.frame_offset_end`
- `Sequence.frame_still_end`
- `Sequence.input_1`
- `Sequence.input_2`
- `Sequence.input_3`
- `Sequence.select_left_handle`
- `Sequence.frame_final_duration`
- `Sequence.frame_duration`
- `Sequence.lock`
- `Sequence.mute`
- `Sequence.select_right_handle`
- `Sequence.select`
- `Sequence.speed_factor`
- `Sequence.frame_start`
- `Sequence.frame_final_start`
- `Sequence.frame_offset_start`
- `Sequence.frame_still_start`
- `Sequence.type`
- `Sequence.use_default_fade`
- `Sequence.input_count`
- `EffectSequence.color_balance`
- `EffectSequence.use_float`
- `EffectSequence.crop`
- `EffectSequence.use_deinterlace`
- `EffectSequence.use_reverse_frames`

- EffectSequence.use\_flip\_x
- EffectSequence.use\_flip\_y
- EffectSequence.color\_multiply
- EffectSequence.use\_premultiply
- EffectSequence.proxy
- EffectSequence.use\_proxy\_custom\_directory
- EffectSequence.use\_proxy\_custom\_file
- EffectSequence.color\_saturation
- EffectSequence.strobe
- EffectSequence.transform
- EffectSequence.use\_color\_balance
- EffectSequence.use\_crop
- EffectSequence.use\_proxy
- EffectSequence.use\_translation

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- Sequence.getStripElem
- Sequence.swap

## 2.4.98 CompositorNode(Node)

base classes — bpy\_struct, Node

subclasses — CompositorNodeSepHSVA, CompositorNodeValToRGB, CompositorNodeSepYCCA, CompositorNodeSetAlpha, CompositorNodeCrop, CompositorNodeMath, CompositorNodeCurveRGB, CompositorNodeDilateErode, CompositorNodeGamma, CompositorNodeRotate, CompositorNodeLensdist, CompositorNodeLumaMatte, CompositorNodeTranslate, CompositorNodeCombYCCA, CompositorNodeBilateralblur, CompositorNodeZcombine, CompositorNodeFilter, CompositorNodePremulKey, CompositorNodeMixRGB, CompositorNodeTime, CompositorNodeValue, CompositorNodeHueCorrect, CompositorNodeNormal, CompositorNodeIDMask, CompositorNodeVecBlur, CompositorNodeRLayers, CompositorNodeComposite, CompositorNodeCombRGBA, CompositorNodeViewer, CompositorNodeCombHSVA, CompositorNodeOutputFile, CompositorNodeInvert, CompositorNodeCombYUVA, CompositorNodeDistanceMatte, CompositorNodeRGBOBW, CompositorNodeBlur, CompositorNodeDefocus, CompositorNodeGlare,

```
CompositorNodeDiffMatte,           CompositorNodeImage,          CompositorNodeDBlur,
CompositorNodeMapValue,           CompositorNodeBrightContrast, CompositorNodeTexture,
CompositorNodeLevels,            CompositorNodeNormalize,     CompositorNodeChannelMatte,
CompositorNodeRGB,              CompositorNodeColorSpill,    CompositorNodeSepRGBA,
CompositorNodeScale,             CompositorNodeMapUV,       CompositorNodeChromaMatte,
CompositorNodeDisplace,          CompositorNodeColorBalance, CompositorNodeTonemap,
CompositorNodeAlphaOver,         CompositorNodeColorMatte,   CompositorNodeHueSat,
CompositorNodeSepYUVA,           CompositorNodeCurveVec,    CompositorNodeSplitViewer
```

```
class bpy.types.CompositorNode (Node)
```

#### type

**Type** enum in ['VIEWER', 'RGB', 'VALUE', 'MIX\_RGB', 'VALTORGB', 'RG-BTOBW', 'NORMAL', 'CURVE\_VEC', 'CURVE\_RGB', 'ALPHAOVER', 'BLUR', 'FILTER', 'MAP\_VALUE', 'TIME', 'VECBLUR', 'SEPRGBA', 'SEPHSVA', 'SETALPHA', 'HUE\_SAT', 'IMAGE', 'R\_LAYERS', 'COMPOSITE', 'OUTPUT\_FILE', 'TEXTURE', 'TRANSLATE', 'ZCOMBINE', 'COMBRGBA', 'DILATEERODE', 'ROTATE', 'SCALE', 'SEPYCCA', 'COMBYCCA', 'SEPYUVA', 'COMBYUVA', 'DIFF\_MATTE', 'COLOR\_SPILL', 'CHROMA\_MATTE', 'CHANNEL\_MATTE', 'FLIP', 'SPLITVIEWER', 'MAP\_UV', 'ID\_MASK', 'DEFOCUS', 'DISPLACE', 'COMBHSA', 'MATH', 'LUMA\_MATTE', 'BRIGHTCONTRAST', 'GAMMA', 'INVERT', 'NORMALIZE', 'CROP', 'DBLUR', 'BILATERALBLUR', 'PREMULKEY', 'DISTANCE\_MATTE', 'LEVELS', 'COLOR\_MATTE', 'COLORBALANCE', 'HUECORRECT', 'GLARE', 'TONEMAP', 'LENSDIST', 'SCRIPT', 'GROUP'], default 'VIEWER', (readonly)

#### Inherited Properties

- bpy\_struct.id\_data
- Node.name
- Node.inputs
- Node.label
- Node.location
- Node.outputs

#### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.99 CompositorNodeAlphaOver(CompositorNode)

base classes — `bpy_struct`, `Node`, `CompositorNode`

`class bpy.types.CompositorNodeAlphaOver (CompositorNode)`

### `premul`

Mix Factor

**Type** float in [0, 1], default 0.0

### `use_premultiply`

**Type** boolean, default False

### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `CompositorNode.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.100 CompositorNodeBilateralblur(CompositorNode)

base classes — `bpy_struct`, `Node`, `CompositorNode`

`class bpy.types.CompositorNodeBilateralblur (CompositorNode)`

### `iterations`

**Type** int in [1, 128], default 0

```
sigma_color
  Type float in [0.01, 3], default 0.0
sigma_space
  Type float in [0.01, 30], default 0.0
```

### Inherited Properties

- bpy\_struct.id\_data
- Node.name
- Node.inputs
- Node.label
- Node.location
- Node.outputs
- CompositorNode.type

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.101 CompositorNodeBlur(CompositorNode)

base classes — bpy\_struct, Node, CompositorNode

class bpy.types.CompositorNodeBlur (CompositorNode)

```
aspect_correction
  Type of aspect correction to use
  Type enum in ['NONE', 'Y', 'X'], default 'NONE'
factor
  Type float in [0, 2], default 0.0
factor_x
  Type float in [0, 100], default 0.0
```

**factor\_y**

**Type** float in [0, 100], default 0.0

**filter\_type**

**Type** enum in ['FLAT', 'TENT', 'QUAD', 'CUBIC', 'GAUSS', 'FAST\_GAUSS', 'CATROM', 'MITCH'], default 'FLAT'

**size\_x**

**Type** int in [0, 2048], default 0

**size\_y**

**Type** int in [0, 2048], default 0

**use\_bokeh**

Uses circular filter (slower)

**Type** boolean, default False

**use\_gamma\_correction**

Applies filter on gamma corrected values

**Type** boolean, default False

**use\_relative**

Use relative (percent) values to define blur radius

**Type** boolean, default False

**Inherited Properties**

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `CompositorNode.type`

**Inherited Functions**

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`

- `bpy_struct.values`

## 2.4.102 CompositorNodeBrightContrast(CompositorNode)

base classes — `bpy_struct, Node, CompositorNode`

`class bpy.types.CompositorNodeBrightContrast (CompositorNode)`

### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `CompositorNode.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.103 CompositorNodeChannelMatte(CompositorNode)

base classes — `bpy_struct, Node, CompositorNode`

`class bpy.types.CompositorNodeChannelMatte (CompositorNode)`

#### `color_space`

Type enum in ['RGB', 'HSV', 'YUV', 'YCC'], default 'RGB'

#### `limit_channel`

Limit by this channels value

Type enum in ['R', 'G', 'B'], default 'R'

**limit\_max**

Values higher than this setting are 100% opaque

**Type** float in [0, 1], default 0.0

**limit\_method**

Algorithm to use to limit channel

**Type** enum in ['SINGLE', 'MAX'], default 'SINGLE'

**limit\_min**

Values lower than this setting are 100% keyed

**Type** float in [0, 1], default 0.0

**matte\_channel**

Channel used to determine matte

**Type** enum in ['R', 'G', 'B'], default 'R'

## Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `CompositorNode.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.104 CompositorNodeChromaMatte(CompositorNode)

base classes — `bpy_struct`, `Node`, `CompositorNode`

`class bpy.types.CompositorNodeChromaMatte (CompositorNode)`

**gain**

Alpha gain

**Type** float in [0, 1], default 0.0

**lift**

Alpha lift

**Type** float in [0, 1], default 0.0

**shadow\_adjust**

Adjusts the brightness of any shadows captured

**Type** float in [0, 1], default 0.0

**threshold**

Tolerance below which colors will be considered as exact matches

**Type** float in [0, 30], default 0.0

**tolerance**

Tolerance for a color to be considered a keying color

**Type** float in [1, 80], default 0.0

## Inherited Properties

- bpy\_struct.id\_data
- Node.name
- Node.inputs
- Node.label
- Node.location
- Node.outputs
- CompositorNode.type

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.105 CompositorNodeColorBalance(CompositorNode)

base classes — `bpy_struct`, `Node`, `CompositorNode`

```
class bpy.types.CompositorNodeColorBalance (CompositorNode)
```

**correction\_method**

**Type** enum in ['LIFT\_GAMMA\_GAIN', 'OFFSET\_POWER\_SLOPE'], default 'LIFT\_GAMMA\_GAIN'

**gain**

Correction for Highlights

**Type** float array of 3 items in [-inf, inf], default (1.0, 1.0, 1.0)

**gamma**

Correction for Midtones

**Type** float array of 3 items in [-inf, inf], default (1.0, 1.0, 1.0)

**lift**

Correction for Shadows

**Type** float array of 3 items in [-inf, inf], default (1.0, 1.0, 1.0)

**offset**

Correction for Shadows

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**power**

Correction for Midtones

**Type** float array of 3 items in [0, inf], default (1.0, 1.0, 1.0)

**slope**

Correction for Highlights

**Type** float array of 3 items in [0, inf], default (1.0, 1.0, 1.0)

### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `CompositorNode.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`

- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.106 CompositorNodeColorMatte(CompositorNode)

base classes — bpy\_struct, Node, CompositorNode

class bpy.types.CompositorNodeColorMatte (CompositorNode)

### color\_hue

Hue tolerance for colors to be considered a keying color

Type float in [0, 1], default 0.0

### color\_saturation

Saturation Tolerance for the color

Type float in [0, 1], default 0.0

### color\_value

Value Tolerance for the color

Type float in [0, 1], default 0.0

## Inherited Properties

- bpy\_struct.id\_data
- Node.name
- Node.inputs
- Node.label
- Node.location
- Node.outputs
- CompositorNode.type

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete

- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.107 CompositorNodeColorSpill(CompositorNode)

base classes — bpy\_struct, Node, CompositorNode

class bpy.types.CompositorNodeColorSpill (CompositorNode)

### channel

Type enum in [‘R’, ‘G’, ‘B’], default ‘R’

### limit\_channel

Type enum in [‘R’, ‘G’, ‘B’], default ‘R’

### limit\_method

Type enum in [‘SIMPLE’, ‘AVERAGE’], default ‘SIMPLE’

### ratio

Scale limit by value

Type float in [0.5, 1.5], default 0.0

### unspill\_blue

Blue spillmap scale

Type float in [0, 1.5], default 0.0

### unspill\_green

Green spillmap scale

Type float in [0, 1.5], default 0.0

### unspill\_red

Red spillmap scale

Type float in [0, 1.5], default 0.0

### use\_unspill

Compensate all channels (differently) by hand

Type boolean, default False

## Inherited Properties

- bpy\_struct.id\_data
- Node.name
- Node.inputs
- Node.label
- Node.location
- Node.outputs
- CompositorNode.type

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.108 CompositorNodeCombHSVA(CompositorNode)

base classes — `bpy_struct, Node, CompositorNode`

`class bpy.types.CompositorNodeCombHSVA (CompositorNode)`

## Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `CompositorNode.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`

- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.109 CompositorNodeCombRGBA(CompositorNode)

base classes — `bpy_struct`, `Node`, `CompositorNode`

`class bpy.types.CompositorNodeCombRGBA (CompositorNode)`

### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `CompositorNode.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.110 CompositorNodeCombYCCA(CompositorNode)

base classes — `bpy_struct`, `Node`, `CompositorNode`

`class bpy.types.CompositorNodeCombYCCA (CompositorNode)`

### mode

**Type** enum in ['ITUBT601', 'ITUBT709', 'JFIF'], default 'ITUBT601'

### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `CompositorNode.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.111 CompositorNodeCombYUVA(CompositorNode)

base classes — `bpy_struct`, `Node`, `CompositorNode`

`class bpy.types.CompositorNodeCombYUVA (CompositorNode)`

### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `CompositorNode.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`

- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.112 CompositorNodeComposite(CompositorNode)

base classes — `bpy_struct, Node, CompositorNode`

`class bpy.types.CompositorNodeComposite (CompositorNode)`

### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `CompositorNode.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.113 CompositorNodeCrop(CompositorNode)

base classes — `bpy_struct, Node, CompositorNode`

```
class bpy.types.CompositorNodeCrop (CompositorNode)
```

**max\_x**

**Type** int in [0, 10000], default 0

**max\_y**

**Type** int in [0, 10000], default 0

**min\_x**

**Type** int in [0, 10000], default 0

**min\_y**

**Type** int in [0, 10000], default 0

**rel\_max\_x**

**Type** float in [0, 1], default 0.0

**rel\_max\_y**

**Type** float in [0, 1], default 0.0

**rel\_min\_x**

**Type** float in [0, 1], default 0.0

**rel\_min\_y**

**Type** float in [0, 1], default 0.0

**relative**

Use relative values to crop image

**Type** boolean, default False

**use\_crop\_size**

Whether to crop the size of the input image

**Type** boolean, default False

## Inherited Properties

- [bpy\\_struct.id\\_data](#)
- [Node.name](#)
- [Node.inputs](#)
- [Node.label](#)
- [Node.location](#)
- [Node.outputs](#)
- [CompositorNode.type](#)

## Inherited Functions

- [bpy\\_struct.as\\_pointer](#)
- [bpy\\_struct.callback\\_add](#)
- [bpy\\_struct.callback\\_remove](#)
- [bpy\\_struct.driver\\_add](#)
- [bpy\\_struct.driver\\_remove](#)

- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.114 CompositorNodeCurveRGB(CompositorNode)

base classes — `bpy_struct`, `Node`, `CompositorNode`

`class bpy.types.CompositorNodeCurveRGB (CompositorNode)`

**mapping**

**Type** `CurveMapping`, (readonly)

### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `CompositorNode.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.115 CompositorNodeCurveVec(CompositorNode)

base classes — `bpy_struct`, `Node`, `CompositorNode`

`class bpy.types.CompositorNodeCurveVec (CompositorNode)`

**mapping**  
**Type** `CurveMapping`, (readonly)

### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `CompositorNode.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.116 CompositorNodeDBlur(CompositorNode)

base classes — `bpy_struct`, `Node`, `CompositorNode`

`class bpy.types.CompositorNodeDBlur (CompositorNode)`

**angle**  
**Type** float in [0, 360], default 0.0

**center\_x**  
**Type** float in [0, 1], default 0.0

**center\_y**

**Type** float in [0, 1], default 0.0  
**distance**  
  **Type** float in [-1, 1], default 0.0  
**iterations**  
  **Type** int in [1, 32], default 0  
**spin**  
  **Type** float in [-360, 360], default 0.0  
**use\_wrap**  
  **Type** boolean, default False  
**zoom**  
  **Type** float in [0, 100], default 0.0

### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `CompositorNode.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.117 CompositorNodeDefocus(CompositorNode)

base classes — `bpy_struct`, `Node`, `CompositorNode`

**class** `bpy.types.CompositorNodeDefocus` (`CompositorNode`)

**angle**

Bokeh shape rotation offset in degrees

**Type** int in [0, 90], default 0

**blur\_max**

blur limit, maximum CoC radius, 0=no limit

**Type** float in [0, 10000], default 0.0

**bokeh**

**Type** enum in ['OCTAGON', 'HEPTAGON', 'HEXAGON', 'PENTAGON', 'SQUARE', 'TRIANGLE', 'CIRCLE'], default 'CIRCLE'

**f\_stop**

Amount of focal blur, 128=infinity=perfect focus, half the value doubles the blur radius

**Type** float in [0, 128], default 0.0

**samples**

Number of samples (16=grainy, higher=less noise)

**Type** int in [16, 256], default 0

**threshold**

CoC radius threshold, prevents background bleed on in-focus midground, 0=off

**Type** float in [0, 100], default 0.0

**use\_gamma\_correction**

Enable gamma correction before and after main process

**Type** boolean, default False

**use\_preview**

Enable sampling mode, useful for preview when using low samplecounts

**Type** boolean, default False

**use\_zbuffer**

Disable when using an image as input instead of actual z-buffer (auto enabled if node not image based, eg. time node)

**Type** boolean, default False

**z\_scale**

Scales the Z input when not using a z-buffer, controls maximum blur designated by the color white or input value 1

**Type** float in [0, 1000], default 0.0

**Inherited Properties**

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `CompositorNode.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.118 CompositorNodeDiffMatte(CompositorNode)

base classes — `bpy_struct, Node, CompositorNode`

`class bpy.types.CompositorNodeDiffMatte (CompositorNode)`

#### **falloff**

Color distances below this additional threshold are partially keyed

**Type** float in [0, 1], default 0.0

#### **tolerance**

Color distances below this threshold are keyed

**Type** float in [0, 1], default 0.0

### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `CompositorNode.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`

- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.119 CompositorNodeDilateErode(CompositorNode)

base classes — `bpy_struct`, `Node`, `CompositorNode`

`class bpy.types.CompositorNodeDilateErode (CompositorNode)`

### **distance**

Distance to grow/shrink (number of iterations)

**Type** int in [-100, 100], default 0

### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `CompositorNode.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.120 CompositorNodeDisplace(CompositorNode)

base classes — `bpy_struct`, `Node`, `CompositorNode`

`class bpy.types.CompositorNodeDisplace (CompositorNode)`

### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `CompositorNode.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.121 CompositorNodeDistanceMatte(CompositorNode)

base classes — `bpy_struct`, `Node`, `CompositorNode`

`class bpy.types.CompositorNodeDistanceMatte (CompositorNode)`

#### **falloff**

Color distances below this additional threshold are partially keyed

**Type** float in [0, 1], default 0.0

#### **tolerance**

Color distances below this threshold are keyed

**Type** float in [0, 1], default 0.0

## Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `CompositorNode.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.122 CompositorNodeFilter(CompositorNode)

base classes — `bpy_struct`, `Node`, `CompositorNode`

**class** `bpy.types.CompositorNodeFilter` (`CompositorNode`)

### `filter_type`

**Type** enum in ['SOFTEN', 'SHARPEN', 'LAPLACE', 'SOBEL', 'PREWITT', 'KIRSCH', 'SHADOW'], default 'SOFTEN'

## Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `CompositorNode.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.123 CompositorNodeFlip(CompositorNode)

base classes — `bpy_struct, Node, CompositorNode`  
`class bpy.types.CompositorNodeFlip (CompositorNode)`

### **axis**

**Type** enum in ['X', 'Y', 'XY'], default 'X'

## Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `CompositorNode.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`

- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.124 CompositorNodeGamma(CompositorNode)

base classes — bpy\_struct, Node, CompositorNode

**class bpy.types.CompositorNodeGamma** (*CompositorNode*)

### Inherited Properties

- bpy\_struct.id\_data
- Node.name
- Node.inputs
- Node.label
- Node.location
- Node.outputs
- CompositorNode.type

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.125 CompositorNodeGlare(CompositorNode)

base classes — bpy\_struct, Node, CompositorNode

**class bpy.types.CompositorNodeGlare** (*CompositorNode*)

### angle\_offset

Streak angle offset in degrees

**Type** int in [0, 180], default 0

**color\_modulation**  
Amount of Color Modulation, modulates colors of streaks and ghosts for a spectral dispersion effect

**Type** float in [0, 1], default 0.0

**fade**  
Streak fade-out factor

**Type** float in [0.75, 1], default 0.0

**glare\_type**

**Type** enum in ['GHOSTS', 'STREAKS', 'FOG\_GLOW', 'SIMPLE\_STAR'], default 'SIMPLE\_STAR'

**iterations**

**Type** int in [2, 5], default 0

**mix**  
-1 is original image only, 0 is exact 50/50 mix, 1 is processed image only

**Type** float in [-1, 1], default 0.0

**quality**  
If not set to high quality, the effect will be applied to a low-res copy of the source image

**Type** enum in ['HIGH', 'MEDIUM', 'LOW'], default 'HIGH'

**size**  
Glow/glare size (not actual size; relative to initial size of bright area of pixels)

**Type** int in [6, 9], default 0

**streaks**  
Total number of streaks

**Type** int in [2, 16], default 0

**threshold**  
The glare filter will only be applied to pixels brighter than this value

**Type** float in [0, 1000], default 0.0

**use\_rotate\_45**  
Simple star filter: add 45 degree rotation offset

**Type** boolean, default False

## Inherited Properties

- bpy\_struct.id\_data
- Node.name
- Node.inputs
- Node.label
- Node.location
- Node.outputs
- CompositorNode.type

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.126 CompositorNodeHueCorrect(CompositorNode)

base classes — `bpy_struct, Node, CompositorNode`

`class bpy.types.CompositorNodeHueCorrect (CompositorNode)`

### `mapping`

Type `CurveMapping, (readonly)`

## Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `CompositorNode.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`

- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.127 CompositorNodeHueSat(CompositorNode)

base classes — bpy\_struct, Node, CompositorNode

class bpy.types.CompositorNodeHueSat (CompositorNode)

### color\_hue

Type float in [0, 1], default 0.0

### color\_saturation

Type float in [0, 2], default 0.0

### color\_value

Type float in [0, 2], default 0.0

## Inherited Properties

- bpy\_struct.id\_data
- Node.name
- Node.inputs
- Node.label
- Node.location
- Node.outputs
- CompositorNode.type

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.128 CompositorNodeIDMask(CompositorNode)

base classes — `bpy_struct`, `Node`, `CompositorNode`

`class bpy.types.CompositorNodeIDMask (CompositorNode)`

### **index**

Pass index number to convert to alpha

**Type** int in [0, 10000], default 0

### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `CompositorNode.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.129 CompositorNodeImage(CompositorNode)

base classes — `bpy_struct`, `Node`, `CompositorNode`

`class bpy.types.CompositorNodeImage (CompositorNode)`

### **frame\_duration**

Sets the number of images of a movie to use

**Type** int in [0, 300000], default 0

### **frame\_offset**

Offsets the number of the frame to use in the animation

**Type** int in [-300000, 300000], default 0

**frame\_start**

Sets the global starting frame of the movie/sequence, assuming first picture has a #1

**Type** int in [-300000, 300000], default 0

**image**

**Type** Image

**layer**

**Type** enum in ['PLACEHOLDER'], default 'PLACEHOLDER'

**use\_auto\_refresh**

Always refresh image on frame changes

**Type** boolean, default False

**use\_cyclic**

Cycle the images in the movie

**Type** boolean, default False

## Inherited Properties

- bpy\_struct.id\_data
- Node.name
- Node.inputs
- Node.label
- Node.location
- Node.outputs
- CompositorNode.type

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.130 CompositorNodeInvert(CompositorNode)

base classes — `bpy_struct`, `Node`, `CompositorNode`

`class bpy.types.CompositorNodeInvert (CompositorNode)`

**invert\_alpha**  
**Type** boolean, default False

**invert\_rgb**  
**Type** boolean, default False

### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `CompositorNode.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.131 CompositorNodeLensdist(CompositorNode)

base classes — `bpy_struct`, `Node`, `CompositorNode`

`class bpy.types.CompositorNodeLensdist (CompositorNode)`

**use\_fit**  
For positive distortion factor only: scale image such that black areas are not visible  
**Type** boolean, default False

**use\_jitter**

Enable/disable jittering; faster, but also noisier

**Type** boolean, default False

**use\_projector**

Enable/disable projector mode. Effect is applied in horizontal direction only

**Type** boolean, default False

### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `CompositorNode.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.132 CompositorNodeLevels(CompositorNode)

base classes — `bpy_struct`, `Node`, `CompositorNode`

**class** `bpy.types.CompositorNodeLevels` (`CompositorNode`)

**channel**

**Type** enum in ['COMBINED\_RGB', 'RED', 'GREEN', 'BLUE', 'LUMINANCE'], default 'COMBINED\_RGB'

## Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `CompositorNode.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.133 CompositorNodeLumaMatte(CompositorNode)

base classes — `bpy_struct`, `Node`, `CompositorNode`

`class bpy.types.CompositorNodeLumaMatte (CompositorNode)`

### `limit_max`

Values higher than this setting are 100% opaque

**Type** float in [0, 1], default 0.0

### `limit_min`

Values lower than this setting are 100% keyed

**Type** float in [0, 1], default 0.0

## Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`

- `Node.outputs`
- `CompositorNode.type`

#### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

### 2.4.134 CompositorNodeMapUV(CompositorNode)

base classes — `bpy_struct, Node, CompositorNode`

**class bpy.types.CompositorNodeMapUV (CompositorNode)**

#### **alpha**

**Type** int in [0, 100], default 0

#### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `CompositorNode.type`

#### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`

- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.135 CompositorNodeMapView(CompositorNode)

base classes — bpy\_struct, Node, CompositorNode

class bpy.types.CompositorNodeMapView (CompositorNode)

**max**

**Type** float array of 1 items in [-1000, 1000], default (0.0)

**min**

**Type** float array of 1 items in [-1000, 1000], default (0.0)

**offset**

**Type** float array of 1 items in [-1000, 1000], default (0.0)

**size**

**Type** float array of 1 items in [-1000, 1000], default (0.0)

**use\_max**

**Type** boolean, default False

**use\_min**

**Type** boolean, default False

### Inherited Properties

- bpy\_struct.id\_data
- Node.name
- Node.inputs
- Node.label
- Node.location
- Node.outputs
- CompositorNode.type

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove

- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.136 CompositorNodeMath(CompositorNode)

base classes — `bpy_struct`, `Node`, `CompositorNode`

`class bpy.types.CompositorNodeMath (CompositorNode)`

### **operation**

**Type** enum in ['ADD', 'SUBTRACT', 'MULTIPLY', 'DIVIDE', 'SINE', 'COSINE', 'TANGENT', 'ARCSINE', 'ARCCOSINE', 'ARCTANGENT', 'POWER', 'LOGARITHM', 'MINIMUM', 'MAXIMUM', 'ROUND', 'LESS\_THAN', 'GREATER\_THAN'], default 'ADD'

### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `CompositorNode.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`

- bpy\_struct.values

## 2.4.137 CompositorNodeMixRGB(CompositorNode)

base classes — bpy\_struct, Node, CompositorNode

class bpy.types.CompositorNodeMixRGB (CompositorNode)

### blend\_type

Type enum in ['MIX', 'ADD', 'MULTIPLY', 'SUBTRACT', 'SCREEN', 'DIVIDE', 'DIFFERENCE', 'DARKEN', 'LIGHTEN', 'OVERLAY', 'DODGE', 'BURN', 'HUE', 'SATURATION', 'VALUE', 'COLOR', 'SOFT\_LIGHT', 'LINEAR\_LIGHT'], default 'MIX'

### use\_alpha

Include alpha of second input in this operation

Type boolean, default False

### Inherited Properties

- bpy\_struct.id\_data
- Node.name
- Node.inputs
- Node.label
- Node.location
- Node.outputs
- CompositorNode.type

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.138 CompositorNodeNormal(CompositorNode)

base classes — bpy\_struct, Node, CompositorNode

```
class bpy.types.CompositorNodeNormal (CompositorNode)
```

#### Inherited Properties

- bpy\_struct.id\_data
- Node.name
- Node.inputs
- Node.label
- Node.location
- Node.outputs
- CompositorNode.type

#### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

### 2.4.139 CompositorNodeNormalize(CompositorNode)

base classes — bpy\_struct, Node, CompositorNode

```
class bpy.types.CompositorNodeNormalize (CompositorNode)
```

#### Inherited Properties

- bpy\_struct.id\_data
- Node.name
- Node.inputs
- Node.label
- Node.location
- Node.outputs
- CompositorNode.type

#### Inherited Functions

- bpy\_struct.as\_pointer

- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.140 CompositorNodeOutputFile(CompositorNode)

base classes — `bpy_struct`, `Node`, `CompositorNode`

`class bpy.types.CompositorNodeOutputFile (CompositorNode)`

### `exr_codec`

**Type** enum in ['NONE', 'PXR24', 'ZIP', 'PIZ', 'RLE'], default 'NONE'

### `filepath`

Output path for the image, same functionality as render output.

**Type** string, default ""

### `frame_end`

**Type** int in [0, 300000], default 0

### `frame_start`

**Type** int in [0, 300000], default 0

### `image_type`

**Type** enum in ['TARGA', 'RAW\_TARGA', 'PNG', 'BMP', 'JPEG', 'IRIS', 'RADIANCE\_HDR', 'CINEON', 'DPX', 'OPENEXR'], default 'TARGA'

### `quality`

**Type** int in [1, 100], default 0

### `use_exr_half`

**Type** boolean, default False

## Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`

- `Node.outputs`
- `CompositorNode.type`

#### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

### 2.4.141 CompositorNodePremulKey(CompositorNode)

base classes — `bpy_struct, Node, CompositorNode`

`class bpy.types.CompositorNodePremulKey (CompositorNode)`

#### mapping

Conversion between premultiplied alpha and key alpha

**Type** enum in ['KEY\_TO\_PREMUL', 'PREMUL\_TO\_KEY'], default 'KEY\_TO\_PREMUL'

#### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `CompositorNode.type`

#### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`

- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.142 CompositorNodeRGB(CompositorNode)

base classes — bpy\_struct, Node, CompositorNode

**class** bpy.types.CompositorNodeRGB (*CompositorNode*)

### Inherited Properties

- bpy\_struct.id\_data
- Node.name
- Node.inputs
- Node.label
- Node.location
- Node.outputs
- CompositorNode.type

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.143 CompositorNodeRGBToBW(CompositorNode)

base classes — bpy\_struct, Node, CompositorNode

**class** bpy.types.CompositorNodeRGBToBW (*CompositorNode*)

### Inherited Properties

- bpy\_struct.id\_data
- Node.name
- Node.inputs
- Node.label
- Node.location
- Node.outputs
- CompositorNode.type

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.144 CompositorNodeRLayers(CompositorNode)

base classes — bpy\_struct, Node, CompositorNode

class bpy.types.CompositorNodeRLayers (CompositorNode)

#### layer

Type enum in ['PLACEHOLDER'], default 'PLACEHOLDER'

#### scene

Type Scene

### Inherited Properties

- bpy\_struct.id\_data
- Node.name
- Node.inputs
- Node.label
- Node.location
- Node.outputs
- CompositorNode.type

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.145 CompositorNodeRotate(CompositorNode)

base classes — `bpy_struct, Node, CompositorNode`

`class bpy.types.CompositorNodeRotate (CompositorNode)`

### `filter_type`

Method to use to filter rotation

**Type** enum in ['NEAREST', 'BILINEAR', 'BICUBIC'], default 'NEAREST'

## Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `CompositorNode.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`

- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.146 CompositorNodeScale(CompositorNode)

base classes — bpy\_struct, Node, CompositorNode

class bpy.types.CompositorNodeScale (CompositorNode)

### space

Coordinate space to scale relative to

Type enum in ['RELATIVE', 'ABSOLUTE', 'SCENE\_SIZE', 'RENDER\_SIZE'], default 'RELATIVE'

### Inherited Properties

- bpy\_struct.id\_data
- Node.name
- Node.inputs
- Node.label
- Node.location
- Node.outputs
- CompositorNode.type

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.147 CompositorNodeSepHSVA(CompositorNode)

base classes — `bpy_struct`, `Node`, `CompositorNode`

`class bpy.types.CompositorNodeSepHSVA (CompositorNode)`

### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `CompositorNode.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.148 CompositorNodeSepRGBA(CompositorNode)

base classes — `bpy_struct`, `Node`, `CompositorNode`

`class bpy.types.CompositorNodeSepRGBA (CompositorNode)`

### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `CompositorNode.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.149 CompositorNodeSepYCCA(CompositorNode)

base classes — `bpy_struct, Node, CompositorNode`

`class bpy.types.CompositorNodeSepYCCA (CompositorNode)`

`mode`

**Type** enum in ['ITUBT601', 'ITUBT709', 'JFIF'], default 'ITUBT601'

## Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `CompositorNode.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`

- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.150 CompositorNodeSepYUVA(CompositorNode)

base classes — bpy\_struct, Node, CompositorNode

**class bpy.types.CompositorNodeSepYUVA** (*CompositorNode*)

### Inherited Properties

- bpy\_struct.id\_data
- Node.name
- Node.inputs
- Node.label
- Node.location
- Node.outputs
- CompositorNode.type

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.151 CompositorNodeSetAlpha(CompositorNode)

base classes — bpy\_struct, Node, CompositorNode

**class bpy.types.CompositorNodeSetAlpha** (*CompositorNode*)

### Inherited Properties

- bpy\_struct.id\_data

- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `CompositorNode.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.152 CompositorNodeSplitViewer(CompositorNode)

base classes — `bpy_struct, Node, CompositorNode`

`class bpy.types.CompositorNodeSplitViewer (CompositorNode)`

#### `axis`

**Type** enum in ['X', 'Y'], default 'X'

#### `factor`

**Type** int in [0, 100], default 0

### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `CompositorNode.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.153 CompositorNodeTexture(CompositorNode)

base classes — `bpy_struct, Node, CompositorNode`

`class bpy.types.CompositorNodeTexture (CompositorNode)`

### `node_output`

For node-based textures, which output node to use

**Type** int in [-32768, 32767], default 0

### `texture`

**Type** `Texture`

## Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `CompositorNode.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`

- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.154 CompositorNodeTime(CompositorNode)

base classes — bpy\_struct, Node, CompositorNode

class bpy.types.CompositorNodeTime (CompositorNode)

**curve**

Type CurveMapping, (readonly)

**frame\_end**

Type int in [-32768, 32767], default 0

**frame\_start**

Type int in [-32768, 32767], default 0

### Inherited Properties

- bpy\_struct.id\_data
- Node.name
- Node.inputs
- Node.label
- Node.location
- Node.outputs
- CompositorNode.type

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id

- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.155 CompositorNodeTonemap(CompositorNode)

base classes — `bpy_struct`, `Node`, `CompositorNode`

`class bpy.types.CompositorNodeTonemap(CompositorNode)`

### **adaptation**

If 0, global; if 1, based on pixel intensity

**Type** float in [0, 1], default 0.0

### **contrast**

Set to 0 to use estimate from input image

**Type** float in [0, 1], default 0.0

### **correction**

If 0, same for all channels; if 1, each independent

**Type** float in [0, 1], default 0.0

### **gamma**

If not used, set to 1

**Type** float in [0.001, 3], default 0.0

### **intensity**

If less than zero, darkens image; otherwise, makes it brighter

**Type** float in [-8, 8], default 0.0

### **key**

The value the average luminance is mapped to

**Type** float in [0, 1], default 0.0

### **offset**

Normally always 1, but can be used as an extra control to alter the brightness curve

**Type** float in [0.001, 10], default 0.0

### **tonemap\_type**

**Type** enum in ['RD\_PHOTORECEPTOR', 'RH\_SIMPLE'], default 'RH\_SIMPLE'

## Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `CompositorNode.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.156 CompositorNodeTranslate(CompositorNode)

base classes — `bpy_struct, Node, CompositorNode`

`class bpy.types.CompositorNodeTranslate (CompositorNode)`

### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `CompositorNode.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`

- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.157 CompositorNodeTree(NodeTree)

base classes — `bpy_struct, ID, NodeTree`

**class bpy.types.CompositorNodeTree (NodeTree)**  
Node tree consisting of linked nodes used for compositing

### nodes

**Type** `CompositorNodes bpy_prop_collection of Node, (readonly)`

### Inherited Properties

- `bpy_struct.id_data`
- `ID.name`
- `ID.use_fake_user`
- `ID.library`
- `ID.tag`
- `ID.users`
- `NodeTree.animation_data`
- `NodeTree.grease_pencil`
- `NodeTree.inputs`
- `NodeTree.links`
- `NodeTree.outputs`
- `NodeTree.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`
- `ID.copy`
- `ID.user_clear`
- `ID.animation_data_create`
- `ID.animation_data_clear`
- `ID.update_tag`

## 2.4.158 CompositorNodeValToRGB(CompositorNode)

base classes — `bpy_struct`, `Node`, `CompositorNode`

`class bpy.types.CompositorNodeValToRGB (CompositorNode)`

`color_ramp`

Type `ColorRamp`, (readonly)

### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `CompositorNode.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.159 CompositorNodeValue(CompositorNode)

base classes — `bpy_struct`, `Node`, `CompositorNode`

`class bpy.types.CompositorNodeValue (CompositorNode)`

### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`

- `Node.location`
- `Node.outputs`
- `CompositorNode.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.160 CompositorNodeVecBlur(CompositorNode)

base classes — `bpy_struct`, `Node`, `CompositorNode`

`class bpy.types.CompositorNodeVecBlur (CompositorNode)`

#### **factor**

Scaling factor for motion vectors; actually ‘shutter speed’ in frames

**Type** float in [0, 2], default 0.0

#### **samples**

**Type** int in [1, 256], default 0

#### **speed\_max**

Maximum speed, or zero for none

**Type** int in [0, 1024], default 0

#### **speed\_min**

Minimum speed for a pixel to be blurred; used to separate background from foreground

**Type** int in [0, 1024], default 0

#### **use\_curved**

Interpolate between frames in a Bezier curve, rather than linearly

**Type** boolean, default False

### Inherited Properties

- `bpy_struct.id_data`

- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `CompositorNode.type`

#### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

### 2.4.161 CompositorNodeViewer(CompositorNode)

base classes — `bpy_struct, Node, CompositorNode`  
`class bpy.types.CompositorNodeViewer(CompositorNode)`

#### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `CompositorNode.type`

#### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`

- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.162 CompositorNodeZcombine(CompositorNode)

base classes — bpy\_struct, Node, CompositorNode

class bpy.types.CompositorNodeZcombine (CompositorNode)

### use\_alpha

Takes Alpha channel into account when doing the Z operation

Type boolean, default False

### Inherited Properties

- bpy\_struct.id\_data
- Node.name
- Node.inputs
- Node.label
- Node.location
- Node.outputs
- CompositorNode.type

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.163 CompositorNodes(bpy\_struct)

base class — `bpy_struct`

**class** `bpy.types.CompositorNodes` (`bpy_struct`)

Collection of Compositor Nodes

**new** (`type, group=None`)

Add a node to this node tree.

### Parameters

- `type` (`enum in ['VIEWER', 'RGB', 'VALUE', 'MIX_RGB', 'VALTORGB', 'RG-BTOBW', 'NORMAL', 'CURVE_VEC', 'CURVE_RGB', 'ALPHAOVER', 'BLUR', 'FILTER', 'MAP_VALUE', 'TIME', 'VECBLUR', 'SEPRGBA', 'SEPHSVA', 'SETALPHA', 'HUE_SAT', 'IMAGE', 'R_LAYERS', 'COMPOSITE', 'OUTPUT_FILE', 'TEXTURE', 'TRANSLATE', 'ZCOMBINE', 'COMBRGBA', 'DILATEERODE', 'ROTATE', 'SCALE', 'SEPYCCA', 'COMBYCCA', 'SEPYUVA', 'COMBYUVA', 'DIFF_MATTE', 'COLOR_SPILL', 'CHROMA_MATTE', 'CHANNEL_MATTE', 'FLIP', 'SPLITVIEWER', 'MAP_UV', 'ID_MASK', 'DEFOCUS', 'DISPLACE', 'COMBHNSVA', 'MATH', 'LUMA_MATTE', 'BRIGHTCONTRAST', 'GAMMA', 'INVERT', 'NORMALIZE', 'CROP', 'DBLUR', 'BILATERALBLUR', 'PREMULKEY', 'DISTANCE_MATTE', 'LEVELS', 'COLOR_MATTE', 'COLORBALANCE', 'HUECORRECT', 'GLARE', 'TONEMAP', 'LENSDIST', 'SCRIPT', 'GROUP'])` – Type, Type of node to add
- `group` (`NodeTree`, (optional)) – The group tree

**Returns** New node.

**Return type** `Node`

**remove** (`node`)

remove a node from this node tree.

**Parameters** `node` (`Node`) – The node to remove.

### Inherited Properties

- `bpy_struct.id_data`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`

- `bpy_struct.values`

## References

- `CompositorNodeTree.nodes`

### 2.4.164 ConsoleLine(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.ConsoleLine(bpy_struct)`

Input line for the interactive console

#### **body**

Text in the line

**Type** string, default “”

#### **current\_character**

**Type** int in [-inf, inf], default 0

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `SpaceConsole.history`
- `SpaceConsole.scrollback`

## 2.4.165 Constraint(bpy\_struct)

base class — `bpy_struct`

subclasses — `KinematicConstraint`, `CopyScaleConstraint`, `ShrinkwrapConstraint`, `FollowPathConstraint`, `LockedTrackConstraint`, `CopyTransformsConstraint`, `PythonConstraint`, `LimitDistanceConstraint`, `StretchToConstraint`, `PivotConstraint`, `ClampToConstraint`, `TransformConstraint`, `LimitRotationConstraint`, `LimitLocationConstraint`, `ChildOfConstraint`, `CopyRotationConstraint`, `DampedTrackConstraint`, `TrackToConstraint`, `SplineIKConstraint`, `MaintainVolumeConstraint`, `LimitScaleConstraint`, `RigidBodyJointConstraint`, `FloorConstraint`, `ActionConstraint`, `CopyLocationConstraint`

**class** `bpy.types.Constraint` (`bpy_struct`)  
Constraint modifying the transformation of objects and bones

**active**  
Constraint is the one being edited  
**Type** boolean, default False

**error\_location**  
Amount of residual error in Blender space unit for constraints that work on position  
**Type** float in [-inf, inf], default 0.0, (readonly)

**error\_rotation**  
Amount of residual error in radiant for constraints that work on orientation  
**Type** float in [-inf, inf], default 0.0, (readonly)

**influence**  
Amount of influence constraint will have on the final solution  
**Type** float in [0, 1], default 0.0

**is\_proxy\_local**  
Constraint was added in this proxy instance (i.e. did not belong to source Armature)  
**Type** boolean, default False

**is\_valid**  
Constraint has valid settings and can be evaluated  
**Type** boolean, default False, (readonly)

**mute**  
Enable/Disable Constraint  
**Type** boolean, default False

**name**  
Constraint name  
**Type** string, default ""

**owner\_space**  
Space that owner is evaluated in  
**Type** enum in ['WORLD', 'POSE', 'LOCAL\_WITH\_PARENT', 'LOCAL'], default 'WORLD'

**show\_expanded**  
Constraint's panel is expanded in UI

**Type** boolean, default False

**target\_space**

Space that target is evaluated in

**Type** enum in ['WORLD', 'POSE', 'LOCAL\_WITH\_PARENT', 'LOCAL'], default 'WORLD'

**type**

**Type** enum in ['COPY\_LOCATION', 'COPY\_ROTATION', 'COPY\_SCALE', 'COPY\_TRANSFORMS', 'LIMIT\_DISTANCE', 'LIMIT\_LOCATION', 'LIMIT\_ROTATION', 'LIMIT\_SCALE', 'MAINTAIN\_VOLUME', 'TRANSFORM', 'CLAMP\_TO', 'DAMPED\_TRACK', 'IK', 'LOCKED\_TRACK', 'SPLINE\_IK', 'STRETCH\_TO', 'TRACK\_TO', 'ACTION', 'CHILD\_OF', 'FLOOR', 'FOLLOW\_PATH', 'PIVOT', 'RIGID\_BODY\_JOINT', 'SCRIPT', 'SHRINKWRAP'], default 'COPY\_LOCATION', (readonly)

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `Object.constraints`
- `ObjectConstraints.active`
- `ObjectConstraints.new`
- `ObjectConstraints.remove`
- `PoseBone.constraints`
- `PoseBoneConstraints.active`
- `PoseBoneConstraints.new`
- `PoseBoneConstraints.remove`
- `UILayout.template_constraint`

## 2.4.166 ConstraintActuator(*Actuator*)

base classes — `bpy_struct, Actuator`

**class** `bpy.types.ConstraintActuator` (*Actuator*)

Actuator to handle Constraints

### **angle\_max**

Maximum angle (in degree) allowed with target direction. No correction is done if angle with target direction is between min and max

**Type** float in [0, 180], default 0.0

### **angle\_min**

Minimum angle (in degree) to maintain with target direction. No correction is done if angle with target direction is between min and max

**Type** float in [0, 180], default 0.0

### **damping**

Damping factor: time constant (in frame) of low pass filter

**Type** int in [-32768, 32767], default 0

### **damping\_rotation**

Use a different damping for orientation

**Type** int in [-32768, 32767], default 0

### **direction**

Set the direction of the ray

**Type** enum in ['NONE', 'DIRPX', 'DIRPY', 'DIRPZ', 'DIRNX', 'DIRNY', 'DIRNZ'], default 'NONE'

### **direction\_axis**

Select the axis to be aligned along the reference direction

**Type** enum in ['NONE', 'DIRPX', 'DIRPY', 'DIRPZ', 'DIRNX', 'DIRNY', 'DIRNZ'], default 'NONE'

### **direction\_axis\_pos**

Select the axis to be aligned along the reference direction

**Type** enum in ['NONE', 'DIRPX', 'DIRPY', 'DIRPZ'], default 'NONE'

### **distance**

Keep this distance to target

**Type** float in [-inf, inf], default 0.0

### **fh\_damping**

Damping factor of the force field spring

**Type** float in [-inf, inf], default 0.0

### **fh\_force**

Spring force within the force field area

**Type** float in [-inf, inf], default 0.0

### **fh\_height**

Height of the force field area

**Type** float in [-inf, inf], default 0.0

**limit**

**Type** enum in ['NONE', 'LOCX', 'LOCY', 'LOCZ'], default 'NONE'

**limit\_max**

**Type** float in [-inf, inf], default 0.0

**limit\_min**

**Type** float in [-inf, inf], default 0.0

**material**

Ray detects only Objects with this material

**Type** string, default ""

**mode**

The type of the constraint

**Type** enum in ['LOC', 'DIST', 'ORI', 'FH'], default 'LOC'

**property**

Ray detect only Objects with this property

**Type** string, default ""

**range**

Set the maximum length of ray

**Type** float in [-inf, inf], default 0.0

**rotation\_max**

Reference Direction

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**time**

Maximum activation time in frame, 0 for unlimited

**Type** int in [-32768, 32767], default 0

**use\_fh\_normal**

Add a horizontal spring force on slopes

**Type** boolean, default False

**use\_fh\_parallel\_axis**

Keep object axis parallel to normal

**Type** boolean, default False

**use\_force\_distance**

Force distance of object to point of impact of ray

**Type** boolean, default False

**use\_local**

Set ray along object's axis or global axis

**Type** boolean, default False

**use\_material\_detect**

Detect material instead of property

**Type** boolean, default False

**use\_normal**

Set object axis along (local axis) or parallel (global axis) to the normal at hit position

**Type** boolean, default False

**use\_persistent**

Persistent actuator: stays active even if ray does not reach target

**Type** boolean, default False

### Inherited Properties

- bpy\_struct.id\_data
- Actuator.name
- Actuator.show\_expanded
- Actuator.pin
- Actuator.type

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- Actuator.link
- Actuator.unlink

## 2.4.167 ConstraintTarget(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.ConstraintTarget (*bpy\_struct*)

Target object for multi-target constraints

**subtarget**

**Type** string, default “”

**target**

Target Object

**Type** Object

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- PythonConstraint.targets

### 2.4.168 Context(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.Context (*bpy\_struct*)  
Current windowmanager and data context

**area**

Type Area, (readonly)

**blend\_data**

Type BlendData, (readonly)

**mode**

Type enum in ['EDIT\_MESH', 'EDIT\_CURVE', 'EDIT\_SURFACE', 'EDIT\_TEXT', 'EDIT\_ARMATURE', 'EDIT\_METABALL', 'EDIT\_LATTICE', 'POSE', 'SCULPT', 'PAINT\_WEIGHT', 'PAINT\_VERTEX', 'PAINT\_TEXTURE', 'PARTICLE', 'OBJECT'], default 'EDIT\_MESH', (readonly)

**region**

Type Region, (readonly)

**region\_data**

Type RegionView3D, (readonly)

**scene**

Type [Scene](#), (readonly)

**screen**

Type [Screen](#), (readonly)

**space\_data**

Type [Space](#), (readonly)

**tool\_settings**

Type [ToolSettings](#), (readonly)

**user\_preferences**

Type [UserPreferences](#), (readonly)

**window**

Type [Window](#), (readonly)

**window\_manager**

Type  [WindowManager](#), (readonly)

**static copy (self)**

## Inherited Properties

- [bpy\\_struct.id\\_data](#)

## Inherited Functions

- [bpy\\_struct.as\\_pointer](#)
- [bpy\\_struct.callback\\_add](#)
- [bpy\\_struct.callback\\_remove](#)
- [bpy\\_struct.driver\\_add](#)
- [bpy\\_struct.driver\\_remove](#)
- [bpy\\_struct.get](#)
- [bpy\\_struct.is\\_property\\_hidden](#)
- [bpy\\_struct.is\\_property\\_set](#)
- [bpy\\_struct.items](#)
- [bpy\\_struct.keyframe\\_delete](#)
- [bpy\\_struct.keyframe\\_insert](#)
- [bpy\\_struct.keys](#)
- [bpy\\_struct.path\\_from\\_id](#)
- [bpy\\_struct.path\\_resolve](#)
- [bpy\\_struct.type\\_recast](#)
- [bpy\\_struct.values](#)

## References

- [Header.draw](#)
- [KeyingSetInfo.generate](#)
- [KeyingSetInfo.iterator](#)

- KeyingSetInfo.poll
- Macro.draw
- Macro.poll
- Menu.draw
- Menu.poll
- Operator.cancel
- Operator.check
- Operator.draw
- Operator.execute
- Operator.invoke
- Operator.modal
- Operator.poll
- Panel.draw
- Panel.draw\_header
- Panel.poll

## 2.4.169 ControlFluidSettings(FluidSettings)

base classes — `bpy_struct`, `FluidSettings`

**class bpy.types.ControlFluidSettings(FluidSettings)**

Fluid simulation settings for objects controlling the motion of fluid in the simulation

**attraction\_radius**

Specifies the force field radius around the control object

**Type** float in [0, 10], default 0.0

**attraction\_strength**

Force strength for directional attraction towards the control object

**Type** float in [-10, 10], default 0.0

**end\_time**

Specifies time when the control particles are deactivated

**Type** float in [0, 100], default 0.0

**quality**

Specifies the quality which is used for object sampling. (higher = better but slower)

**Type** float in [5, 100], default 0.0

**start\_time**

Specifies time when the control particles are activated

**Type** float in [0, 100], default 0.0

**use**

Object contributes to the fluid simulation

**Type** boolean, default False

**use\_reverse\_frames**

Reverse control object movement

**Type** boolean, default False

**velocity\_radius**

Specifies the force field radius around the control object

**Type** float in [0, 10], default 0.0

**velocity\_strength**

Force strength of how much of the control object's velocity is influencing the fluid velocity

**Type** float in [0, 10], default 0.0

**Inherited Properties**

- bpy\_struct.id\_data
- FluidSettings.type

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.170 Controller(bpy\_struct)

base class — bpy\_struct

subclasses — ExpressionController, XnorController, PythonController, AndController, NorController, OrController, XorController, NandController

**class** bpy.types.Controller (*bpy\_struct*)

Game engine logic brick to process events, connecting sensors to actuators

**name**

**Type** string, default “”

**show\_expanded**

Set controller expanded in the user interface

**Type** boolean, default False

**states**

Set Controller state index (1 to 30)

**Type** int in [1, 30], default 0

**type**

**Type** enum in ['LOGIC\_AND', 'LOGIC\_OR', 'LOGIC\_NAND', 'LOGIC\_NOR', 'LOGIC\_XOR', 'LOGIC\_XNOR', 'EXPRESSION', 'PYTHON'], default 'LOGIC\_AND'

**use\_priority**

Mark controller for execution before all non-marked controllers (good for startup scripts)

**Type** boolean, default False

**link**(*sensor=None, actuator=None*)

Link the controller with a sensor/actuator.

**Parameters**

- **sensor** ([Sensor](#), (optional)) – Sensor to link the controller to.
- **actuator** ([Actuator](#), (optional)) – Actuator to link the controller to.

**unlink**(*sensor=None, actuator=None*)

Unlink the controller from a sensor/actuator.

**Parameters**

- **sensor** ([Sensor](#), (optional)) – Sensor to unlink the controller from.
- **actuator** ([Actuator](#), (optional)) – Actuator to unlink the controller from.

**Inherited Properties**

- `bpy_struct.id_data`

**Inherited Functions**

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

**References**

- `Actuator.link`
- `Actuator.unlink`
- `GameObjectSettings.controllers`
- `Sensor.link`
- `Sensor.unlink`

## 2.4.171 CopyLocationConstraint(Constraint)

base classes — `bpy_struct`, `Constraint`

`class bpy.types.CopyLocationConstraint (Constraint)`

Copies the location of the target

**head\_tail**

Target along length of bone: Head=0, Tail=1

**Type** float in [0, 1], default 0.0

**invert\_x**

Invert the X location

**Type** boolean, default False

**invert\_y**

Invert the Y location

**Type** boolean, default False

**invert\_z**

Invert the Z location

**Type** boolean, default False

**subtarget**

**Type** string, default “”

**target**

Target Object

**Type** `Object`

**use\_offset**

Add original location into copied location

**Type** boolean, default False

**use\_x**

Copy the target’s X location

**Type** boolean, default False

**use\_y**

Copy the target’s Y location

**Type** boolean, default False

**use\_z**

Copy the target’s Z location

**Type** boolean, default False

### Inherited Properties

- `bpy_struct.id_data`
- `Constraint.name`
- `Constraint.active`
- `Constraint.mute`
- `Constraint.show_expanded`

- Constraint.influence
- Constraint.error\_location
- Constraint.owner\_space
- Constraint.is\_proxy\_local
- Constraint.error\_rotation
- Constraint.target\_space
- Constraint.type
- Constraint.is\_valid

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.172 CopyRotationConstraint(Constraint)

base classes — bpy\_struct, Constraint

**class bpy.types.CopyRotationConstraint (Constraint)**  
Copies the rotation of the target

**invert\_x**

Invert the X rotation

**Type** boolean, default False

**invert\_y**

Invert the Y rotation

**Type** boolean, default False

**invert\_z**

Invert the Z rotation

**Type** boolean, default False

**subtarget**

**Type** string, default “”

**target**

Target Object

**Type** Object

**use\_offset**

Add original rotation into copied rotation

**Type** boolean, default False

**use\_x**

Copy the target's X rotation

**Type** boolean, default False

**use\_y**

Copy the target's Y rotation

**Type** boolean, default False

**use\_z**

Copy the target's Z rotation

**Type** boolean, default False

## Inherited Properties

- bpy\_struct.id\_data
- Constraint.name
- Constraint.active
- Constraint.mute
- Constraint.show\_expanded
- Constraint.influence
- Constraint.error\_location
- Constraint.owner\_space
- Constraint.is\_proxy\_local
- Constraint.error\_rotation
- Constraint.target\_space
- Constraint.type
- Constraint.is\_valid

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.173 CopyScaleConstraint(Constraint)

base classes — `bpy_struct`, `Constraint`

`class bpy.types.CopyScaleConstraint (Constraint)`

Copies the scale of the target

### `subtarget`

**Type** string, default “”

### `target`

Target Object

**Type** `Object`

### `use_offset`

Add original scale into copied scale

**Type** boolean, default False

### `use_x`

Copy the target’s X scale

**Type** boolean, default False

### `use_y`

Copy the target’s Y scale

**Type** boolean, default False

### `use_z`

Copy the target’s Z scale

**Type** boolean, default False

## Inherited Properties

- `bpy_struct.id_data`
- `Constraint.name`
- `Constraint.active`
- `Constraint.mute`
- `Constraint.show_expanded`
- `Constraint.influence`
- `Constraint.error_location`
- `Constraint.owner_space`
- `Constraint.is_proxy_local`
- `Constraint.error_rotation`
- `Constraint.target_space`
- `Constraint.type`
- `Constraint.is_valid`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`

- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.174 CopyTransformsConstraint(Constraint)

base classes — `bpy_struct, Constraint`

**class bpy.types.CopyTransformsConstraint (Constraint)**

Copies all the transforms of the target

### **head\_tail**

Target along length of bone: Head=0, Tail=1

**Type** float in [0, 1], default 0.0

### **subtarget**

**Type** string, default “”

### **target**

Target Object

**Type** Object

## Inherited Properties

- `bpy_struct.id_data`
- `Constraint.name`
- `Constraint.active`
- `Constraint.mute`
- `Constraint.show_expanded`
- `Constraint.influence`
- `Constraint.error_location`
- `Constraint.owner_space`
- `Constraint.is_proxy_local`
- `Constraint.error_rotation`
- `Constraint.target_space`
- `Constraint.type`
- `Constraint.is_valid`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`

- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.175 Curve(ID)

base classes — bpy\_struct, ID

subclasses — SurfaceCurve, TextCurve

**class bpy.types.Curve (ID)**

Curve datablock storing curves, splines and NURBS

**animation\_data**

Animation data for this datablock

**Type** AnimData, (readonly)

**bevel\_depth**

Bevel depth when not using a bevel object

**Type** float in [-inf, inf], default 0.0

**bevel\_object**

Curve object name that defines the bevel shape

**Type** Object

**bevel\_resolution**

Bevel resolution when depth is non-zero and no specific bevel object has been defined

**Type** int in [0, 32], default 0

**dimensions**

Select 2D or 3D curve type

**Type** enum in ['2D', '3D'], default '2D'

**eval\_time**

Parametric position along the length of the curve that Objects ‘following’ it should be at. Position is evaluated by dividing by the ‘Path Length’ value

**Type** float in [-inf, inf], default 0.0

**extrude**

Amount of curve extrusion when not using a bevel object

**Type** float in [0, inf], default 0.0

**materials**

**Type** IDMaterials bpy\_prop\_collection of Material, (readonly)

**offset**

Offset the curve to adjust the width of a text

**Type** float in [-inf, inf], default 0.0

**path\_duration**

The number of frames that are needed to traverse the path, defining the maximum value for the ‘Evaluation Time’ setting

**Type** int in [1, 300000], default 0

**render\_resolution\_u**

Surface resolution in U direction used while rendering. Zero skips this property

**Type** int in [0, 32767], default 0

**render\_resolution\_v**

Surface resolution in V direction used while rendering. Zero skips this property

**Type** int in [0, 32767], default 0

**resolution\_u**

Surface resolution in U direction

**Type** int in [1, 32767], default 0

**resolution\_v**

Surface resolution in V direction

**Type** int in [1, 32767], default 0

**shape\_keys**

**Type** [Key](#), (readonly)

**show\_handles**

Display Bezier handles in editmode

**Type** boolean, default False

**show\_normal\_face**

Display 3D curve normals in editmode

**Type** boolean, default False

**splines**

Collection of splines in this curve data object

**Type** [CurveSplines](#) bpy\_prop\_collection of [Spline](#), (readonly)

**taper\_object**

Curve object name that defines the taper (width)

**Type** [Object](#)

**texspace\_location**

Texture space location

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**texspace\_size**

Texture space size

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**twist\_mode**

The type of tilt calculation for 3D Curves

**Type** enum in [‘Z\_UP’, ‘MINIMUM’, ‘TANGENT’], default ‘Z\_UP’

**twist\_smooth**  
Smoothing iteration for tangents  
**Type** float in [-inf, inf], default 0.0

**use\_auto\_texspace**  
Adjusts active object’s texture space automatically when transforming object  
**Type** boolean, default False

**use\_deform\_bounds**  
Use the mesh bounds to clamp the deformation  
**Type** boolean, default False

**use\_fill\_back**  
Draw filled back for extruded/beveled curves  
**Type** boolean, default False

**use\_fill\_deform**  
Fill curve after applying shape keys and all modifiers  
**Type** boolean, default False

**use\_fill\_front**  
Draw filled front for extruded/beveled curves  
**Type** boolean, default False

**use\_path**  
Enable the curve to become a translation path  
**Type** boolean, default False

**use\_path\_follow**  
Make curve path children to rotate along the path  
**Type** boolean, default False

**use\_radius**  
Option for paths: apply the curve radius with path following it and deforming  
**Type** boolean, default False

**use\_stretch**  
Option for curve-deform: makes deformed child to stretch along entire path  
**Type** boolean, default False

**use\_time\_offset**  
Children will use TimeOffs value as path distance offset  
**Type** boolean, default False

**use\_uv\_as\_generated**  
Uses the UV values as Generated textured coordinates  
**Type** boolean, default False

## Inherited Properties

- `bpy_struct.id_data`
- `ID.name`
- `ID.use_fake_user`
- `ID.library`
- `ID.tag`
- `ID.users`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`
- `ID.copy`
- `ID.user_clear`
- `ID.animation_data_create`
- `ID.animation_data_clear`
- `ID.update_tag`

## References

- `BlendData.curves`
- `BlendDataCurves.new`
- `BlendDataCurves.remove`

### 2.4.176 CurveMap(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.CurveMap` (`bpy_struct`)  
Curve in a curve mapping

**extend**

Extrapolate the curve or extend it horizontally

**Type** enum in ['HORIZONTAL', 'EXTRAPOLATED'], default 'HORIZONTAL', (readonly)

**points**

**Type** bpy\_prop\_collection of CurveMapPoint, (readonly)

### Inherited Properties

- bpy\_struct.id\_data

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

### References

- CurveMapping.curves

## 2.4.177 CurveMapPoint(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.CurveMapPoint (*bpy\_struct*)

Point of a curve used for a curve mapping

**handle\_type**

Curve interpolation at this point: Bezier or vector

**Type** enum in ['AUTO', 'VECTOR'], default 'AUTO', (readonly)

**location**

X/Y coordinates of the curve point

**Type** float array of 2 items in [-inf, inf], default (0.0, 0.0), (readonly)

**select**

Selection state of the curve point

**Type** boolean, default False

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `CurveMap.points`

### 2.4.178 CurveMapping(`bpy_struct`)

base class — `bpy_struct`

`class bpy.types.CurveMapping(bpy_struct)`

Curve mapping to map color, vector and scalar values to other values using a user defined curve

#### `black_level`

For RGB curves, the color that black is mapped to

**Type** float array of 3 items in [-1000, 1000], default (0.0, 0.0, 0.0)

#### `clip_max_x`

**Type** float in [-100, 100], default 0.0

#### `clip_max_y`

**Type** float in [-100, 100], default 0.0

#### `clip_min_x`

**Type** float in [-100, 100], default 0.0

#### `clip_min_y`

**Type** float in [-100, 100], default 0.0

#### `curves`

**Type** bpy\_prop\_collection of CurveMap, (readonly)

**use\_clip**

Force the curve view to fit a defined boundary

**Type** boolean, default False

**white\_level**

For RGB curves, the color that white is mapped to

**Type** float array of 3 items in [-1000, 1000], default (0.0, 0.0, 0.0)

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- Brush.curve
- CompositorNodeCurveRGB.mapping
- CompositorNodeCurveVec.mapping
- CompositorNodeHueCorrect.mapping
- CompositorNodeTime.curve
- ParticleBrush.curve
- PointDensity.falloff\_curve
- PointLamp.falloff\_curve
- ShaderNodeRGBCurve.mapping
- ShaderNodeVectorCurve.mapping
- SpaceImageEditor.curve
- SpotLamp.falloff\_curve
- TextureNodeCurveRGB.mapping
- TextureNodeCurveTime.curve
- WarpModifier.falloff\_curve

## 2.4.179 CurveModifier(Modifier)

base classes — `bpy_struct`, `Modifier`

**class** `bpy.types.CurveModifier`(*Modifier*)

Curve deformation modifier

**deform\_axis**  
The axis that the curve deforms along

**Type** enum in ['POS\_X', 'POS\_Y', 'POS\_Z', 'NEG\_X', 'NEG\_Y', 'NEG\_Z'], default 'POS\_X'

**object**  
Curve object to deform with

**Type** `Object`

**vertex\_group**  
Name of Vertex Group which determines influence of modifier per point

**Type** string, default “”

### Inherited Properties

- `bpy_struct.id_data`
- `Modifier.name`
- `Modifier.use_apply_on_spline`
- `Modifier.show_in_editmode`
- `Modifier.show_expanded`
- `Modifier.show_on_cage`
- `Modifier.show_viewport`
- `Modifier.show_render`
- `Modifier.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.180 CurveSplines(bpy\_struct)

base class — `bpy_struct`

**class** `bpy.types.CurveSplines` (*bpy\_struct*)

Collection of curve splines

**active**

Active curve spline

**Type** `Object`

**new** (*type*)

Add a new spline to the curve.

**Parameters** `type` (*enum in ['POLY', 'BEZIER', 'BSPLINE', 'CARDINAL', 'NURBS']*) – type for the new spline.

**Returns** The newly created spline.

**Return type** `Spline`

**remove** (*spline*)

Remove a spline from a curve.

**Parameters** `spline` (`Spline`, (never None)) – The spline to remove.

### Inherited Properties

- `bpy_struct.id_data`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

### References

- `Curve.splines`

## 2.4.181 DampedTrackConstraint(Constraint)

base classes — `bpy_struct`, `Constraint`

`class bpy.types.DampedTrackConstraint(Constraint)`

Points toward target by taking the shortest rotation path

**subtarget**

**Type** string, default “”

**target**

Target Object

**Type** `Object`

**track\_axis**

Axis that points to the target object

**Type** enum in [‘TRACK\_X’, ‘TRACK\_Y’, ‘TRACK\_Z’, ‘TRACK\_NEGATIVE\_X’, ‘TRACK\_NEGATIVE\_Y’, ‘TRACK\_NEGATIVE\_Z’], default ‘TRACK\_X’

### Inherited Properties

- `bpy_struct.id_data`
- `Constraint.name`
- `Constraint.active`
- `Constraint.mute`
- `Constraint.show_expanded`
- `Constraint.influence`
- `Constraint.error_location`
- `Constraint.owner_space`
- `Constraint.is_proxy_local`
- `Constraint.error_rotation`
- `Constraint.target_space`
- `Constraint.type`
- `Constraint.is_valid`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.182 DecimateModifier(Modifier)

base classes — `bpy_struct`, `Modifier`

**class bpy.types.DecimateModifier (Modifier)**  
Decimation modifier

**face\_count**  
The current number of faces in the decimated mesh  
**Type** int in [-inf, inf], default 0, (readonly)

**ratio**  
Defines the ratio of triangles to reduce to  
**Type** float in [0, 1], default 0.0

### Inherited Properties

- `bpy_struct.id_data`
- `Modifier.name`
- `Modifier.use_apply_on_spline`
- `Modifier.show_in_editmode`
- `Modifier.show_expanded`
- `Modifier.show_on_cage`
- `Modifier.show_viewport`
- `Modifier.show_render`
- `Modifier.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.183 DelaySensor(Sensor)

base classes — `bpy_struct`, `Sensor`

**class bpy.types.DelaySensor (Sensor)**  
Sensor to send delayed events

**delay**

Delay in number of logic tics before the positive trigger (default 60 per second)

**Type** int in [0, 5000], default 0

**duration**

If >0, delay in number of logic tics before the negative trigger following the positive trigger

**Type** int in [0, 5000], default 0

**use\_repeat**

Toggle repeat option. If selected, the sensor restarts after Delay+Dur logic tics

**Type** boolean, default False

**Inherited Properties**

- `bpy_struct.id_data`
- `Sensor.name`
- `Sensor.show_expanded`
- `Sensor.frequency`
- `Sensor.invert`
- `Sensor.use_level`
- `Sensor.pin`
- `Sensor.use_pulse_false_level`
- `Sensor.use_pulse_true_level`
- `Sensor.use_tap`
- `Sensor.type`

**Inherited Functions**

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`
- `Sensor.link`
- `Sensor.unlink`

## 2.4.184 DisplaceModifier(Modifier)

base classes — `bpy_struct, Modifier`

```
class bpy.types.DisplaceModifier(Modifier)
    Displacement modifier

    direction
        Type enum in ['X', 'Y', 'Z', 'NORMAL', 'RGB_TO_XYZ'], default 'X'

    mid_level
        Material value that gives no displacement
        Type float in [-inf, inf], default 0.0

    strength
        Amount to displace geometry
        Type float in [-inf, inf], default 0.0

    texture
        Type Texture

    texture_coords
        Type enum in ['LOCAL', 'GLOBAL', 'OBJECT', 'UV'], default 'LOCAL'

    texture_coords_object
        Object to set the texture coordinates
        Type Object

    uv_layer
        UV layer name
        Type string, default ""

    vertex_group
        Name of Vertex Group which determines influence of modifier per point
        Type string, default ""
```

## Inherited Properties

- bpy\_struct.id\_data
- Modifier.name
- Modifier.use\_apply\_on\_spline
- Modifier.show\_in\_editmode
- Modifier.show\_expanded
- Modifier.show\_on\_cage
- Modifier.show\_viewport
- Modifier.show\_render
- Modifier.type

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get

- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.185 DistortedNoiseTexture(Texture)

base classes — bpy\_struct, ID, Texture

**class bpy.types.DistortedNoiseTexture (Texture)**

Procedural distorted noise texture

### **distortion**

Amount of distortion

**Type** float in [0, 10], default 0.0

### **nabla**

Size of derivative offset used for calculating normal

**Type** float in [0.001, 0.1], default 0.0

### **noise\_basis**

Sets the noise basis used for turbulence

**Type** enum in ['BLENDER\_ORIGINAL', 'ORIGINAL\_PERLIN', 'IMPROVED\_PERLIN', 'VORONOI\_F1', 'VORONOI\_F2', 'VORONOI\_F3', 'VORONOI\_F4', 'VORONOI\_F2\_F1', 'VORONOI\_CRACKLE', 'CELL\_NOISE'], default 'BLENDER\_ORIGINAL'

### **noise\_distortion**

Sets the noise basis for the distortion

**Type** enum in ['BLENDER\_ORIGINAL', 'ORIGINAL\_PERLIN', 'IMPROVED\_PERLIN', 'VORONOI\_F1', 'VORONOI\_F2', 'VORONOI\_F3', 'VORONOI\_F4', 'VORONOI\_F2\_F1', 'VORONOI\_CRACKLE', 'CELL\_NOISE'], default 'BLENDER\_ORIGINAL'

### **noise\_scale**

Sets scaling for noise input

**Type** float in [0.0001, inf], default 0.0

### **users\_material**

Materials that use this texture (readonly)

### **users\_object\_modifier**

Object modifiers that use this texture (readonly)

## Inherited Properties

- bpy\_struct.id\_data
- ID.name

- ID.use\_fake\_user
- ID.library
- ID.tag
- ID.users
- Texture.animation\_data
- Texture.intensity
- Texture.color\_ramp
- Texture.contrast
- Texture.factor\_blue
- Texture.factor\_green
- Texture.factor\_red
- Texture.node\_tree
- Texture.saturation
- Texture.use\_preview\_alpha
- Texture.type
- Texture.use\_color\_ramp
- Texture.use\_nodes
- Texture.users\_material
- Texture.users\_object\_modifier
- Texture.users\_material
- Texture.users\_object\_modifier

#### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- ID.copy
- ID.user\_clear
- ID.animation\_data\_create
- ID.animation\_data\_clear
- ID.update\_tag

### 2.4.186 DomainFluidSettings(FluidSettings)

base classes — bpy\_struct, FluidSettings

**class bpy.types.DomainFluidSettings (FluidSettings)**  
Fluid simulation settings for the domain of a fluid simulation

**compressibility**

Allowed compressibility due to gravitational force for standing fluid. (directly affects simulation step size)

**Type** float in [0.001, 0.1], default 0.0

**end\_time**

Simulation time of the last blender frame (in seconds)

**Type** float in [0, 100], default 0.0

**filepath**

Directory (and/or filename prefix) to store baked fluid simulation files in

**Type** string, default “”

**fluid\_mesh\_vertices**

Vertices of the fluid mesh generated by simulation

**Type** bpy\_prop\_collection of FluidMeshVertex, (readonly)

**generate\_particles**

Amount of particles to generate (0=off, 1=normal, >1=more)

**Type** float in [0, 10], default 0.0

**gravity**

Gravity in X, Y and Z direction

**Type** float array of 3 items in [-1000.1, 1000.1], default (0.0, 0.0, 0.0)

**grid\_levels**

Number of coarsened grids to use (-1 for automatic)

**Type** int in [-1, 4], default 0

**memory\_estimate**

Estimated amount of memory needed for baking the domain

**Type** string, default “”, (readonly)

**partial\_slip\_factor**

Amount of mixing between no- and free-slip, 0 is no slip and 1 is free slip

**Type** float in [0, 1], default 0.0

**preview\_resolution**

Preview resolution in X,Y and Z direction

**Type** int in [1, 100], default 0

**render\_display\_mode**

How to display the mesh for rendering

**Type** enum in ['GEOMETRY', 'PREVIEW', 'FINAL'], default 'GEOMETRY'

**resolution**

Domain resolution in X,Y and Z direction

**Type** int in [1, 1024], default 0

**simulation\_scale**

Size of the simulation domain in metres

**Type** float in [0.001, 10], default 0.0

**slip\_type**

**Type** enum in ['NOSLIP', 'PARTIALSLIP', 'FREESLIP'], default 'NOSLIP'

**start\_time**  
Simulation time of the first blender frame (in seconds)  
**Type** float in [0, 100], default 0.0

**surface\_noobs**  
**Type** boolean, default False

**surface\_smooth**  
Amount of surface smoothing. A value of 0 is off, 1 is normal smoothing and more than 1 is extra smoothing  
**Type** float in [0, 5], default 0.0

**surface\_subdivisions**  
Number of isosurface subdivisions. This is necessary for the inclusion of particles into the surface generation. Warning - can lead to longer computation times!  
**Type** int in [0, 5], default 0

**tracer\_particles**  
Number of tracer particles to generate  
**Type** int in [0, 10000], default 0

**use\_reverse\_frames**  
Reverse fluid frames  
**Type** boolean, default False

**use\_speed\_vectors**  
Generate speed vectors for vector blur  
**Type** boolean, default False

**use\_time\_override**  
Use a custom start and end time (in seconds) instead of the scene's timeline  
**Type** boolean, default False

**viewport\_display\_mode**  
How to display the mesh in the viewport  
**Type** enum in ['GEOMETRY', 'PREVIEW', 'FINAL'], default 'GEOMETRY'

**viscosity\_base**  
Viscosity setting: value that is multiplied by 10 to the power of (exponent\*-1)  
**Type** float in [0, 10], default 0.0

**viscosity\_exponent**  
Negative exponent for the viscosity value (to simplify entering small values e.g. 5\*10^-6.)  
**Type** int in [0, 10], default 0

**viscosity\_preset**  
Set viscosity of the fluid to a preset value, or use manual input  
**Type** enum in ['MANUAL', 'WATER', 'OIL', 'HONEY'], default 'MANUAL'

### Inherited Properties

- `bpy_struct.id_data`
- `FluidSettings.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.187 DopeSheet(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.DopeSheet` (`bpy_struct`)  
Settings for filtering the channels shown in Animation Editors

**filter\_fcurve\_name**  
F-Curve live filtering string  
**Type** string, default “”

**filter\_group**  
Group that included Object should be a member of  
**Type** `Group`

**show\_armatures**  
Include visualization of Armature related Animation data  
**Type** boolean, default False

**show\_cameras**  
Include visualization of Camera related Animation data  
**Type** boolean, default False

**show\_curves**  
Include visualization of Curve related Animation data  
**Type** boolean, default False

**show\_expanded\_summary**  
Collapse summary when shown, so all other channels get hidden. (DopeSheet Editors Only)

**Type** boolean, default False

**show\_hidden**  
Include channels from objects/bone that aren't visible

**Type** boolean, default False

**show\_lamps**  
Include visualization of Lamp related Animation data

**Type** boolean, default False

**show\_lattices**  
Include visualization of Lattice related Animation data

**Type** boolean, default False

**show\_materials**  
Include visualization of Material related Animation data

**Type** boolean, default False

**show\_meshes**  
Include visualization of Mesh related Animation data

**Type** boolean, default False

**show\_metaballs**  
Include visualization of Metaball related Animation data

**Type** boolean, default False

**show\_missing\_nla**  
Include Animation Data blocks with no NLA data. (NLA Editor only)

**Type** boolean, default False

**show\_nodes**  
Include visualization of Node related Animation data

**Type** boolean, default False

**show\_only\_group\_objects**  
Only include channels from Objects in the specified Group

**Type** boolean, default False

**show\_only\_matching\_fcurves**  
Only include F-Curves with names containing search text

**Type** boolean, default False

**show\_only\_selected**  
Only include channels relating to selected objects and data

**Type** boolean, default False

**show\_particles**  
Include visualization of Particle related Animation data

**Type** boolean, default False

**show\_scenes**  
Include visualization of Scene related Animation data

**Type** boolean, default False

**show\_shapekeys**

Include visualization of ShapeKey related Animation data

**Type** boolean, default False

**show\_summary**

Display an additional ‘summary’ line. (DopeSheet Editors only)

**Type** boolean, default False

**show\_textures**

Include visualization of Texture related Animation data

**Type** boolean, default False

**show\_transforms**

Include visualization of Object-level Animation data (mostly Transforms)

**Type** boolean, default False

**show\_worlds**

Include visualization of World related Animation data

**Type** boolean, default False

**source**

ID-Block representing source data, currently ID\_SCE (for Dopesheet), and ID\_SC (for Grease Pencil)

**Type** [ID](#), (readonly)

**Inherited Properties**

- [bpy\\_struct.id\\_data](#)

**Inherited Functions**

- [bpy\\_struct.as\\_pointer](#)
- [bpy\\_struct.callback\\_add](#)
- [bpy\\_struct.callback\\_remove](#)
- [bpy\\_struct.driver\\_add](#)
- [bpy\\_struct.driver\\_remove](#)
- [bpy\\_struct.get](#)
- [bpy\\_struct.is\\_property\\_hidden](#)
- [bpy\\_struct.is\\_property\\_set](#)
- [bpy\\_struct.items](#)
- [bpy\\_struct.keyframe\\_delete](#)
- [bpy\\_struct.keyframe\\_insert](#)
- [bpy\\_struct.keys](#)
- [bpy\\_struct.path\\_from\\_id](#)
- [bpy\\_struct.path\\_resolve](#)
- [bpy\\_struct.type\\_recast](#)
- [bpy\\_struct.values](#)

**References**

- [SpaceDopeSheetEditor.dopesheet](#)
- [SpaceGraphEditor.dopesheet](#)

- SpaceNLA.dopesheet

## 2.4.188 Driver([bpy\\_struct](#))

base class — [bpy\\_struct](#)

**class** bpy.types.Driver ([bpy\\_struct](#))

Driver for the value of a setting based on an external value

**expression**

Expression to use for Scripted Expression

**Type** string, default “”

**is\_valid**

Driver could not be evaluated in past, so should be skipped

**Type** boolean, default False

**show\_debug\_info**

Show intermediate values for the driver calculations to allow debugging of drivers

**Type** boolean, default False

**type**

Driver type

**Type** enum in [‘AVERAGE’, ‘SUM’, ‘SCRIPTED’, ‘MIN’, ‘MAX’], default ‘AVERAGE’

**variables**

Properties acting as inputs for this driver

**Type** ChannelDriverVariables [bpy\\_prop\\_collection](#) of DriverVariable, (readonly)

### Inherited Properties

- [bpy\\_struct.id\\_data](#)

### Inherited Functions

- [bpy\\_struct.as\\_pointer](#)
- [bpy\\_struct.callback\\_add](#)
- [bpy\\_struct.callback\\_remove](#)
- [bpy\\_struct.driver\\_add](#)
- [bpy\\_struct.driver\\_remove](#)
- [bpy\\_struct.get](#)
- [bpy\\_struct.is\\_property\\_hidden](#)
- [bpy\\_struct.is\\_property\\_set](#)
- [bpy\\_struct.items](#)
- [bpy\\_struct.keyframe\\_delete](#)
- [bpy\\_struct.keyframe\\_insert](#)
- [bpy\\_struct.keys](#)
- [bpy\\_struct.path\\_from\\_id](#)
- [bpy\\_struct.path\\_resolve](#)
- [bpy\\_struct.type\\_recast](#)
- [bpy\\_struct.values](#)

## References

- `FCurve.driver`

### 2.4.189 DriverTarget(`bpy_struct`)

base class — `bpy_struct`

`class bpy.types.DriverTarget (bpy_struct)`

Source of input values for driver variables

**bone\_target**

Name of PoseBone to use as target

**Type** string, default “”

**data\_path**

RNA Path (from ID-block) to property used

**Type** string, default “”

**id**

ID-block that the specific property used can be found from (id\_type property must be set first)

**Type** `ID`

**id\_type**

Type of ID-block that can be used

**Type** enum in [‘ACTION’, ‘ARMATURE’, ‘BRUSH’, ‘CAMERA’, ‘CURVE’, ‘FONT’, ‘GREASEPENCIL’, ‘GROUP’, ‘IMAGE’, ‘KEY’, ‘LAMP’, ‘LIBRARY’, ‘LATTICE’, ‘MATERIAL’, ‘META’, ‘MESH’, ‘NODETREE’, ‘OBJECT’, ‘PARTICLE’, ‘SCENE’, ‘SCREEN’, ‘SOUND’, ‘TEXT’, ‘TEXTURE’, ‘WORLD’, ‘WINDOWMANAGER’], default ‘OBJECT’

**transform\_type**

Driver variable type

**Type** enum in [‘LOC\_X’, ‘LOC\_Y’, ‘LOC\_Z’, ‘ROT\_X’, ‘ROT\_Y’, ‘ROT\_Z’, ‘SCALE\_X’, ‘SCALE\_Y’, ‘SCALE\_Z’], default ‘LOC\_X’

**use\_local\_space\_transform**

Use transforms in Local Space (as opposed to the worldspace default)

**Type** boolean, default False

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`

- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `DriverVariable.targets`

### 2.4.190 DriverVariable(`bpy_struct`)

base class — `bpy_struct`

**class bpy.types.DriverVariable (`bpy_struct`)**

Variable from some source/target for driver relationship

#### **name**

Name to use in scripted expressions/functions. (No spaces or dots are allowed. Also, must not start with a symbol or digit)

**Type** string, default “”

#### **targets**

Sources of input data for evaluating this variable

**Type** `bpy_prop_collection` of `DriverTarget`, (readonly)

#### **type**

Driver variable type

**Type** enum in ['SINGLE\_PROP', 'TRANSFORMS', 'ROTATION\_DIFF', 'LOC\_DIFF'], default 'SINGLE\_PROP'

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`

- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `ChannelDriverVariables.new`
- `ChannelDriverVariables.remove`
- `Driver.variables`

### 2.4.191 DupliObject(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.DupliObject` (`bpy_struct`)

An object duplicate

**matrix**

Object duplicate transformation matrix

**Type** float array of 16 items in [-inf, inf], default (0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0)

**matrix\_original**

The original matrix of this object before it was duplicated

**Type** float array of 16 items in [-inf, inf], default (0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0)

**object**

Object being duplicated

**Type** `Object`, (readonly)

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`

- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `Object.dupli_list`

## 2.4.192 EdgeSplitModifier(Modifier)

base classes — `bpy_struct, Modifier`

**class bpy.types.EdgeSplitModifier (Modifier)**  
Edge splitting modifier to create sharp edges

**split\_angle**

Angle above which to split edges

**Type** float in [0, 3.14159], default 0.0

**use\_edge\_angle**

Split edges with high angle between faces

**Type** boolean, default False

**use\_edge\_sharp**

Split edges that are marked as sharp

**Type** boolean, default False

## Inherited Properties

- `bpy_struct.id_data`
- `Modifier.name`
- `Modifier.use_apply_on_spline`
- `Modifier.show_in_editmode`
- `Modifier.show_expanded`
- `Modifier.show_on_cage`
- `Modifier.show_viewport`
- `Modifier.show_render`
- `Modifier.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`

- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.193 EditBone(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.**EditBone** (*bpy\_struct*)  
Editmode bone in an Armature datablock

**bbone\_in**  
Length of first Bezier Handle (for B-Bones only)

**Type** float in [0, 2], default 0.0

**bbone\_out**  
Length of second Bezier Handle (for B-Bones only)

**Type** float in [0, 2], default 0.0

**bbone\_segments**  
Number of subdivisions of bone (for B-Bones only)

**Type** int in [1, 32], default 0

**bbone\_x**  
B-Bone X size

**Type** float in [0, 1000], default 0.0

**bbone\_z**  
B-Bone Z size

**Type** float in [0, 1000], default 0.0

**envelope\_distance**  
Bone deformation distance (for Envelope deform only)

**Type** float in [0, 1000], default 0.0

**envelope\_weight**  
Bone deformation weight (for Envelope deform only)

**Type** float in [0, 1000], default 0.0

**head**  
Location of head end of the bone

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**head\_radius**  
Radius of head of bone (for Envelope deform only)

**Type** float in [0, inf], default 0.0

**hide**  
Bone is not visible when in Edit Mode  
**Type** boolean, default False

**hide\_select**  
Bone is able to be selected  
**Type** boolean, default False

**layers**  
Layers bone exists in  
**Type** boolean array of 32 items, default (False, False, False)

**lock**  
Bone is not able to be transformed when in Edit Mode  
**Type** boolean, default False

**matrix**  
Read-only matrix calculated from the roll (armature space)  
**Type** float array of 16 items in [-inf, inf], default (0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0), (readonly)

**name**  
**Type** string, default “”

**parent**  
Parent edit bone (in same Armature)  
**Type** `EditBone`

**roll**  
Bone rotation around head-tail axis  
**Type** float in [-inf, inf], default 0.0

**select**  
**Type** boolean, default False

**select\_head**  
**Type** boolean, default False

**select\_tail**  
**Type** boolean, default False

**show\_wire**  
Bone is always drawn as Wireframe regardless of viewport draw mode. Useful for non-obstructive custom bone shapes  
**Type** boolean, default False

**tail**  
Location of tail end of the bone  
**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**tail\_radius**  
Radius of tail of bone (for Envelope deform only)

**Type** float in [0, inf], default 0.0

**use\_connect**

When bone has a parent, bone's head is struck to the parent's tail

**Type** boolean, default False

**use\_cyclic\_offset**

When bone doesn't have a parent, it receives cyclic offset effects

**Type** boolean, default False

**use\_deform**

Bone does not deform any geometry

**Type** boolean, default False

**use\_envelope\_multiply**

When deforming bone, multiply effects of Vertex Group weights with Envelope influence

**Type** boolean, default False

**use\_inherit\_rotation**

Bone inherits rotation or scale from parent bone

**Type** boolean, default False

**use\_inherit\_scale**

Bone inherits scaling from parent bone

**Type** boolean, default False

**use\_local\_location**

Bone location is set in local space

**Type** boolean, default False

**basename**

The name of this bone before any '.' character (readonly)

**center**

The midpoint between the head and the tail. (readonly)

**children**

A list of all the bones children. (readonly)

**children\_recursive**

a list of all children from this bone. (readonly)

**children\_recursive\_basename**

Returns a chain of children with the same base name as this bone Only direct chains are supported, forks caused by multiple children with matching basenames will terminate the function and not be returned. (readonly)

**length**

The distance from head to tail, when set the head is moved to fit the length.

**parent\_recursive**

A list of parents, starting with the immediate parent (readonly)

**vector**

The direction this bone is pointing. Utility function for (tail - head) (readonly)

**x\_axis**

Vector pointing down the x-axis of the bone. (readonly)

**y\_axis**

Vector pointing down the x-axis of the bone. (readonly)

**z\_axis**

Vector pointing down the x-axis of the bone. (readonly)

**align\_roll (vector)**

Align the bone to a localspace roll so the Z axis points in the direction of the vector given.

**Parameters** **vector** (*float array of 3 items in [-inf, inf]*) – Vector

**align\_orientation (other)**

Align this bone to another by moving its tail and settings its roll the length of the other bone is not used.

**parent\_index (parent\_test)**

The same as ‘bone in other\_bone.parent\_recursive’ but saved generating a list.

**transform (matrix, scale=True, roll=True)**

Transform the the bones head, tail, roll and envelope (when the matrix has a scale component).

**Parameters**

- **matrix** (`mathutils.Matrix`) – 3x3 or 4x4 transformation matrix.
- **scale** (*bool*) – Scale the bone envelope by the matrix.
- **roll** (*bool*) – Correct the roll to point in the same relative direction to the head and tail.

**translate (vec)**

Utility function to add *vec* to the head and tail of this bone.

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `Armature.edit_bones`

- `ArmatureEditBones.active`
- `ArmatureEditBones.new`
- `ArmatureEditBones.remove`
- `EditBone.parent`

## 2.4.194 EditObjectActuator(Actuator)

base classes — `bpy_struct, Actuator`

**class bpy.types.EditObjectActuator(Actuator)**  
Actuator used to edit objects

**angular\_velocity**

Angular velocity upon creation

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**dynamic\_operation**

**Type** enum in ['RESTOREDYN', 'SUSPENDDYN', 'ENABLERIGIDBODY', 'DISABLE-RIGIDBODY', 'SETMASS'], default 'RESTOREDYN'

**linear\_velocity**

Velocity upon creation

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**mass**

The mass of the object

**Type** float in [-inf, inf], default 0.0

**mesh**

Replace the existing, when left blank 'Phys' will remake the existing physics mesh

**Type** Mesh

**mode**

The mode of the actuator

**Type** enum in ['ADDOBJECT', 'ENDOBJECT', 'REPLACEMESH', 'TRACKTO', 'DYNAMICS'], default 'ADDOBJECT'

**object**

Add this Object and all its children (cant be on an visible layer)

**Type** Object

**time**

Duration the new Object lives or the track takes

**Type** int in [-inf, inf], default 0

**track\_object**

Track to this Object

**Type** Object

**use\_3d\_tracking**

Enable 3D tracking

**Type** boolean, default False

**use\_local\_angular\_velocity**

Apply the rotation locally

**Type** boolean, default False

**use\_local\_linear\_velocity**

Apply the transformation locally

**Type** boolean, default False

**use\_replace\_display\_mesh**

Replace the display mesh

**Type** boolean, default False

**use\_replace\_physics\_mesh**

Replace the physics mesh (triangle bounds only - compound shapes not supported)

**Type** boolean, default False

### Inherited Properties

- bpy\_struct.id\_data
- Actuator.name
- Actuator.show\_expanded
- Actuator.pin
- Actuator.type

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- Actuator.link
- Actuator.unlink

## 2.4.195 EffectSequence(Sequence)

base classes — bpy\_struct, Sequence

subclasses — GlowSequence, PluginSequence, ColorSequence, TransformSequence, WipeSequence, SpeedControlSequence

```
class bpy.types.EffectSequence (Sequence)
    Sequence strip applying an effect on the images created by other strips

    color_balance
        Type SequenceColorBalance, (readonly)

    color_multiply
        Type float in [0, 20], default 0.0

    color_saturation
        Type float in [0, 20], default 0.0

    crop
        Type SequenceCrop, (readonly)

    proxy
        Type SequenceProxy, (readonly)

    strobe
        Only display every nth frame
        Type float in [1, 30], default 0.0

    transform
        Type SequenceTransform, (readonly)

    use_color_balance
        (3-Way color correction) on input
        Type boolean, default False

    use_crop
        Crop image before processing
        Type boolean, default False

    use_deinterlace
        For video movies to remove fields
        Type boolean, default False

    use_flip_x
        Flip on the X axis
        Type boolean, default False

    use_flip_y
        Flip on the Y axis
        Type boolean, default False

    use_float
        Convert input to float data
        Type boolean, default False

    use_premultiply
        Convert RGB from key alpha to premultiplied alpha
        Type boolean, default False
```

**use\_proxy**

Use a preview proxy for this strip

**Type** boolean, default False

**use\_proxy\_custom\_directory**

Use a custom directory to store data

**Type** boolean, default False

**use\_proxy\_custom\_file**

Use a custom file to read proxy data from

**Type** boolean, default False

**use\_reverse\_frames**

Reverse frame order

**Type** boolean, default False

**use\_translation**

Translate image before processing

**Type** boolean, default False

**Inherited Properties**

- bpy\_struct.id\_data
- Sequence.name
- Sequence.blend\_type
- Sequence.blend\_alpha
- Sequence.channel
- Sequence.effect\_fader
- Sequence.frame\_final\_end
- Sequence.frame\_offset\_end
- Sequence.frame\_still\_end
- Sequence.input\_1
- Sequence.input\_2
- Sequence.input\_3
- Sequence.select\_left\_handle
- Sequence.frame\_final\_duration
- Sequence.frame\_duration
- Sequence.lock
- Sequence.mute
- Sequence.select\_right\_handle
- Sequence.select
- Sequence.speed\_factor
- Sequence.frame\_start
- Sequence.frame\_final\_start
- Sequence.frame\_offset\_start
- Sequence.frame\_still\_start
- Sequence.type
- Sequence.use\_default\_fade
- Sequence.input\_count

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`
- `Sequence.getStripElem`
- `Sequence.swap`

## 2.4.196 EffectorWeights(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.EffectorWeights(bpy_struct)`

Effector weights for physics simulation

**all**

All effector's weight

**Type** float in [-200, 200], default 0.0

**apply\_to\_hair\_growing**

Use force fields when growing hair

**Type** boolean, default False

**boid**

Boid effector weight

**Type** float in [-200, 200], default 0.0

**charge**

Charge effector weight

**Type** float in [-200, 200], default 0.0

**curve\_guide**

Curve guide effector weight

**Type** float in [-200, 200], default 0.0

**drag**

Drag effector weight

**Type** float in [-200, 200], default 0.0

**force**

Force effector weight

**Type** float in [-200, 200], default 0.0

**gravity**

Global gravity weight

**Type** float in [-200, 200], default 0.0

**group**

Limit effectors to this Group

**Type** [Group](#)

**harmonic**

Harmonic effector weight

**Type** float in [-200, 200], default 0.0

**lennardjones**

Lennard-Jones effector weight

**Type** float in [-200, 200], default 0.0

**magnetic**

Magnetic effector weight

**Type** float in [-200, 200], default 0.0

**texture**

Texture effector weight

**Type** float in [-200, 200], default 0.0

**turbulence**

Turbulence effector weight

**Type** float in [-200, 200], default 0.0

**vortex**

Vortex effector weight

**Type** float in [-200, 200], default 0.0

**wind**

Wind effector weight

**Type** float in [-200, 200], default 0.0

## Inherited Properties

- [bpy\\_struct.id\\_data](#)

## Inherited Functions

- [bpy\\_struct.as\\_pointer](#)
- [bpy\\_struct.callback\\_add](#)
- [bpy\\_struct.callback\\_remove](#)
- [bpy\\_struct.driver\\_add](#)
- [bpy\\_struct.driver\\_remove](#)
- [bpy\\_struct.get](#)
- [bpy\\_struct.is\\_property\\_hidden](#)
- [bpy\\_struct.is\\_property\\_set](#)

- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `ClothSettings.effector_weights`
- `ParticleSettings.effector_weights`
- `SmokeDomainSettings.effector_weights`
- `SoftBodySettings.effector_weights`

### 2.4.197 `EnumProperty(Property)`

base classes — `bpy_struct, Property`

**class bpy.types.EnumProperty(*Property*)**

RNA enumeration property definition, to choose from a number of predefined options

**default**

Default value for this enum

**Type** enum in ['DUMMY'], default 'DUMMY', (readonly)

**default\_flag**

Default value for this enum

**Type** enum set in {'DUMMY'}, default set(), (readonly)

**enum\_items**

Possible values for the property

**Type** `bpy_prop_collection` of `EnumPropertyItem`, (readonly)

## Inherited Properties

- `bpy_struct.id_data`
- `Property.name`
- `Property.srna`
- `Property.description`
- `Property.is_enum_flag`
- `Property.is_hidden`
- `Property.identifier`
- `Property.is_never_none`
- `Property.is_readonly`
- `Property.is_registered`
- `Property.is_registered_optional`
- `Property.is_required`
- `Property.is_output`
- `Property.is_runtime`
- `Property.is_skip_save`

- `Property.subtype`
- `Property.type`
- `Property.unit`

#### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

### 2.4.198 `EnumPropertyItem(bpy_struct)`

base class — `bpy_struct`

`class bpy.types.EnumPropertyItem(bpy_struct)`

Definition of a choice in an RNA enum property

#### `description`

Description of the item's purpose

**Type** string, default "", (readonly)

#### `identifier`

Unique name used in the code and scripting

**Type** string, default "", (readonly)

#### `name`

Human readable name

**Type** string, default "", (readonly)

#### `value`

Value of the item

**Type** int in [0, inf], default 0, (readonly)

#### Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `EnumProperty.enum_items`

### 2.4.199 EnvironmentMap(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.EnvironmentMap(bpy_struct)`  
Environment map created by the renderer and cached for subsequent renders

**clip\_end**  
Objects further than this are not visible to map  
**Type** float in [0.01, inf], default 0.0

**clip\_start**  
Objects nearer than this are not visible to map  
**Type** float in [0.001, inf], default 0.0

**depth**  
Number of times a map will be rendered recursively (mirror effects.)  
**Type** int in [0, 5], default 0

**layers\_ignore**  
Hide objects on these layers when generating the Environment Map  
**Type** boolean array of 20 items, default (False, False, False)

**mapping**  
**Type** enum in ['CUBE', 'PLANE'], default 'CUBE'

**resolution**  
Pixel resolution of the rendered environment map

**Type** int in [50, 4096], default 0

**source**

**Type** enum in ['STATIC', 'ANIMATED', 'IMAGE\_FILE'], default 'STATIC'

**viewpoint\_object**

Object to use as the environment map's viewpoint location

**Type** Object

**zoom**

**Type** float in [0.1, 5], default 0.0

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- EnvironmentMapTexture.environment\_map

## 2.4.200 EnvironmentMapTexture(Texture)

base classes — bpy\_struct, ID, Texture

**class** bpy.types.EnvironmentMapTexture (*Texture*)  
Environment map texture

**environment\_map**

Gets the environment map associated with this texture

**Type** EnvironmentMap, (readonly)

**filter\_eccentricity**

Maximum eccentricity. Higher gives less blur at distant/oblique angles, but is also slower

**Type** int in [1, 256], default 0

**filter\_probes**

Maximum number of samples. Higher gives less blur at distant/oblique angles, but is also slower

**Type** int in [1, 256], default 0

**filter\_size**

Multiplies the filter size used by MIP Map and Interpolation

**Type** float in [0.1, 50], default 0.0

**filter\_type**

Texture filter to use for sampling image

**Type** enum in ['BOX', 'EWA', 'FELINE', 'AREA'], default 'BOX'

**image**

Source image file to read the environment map from

**Type** [Image](#)

**image\_user**

Parameters defining which layer, pass and frame of the image is displayed

**Type** [ImageUser](#), (readonly)

**use\_filter\_size\_min**

Use Filter Size as a minimal filter value in pixels

**Type** boolean, default False

**use\_mipmap**

Uses auto-generated MIP maps for the image

**Type** boolean, default False

**use\_mipmap\_gauss**

Uses Gauss filter to sample down MIP maps

**Type** boolean, default False

**users\_material**

Materials that use this texture (readonly)

**users\_object\_modifier**

Object modifiers that use this texture (readonly)

**Inherited Properties**

- `bpy_struct.id_data`
- `ID.name`
- `ID.use_fake_user`
- `ID.library`
- `ID.tag`
- `ID.users`
- `Texture.animation_data`
- `Texture.intensity`
- `Texture.color_ramp`

- `Texture.contrast`
- `Texture.factor_blue`
- `Texture.factor_green`
- `Texture.factor_red`
- `Texture.node_tree`
- `Texture.saturation`
- `Texture.use_preview_alpha`
- `Texture.type`
- `Texture.use_color_ramp`
- `Texture.use_nodes`
- `Texture.users_material`
- `Texture.users_object_modifier`
- `Texture.users_material`
- `Texture.users_object_modifier`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`
- `ID.copy`
- `ID.user_clear`
- `ID.animation_data_create`
- `ID.animation_data_clear`
- `ID.update_tag`

## 2.4.201 Event(bpy\_struct)

base class — `bpy_struct`

**class** `bpy.types.Event (bpy_struct)`

Window Manager Event

**alt**

True when the Alt/Option key is held

**Type** boolean, default False, (readonly)

**ascii**

Single ASCII character for this event

**Type** string, default “”, (readonly)

**ctrl**

True when the Ctrl key is held

**Type** boolean, default False, (readonly)

**mouse\_prev\_x**

The window relative vertical location of the mouse

**Type** int in [-inf, inf], default 0, (readonly)

**mouse\_prev\_y**

The window relative horizontal location of the mouse

**Type** int in [-inf, inf], default 0, (readonly)

**mouse\_region\_x**

The region relative vertical location of the mouse

**Type** int in [-inf, inf], default 0, (readonly)

**mouse\_region\_y**

The region relative horizontal location of the mouse

**Type** int in [-inf, inf], default 0, (readonly)

**mouse\_x**

The window relative vertical location of the mouse

**Type** int in [-inf, inf], default 0, (readonly)

**mouse\_y**

The window relative horizontal location of the mouse

**Type** int in [-inf, inf], default 0, (readonly)

**oskey**

True when the Cmd key is held

**Type** boolean, default False, (readonly)

**shift**

True when the Shift key is held

**Type** boolean, default False, (readonly)

**type**

**Type** enum in ['NONE', 'LEFTMOUSE', 'MIDDLEMOUSE', 'RIGHTMOUSE', 'BUTTON4MOUSE', 'BUTTON5MOUSE', 'ACTIONMOUSE', 'SELECTMOUSE', 'MOUSEMOVE', 'INBETWEEN\_MOUSEMOVE', 'TRACKPADPAN', 'TRACKPADZOOM', 'MOUSERotate', 'WHEELUPMOUSE', 'WHEELEDOWNMOUSE', 'WHEELINMOUSE', 'WHEELOUTMOUSE', 'EVT\_TWEAK\_L', 'EVT\_TWEAK\_M', 'EVT\_TWEAK\_R', 'EVT\_TWEAK\_A', 'EVT\_TWEAK\_S', 'A', 'B', 'C', 'D', 'E', 'F', 'G', 'H', 'T', 'J', 'K', 'L', 'M', 'N', 'O', 'P', 'Q', 'R', 'S', 'T', 'U', 'V', 'W', 'X', 'Y', 'Z', 'ZERO', 'ONE', 'TWO', 'THREE', 'FOUR', 'FIVE', 'SIX', 'SEVEN', 'EIGHT', 'NINE', 'LEFT\_CTRL', 'LEFT\_ALT', 'LEFT\_SHIFT', 'RIGHT\_ALT', 'RIGHT\_CTRL', 'RIGHT\_SHIFT', 'OSKEY', 'GRLESS', 'ESC', 'TAB', 'RET', 'SPACE', 'LINE\_FEED', 'BACK\_SPACE', 'DEL', 'SEMI\_COLON', 'PERIOD', 'COMMA', 'QUOTE', 'ACCENT\_GRAVE', 'MINUS', 'SLASH', 'BACK\_SLASH', 'EQUAL', 'LEFT\_BRACKET', 'RIGHT\_BRACKET', 'LEFT\_ARROW', 'DOWN\_ARROW', 'RIGHT\_ARROW', 'UP\_ARROW', 'NUMPAD\_2', 'NUMPAD\_4', 'NUMPAD\_6', 'NUMPAD\_8', 'NUMPAD\_1', 'NUMPAD\_3', 'NUMPAD\_5', 'NUMPAD\_7', 'NUMPAD\_9', 'NUMPAD\_PERIOD', 'NUMPAD\_SLASH', 'NUMPAD\_ASTERIX',

'NUMPAD\_0', 'NUMPAD\_MINUS', 'NUMPAD\_ENTER', 'NUMPAD\_PLUS',  
'F1', 'F2', 'F3', 'F4', 'F5', 'F6', 'F7', 'F8', 'F9', 'F10', 'F11', 'F12',  
'F13', 'F14', 'F15', 'F16', 'F17', 'F18', 'F19', 'PAUSE', 'INSERT', 'HOME',  
'PAGE\_UP', 'PAGE\_DOWN', 'END', 'MEDIA\_PLAY', 'MEDIA\_STOP', 'ME-  
DIA\_FIRST', 'MEDIA\_LAST', 'WINDOW\_DEACTIVATE', 'TIMER', 'TIMER0',  
'TIMER1', 'TIMER2', 'NDOF\_BUTTON\_MENU', 'NDOF\_BUTTON\_FIT',  
'NDOF\_BUTTON\_TOP', 'NDOF\_BUTTON\_BOTTOM', 'NDOF\_BUTTON\_LEFT',  
'NDOF\_BUTTON\_RIGHT', 'NDOF\_BUTTON\_FRONT', 'NDOF\_BUTTON\_BACK',  
'NDOF\_BUTTON\_ISO1', 'NDOF\_BUTTON\_ISO2', 'NDOF\_BUTTON\_ROLL\_CW',  
'NDOF\_BUTTON\_ROLL\_CCW', 'NDOF\_BUTTON\_SPIN\_CW',  
'NDOF\_BUTTON\_SPIN\_CCW', 'NDOF\_BUTTON\_TILT\_CW',  
'NDOF\_BUTTON\_TILT\_CCW', 'NDOF\_BUTTON\_ROTATE',  
'NDOF\_BUTTON\_PANZOOM', 'NDOF\_BUTTON\_DOMINANT',  
'NDOF\_BUTTON\_PLUS', 'NDOF\_BUTTON\_MINUS', 'NDOF\_BUTTON\_1',  
'NDOF\_BUTTON\_2', 'NDOF\_BUTTON\_3', 'NDOF\_BUTTON\_4',  
'NDOF\_BUTTON\_5', 'NDOF\_BUTTON\_6', 'NDOF\_BUTTON\_7',  
'NDOF\_BUTTON\_8', 'NDOF\_BUTTON\_9', 'NDOF\_BUTTON\_10'], default 'NONE',  
(readonly)

**value**

The type of event, only applies to some

**Type** enum in ['ANY', 'NOTHING', 'PRESS', 'RELEASE', 'CLICK', 'DOUBLE\_CLICK'],  
default 'NOTHING', (readonly)

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- Operator.invoke
- Operator.modal

- `WindowManager.invoke_confirm`
- `WindowManager.invoke_props_popup`

## 2.4.202 ExplodeModifier(Modifier)

base classes — `bpy_struct, Modifier`

**class bpy.types.ExplodeModifier(Modifier)**

Explosion effect modifier based on a particle system

**particle\_uv**

UV Layer to change with particle age

**Type** string, default “”

**protect**

Clean vertex group edges

**Type** float in [0, 1], default 0.0

**show\_alive**

Show mesh when particles are alive

**Type** boolean, default False

**show\_dead**

Show mesh when particles are dead

**Type** boolean, default False

**show\_unborn**

Show mesh when particles are unborn

**Type** boolean, default False

**use\_edge\_cut**

Cut face edges for nicer shrapnel

**Type** boolean, default False

**use\_size**

Use particle size for the shrapnel

**Type** boolean, default False

**vertex\_group**

**Type** string, default “”

### Inherited Properties

- `bpy_struct.id_data`
- `Modifier.name`
- `Modifier.use_apply_on_spline`
- `Modifier.show_in_editmode`
- `Modifier.show_expanded`
- `Modifier.show_on_cage`
- `Modifier.show_viewport`
- `Modifier.show_render`
- `Modifier.type`

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.203 ExpressionController(Controller)

base classes — bpy\_struct, Controller

```
class bpy.types.ExpressionController(Controller)
    Controller passing on events based on the evaluation of an expression
    expression
        Type string, default ""
```

## Inherited Properties

- bpy\_struct.id\_data
- Controller.name
- Controller.states
- Controller.show\_expanded
- Controller.use\_priority
- Controller.type

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert

- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- Controller.link
- Controller.unlink

## 2.4.204 FCurve(bpy\_struct)

base class — bpy\_struct

**class bpy.types.FCurve (bpy\_struct)**

F-Curve defining values of a period of time

**array\_index**

Index to the specific property affected by F-Curve if applicable

**Type** int in [-inf, inf], default 0

**color**

Color of the F-Curve in the Graph Editor

**Type** float array of 3 items in [0, 1], default (0.0, 0.0, 0.0)

**color\_mode**

Method used to determine color of F-Curve in Graph Editor

**Type** enum in ['AUTO\_RAINBOW', 'AUTO\_RGB', 'CUSTOM'], default 'AUTO\_RAINBOW'

**data\_path**

RNA Path to property affected by F-Curve

**Type** string, default “”

**driver**

Channel Driver (only set for Driver F-Curves)

**Type** Driver, (readonly)

**extrapolation**

**Type** enum in ['CONSTANT', 'LINEAR'], default 'CONSTANT'

**group**

Action Group that this F-Curve belongs to

**Type** ActionGroup

**hide**

F-Curve and its keyframes are hidden in the Graph Editor graphs

**Type** boolean, default False

**is\_valid**

False when F-Curve could not be evaluated in past, so should be skipped when evaluating

**Type** boolean, default False

**keyframe\_points**

User-editable keyframes

**Type** FCurveKeyframePoints bpy\_prop\_collection of Keyframe, (readonly)

**lock**

F-Curve's settings cannot be edited

**Type** boolean, default False

**modifiers**

Modifiers affecting the shape of the F-Curve

**Type** `FCurveModifiers bpy_prop_collection of FModifier`, (readonly)

**mute**

F-Curve is not evaluated

**Type** boolean, default False

**sampled\_points**

Sampled animation data

**Type** `bpy_prop_collection of FCurveSample`, (readonly)

**select**

F-Curve is selected for editing

**Type** boolean, default False

**use\_auto\_handle\_clamp**

All auto-handles for F-Curve are clamped

**Type** boolean, default False

**evaluate (frame)**

Evaluate fcurve.

**Parameters** `frame (float in [-inf, inf])` – Frame, Evaluate fcurve at given frame

**Returns** Position, FCurve position

**Return type** float in [-inf, inf]

**range ()**

Get the time extents for F-Curve.

**Returns** Range, Min/Max values

**Return type** float array of 2 items in [-inf, inf]

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`

- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `Action.fcurves`
- `ActionFCurves.new`
- `ActionFCurves.remove`
- `ActionGroup.channels`
- `AnimData.drivers`
- `AnimDataDrivers.from_existing`
- `AnimDataDrivers.from_existing`
- `NlaStrip.fcurves`

## 2.4.205 FCurveActuator(Actuator)

base classes — `bpy_struct, Actuator`

**class bpy.types.FCurveActuator(Actuator)**

Actuator to animate the object

**apply\_to\_children**

Update F-Curve on all children Objects as well

**Type** boolean, default False

**frame\_end**

**Type** float in [-inf, inf], default 0.0

**frame\_property**

Assign the action's current frame number to this property

**Type** string, default “”

**frame\_start**

**Type** float in [-inf, inf], default 0.0

**play\_type**

Specify the way you want to play the animation

**Type** enum in ['PLAY', 'PINGPONG', 'FLIPPER', 'STOP', 'END', 'PROP'], default 'PLAY'

**property**

Use this property to define the F-Curve position

**Type** string, default “”

**use\_additive**

F-Curve is added to the current loc/rot/scale in global or local coordinate according to Local flag

**Type** boolean, default False

**use\_force**

Apply F-Curve as a global or local force depending on the local option (dynamic objects only)

**Type** boolean, default False

**use\_local**

Let the F-Curve act in local coordinates, used in Force and Add mode

**Type** boolean, default False

**Inherited Properties**

- bpy\_struct.id\_data
- Actuator.name
- Actuator.show\_expanded
- Actuator.pin
- Actuator.type

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- Actuator.link
- Actuator.unlink

## 2.4.206 FCurveKeyframePoints(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.FCurveKeyframePoints (*bpy\_struct*)

Collection of keyframe points

**insert** (*frame*, *value*, *options=set()*)

Add a keyframe point to a F-Curve.

**Parameters**

- **frame** (*float in [-inf, inf]*) – X Value of this keyframe point
- **value** (*float in [-inf, inf]*) – Y Value of this keyframe point
- **options** (*enum set in {'REPLACE', 'NEEDED', 'FAST'}*, *(optional)*) – Keyframe options.

**Returns** Newly created keyframe

**Return type** Keyframe

**add**(*count=1*)

Add a keyframe point to a F-Curve.

**Parameters** **count** (*int in [1, inf], (optional)*) – Number, Number of points to add to the spline

**remove**(*keyframe, fast=False*)

Remove keyframe from an fcurve.

**Parameters**

- **keyframe** ([Keyframe](#), (never None)) – Keyframe to remove.
- **fast** (*boolean, (optional)*) – Fast, Fast keyframe removal to avoid recalculating the curve each time

## Inherited Properties

- [bpy\\_struct.id\\_data](#)

## Inherited Functions

- [bpy\\_struct.as\\_pointer](#)
- [bpy\\_struct.callback\\_add](#)
- [bpy\\_struct.callback\\_remove](#)
- [bpy\\_struct.driver\\_add](#)
- [bpy\\_struct.driver\\_remove](#)
- [bpy\\_struct.get](#)
- [bpy\\_struct.is\\_property\\_hidden](#)
- [bpy\\_struct.is\\_property\\_set](#)
- [bpy\\_struct.items](#)
- [bpy\\_struct.keyframe\\_delete](#)
- [bpy\\_struct.keyframe\\_insert](#)
- [bpy\\_struct.keys](#)
- [bpy\\_struct.path\\_from\\_id](#)
- [bpy\\_struct.path\\_resolve](#)
- [bpy\\_struct.type\\_recast](#)
- [bpy\\_struct.values](#)

## References

- [FCurve.keyframe\\_points](#)

## 2.4.207 FCurveModifiers([bpy\\_struct](#))

base class — [bpy\\_struct](#)

**class** [bpy.types.FCurveModifiers](#)(*bpy\_struct*)

Collection of F-Curve Modifiers

**active**

Active F-Curve Modifier

**Type** `FModifier`

**new** (*type*)

Add a constraint to this object

**Parameters** *type* (enum in ['NULL', 'GENERATOR', 'FNGENERATOR', 'ENVELOPE', 'CYCLES', 'NOISE', 'FILTER', 'LIMITS', 'STEPPED']) – Constraint type to add.

**Returns** New fmodifier.

**Return type** `FModifier`

**remove** (*modifier*)

Remove a modifier from this curve.

**Parameters** *modifier* (`FModifier`, (never None)) – Removed modifier.

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `FCurve.modifiers`

## 2.4.208 FCurveSample(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.FCurveSample` (*bpy\_struct*)  
Sample point for F-Curve

**co**

Point coordinates

**Type** float array of 2 items in [-inf, inf], default (0.0, 0.0)

**select**  
Selection status  
**Type** boolean, default False

### Inherited Properties

- bpy\_struct.id\_data

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

### References

- FCurve.sampled\_points

## 2.4.209 FModifier(bpy\_struct)

base class — bpy\_struct  
subclasses — FModifierCycles, FModifierPython, FModifierFunctionGenerator, FModifierLimits, FModifierEnvelope, FModifierNoise, FModifierStepped, FModifierGenerator  
**class** bpy.types.FModifier(bpy\_struct)  
Modifier for values of F-Curve  
**active**  
F-Curve Modifier is the one being edited  
**Type** boolean, default False  
**is\_valid**  
F-Curve Modifier has invalid settings and will not be evaluated  
**Type** boolean, default False, (readonly)

**mute**

F-Curve Modifier will not be evaluated

**Type** boolean, default False

**show\_expanded**

F-Curve Modifier's panel is expanded in UI

**Type** boolean, default False

**type**

F-Curve Modifier Type

**Type** enum in ['NULL', 'GENERATOR', 'FNGENERATOR', 'ENVELOPE', 'CYCLES', 'NOISE', 'FILTER', 'LIMITS', 'STEPPED'], default 'NULL', (readonly)

### Inherited Properties

- `bpy_struct.id_data`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

### References

- `FCurve.modifiers`
- `FCurveModifiers.active`
- `FCurveModifiers.new`
- `FCurveModifiers.remove`
- `NlaStrip.modifiers`

## 2.4.210 FModifierCycles(FModifier)

base classes — `bpy_struct, FModifier`

**class** `bpy.types.FModifierCycles(FModifier)`

Repeats the values of the modified F-Curve

**cycles\_after**

Maximum number of cycles to allow after last keyframe. (0 = infinite)

**Type** int in [-32768, 32767], default 0

**cycles\_before**

Maximum number of cycles to allow before first keyframe. (0 = infinite)

**Type** int in [-32768, 32767], default 0

**mode\_after**

Cycling mode to use after last keyframe

**Type** enum in ['NONE', 'REPEAT', 'REPEAT\_OFFSET', 'MIRROR'], default 'NONE'

**mode\_before**

Cycling mode to use before first keyframe

**Type** enum in ['NONE', 'REPEAT', 'REPEAT\_OFFSET', 'MIRROR'], default 'NONE'

## Inherited Properties

- bpy\_struct.id\_data
- FModifier.active
- FModifier.is\_valid
- FModifier.show\_expanded
- FModifier.mute
- FModifier.type

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.211 FModifierEnvelope(FModifier)

base classes — bpy\_struct, FModifier

**class** bpy.types.FModifierEnvelope (*FModifier*)

Scales the values of the modified F-Curve

**control\_points**

Control points defining the shape of the envelope

**Type** bpy\_prop\_collection of FModifierEnvelopeControlPoint, (readonly)

**default\_max**

Upper distance from Reference Value for 1:1 default influence

**Type** float in [-inf, inf], default 0.0

**default\_min**

Lower distance from Reference Value for 1:1 default influence

**Type** float in [-inf, inf], default 0.0

**reference\_value**

Value that envelope's influence is centered around / based on

**Type** float in [-inf, inf], default 0.0

## Inherited Properties

- bpy\_struct.id\_data
- FModifier.active
- FModifier.is\_valid
- FModifier.show\_expanded
- FModifier.mute
- FModifier.type

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.212 FModifierEnvelopeControlPoint(bpy\_struct)

base class — bpy\_struct

class bpy.types.FModifierEnvelopeControlPoint (*bpy\_struct*)

Control point for envelope F-Modifier

**frame**

Frame this control-point occurs on

**Type** float in [-inf, inf], default 0.0

**max**

Upper bound of envelope at this control-point

**Type** float in [-inf, inf], default 0.0

**min**

Lower bound of envelope at this control-point

**Type** float in [-inf, inf], default 0.0

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- FModifierEnvelope.control\_points

### 2.4.213 FModifierFunctionGenerator(FModifier)

base classes — bpy\_struct, FModifier

**class** bpy.types.FModifierFunctionGenerator (*FModifier*)

Generates values using a Built-In Function

**amplitude**

Scale factor determining the maximum/minimum values

**Type** float in [-inf, inf], default 0.0

**function\_type**

Type of built-in function to use

**Type** enum in ['SIN', 'COS', 'TAN', 'SQRT', 'LN', 'SINC'], default 'SIN'

**phase\_multiplier**

Scale factor determining the 'speed' of the function

**Type** float in [-inf, inf], default 0.0

**phase\_offset**

Constant factor to offset time by for function

**Type** float in [-inf, inf], default 0.0

**use\_additive**

Values generated by this modifier are applied on top of the existing values instead of overwriting them

**Type** boolean, default False

**value\_offset**

Constant factor to offset values by

**Type** float in [-inf, inf], default 0.0

## Inherited Properties

- bpy\_struct.id\_data
- FModifier.active
- FModifier.is\_valid
- FModifier.show\_expanded
- FModifier.mute
- FModifier.type

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.214 FModifierGenerator(FModifier)

base classes — bpy\_struct, FModifier

## Inherited Properties

- bpy\_struct.id\_data
  - FModifier.active
  - FModifier.is\_valid
  - FModifier.show\_expanded
  - FModifier.mute
  - FModifier.type

## Inherited Functions

- bpy\_struct.as\_pointer
  - bpy\_struct.callback\_add
  - bpy\_struct.callback\_remove
  - bpy\_struct.driver\_add
  - bpy\_struct.driver\_remove
  - bpy\_struct.get
  - bpy\_struct.is\_property\_hidden
  - bpy\_struct.is\_property\_set
  - bpy\_struct.items
  - bpy\_struct.keyframe\_delete
  - bpy\_struct.keyframe\_insert
  - bpy\_struct.keys
  - bpy\_struct.path\_from\_id
  - bpy\_struct.path\_resolve
  - bpy\_struct.type\_recast
  - bpy\_struct.values

## 2.4.215 FModifierLimits(FModifier)

base classes — `bpy_struct`, `FModifier`

**class bpy.types.FModifierLimits (FModifier)**  
Limits the time/value ranges of the modified F-Curve

**max\_x**

Highest X value to allow

**Type** float in [-inf, inf], default 0.0

**max\_y**

Highest Y value to allow

**Type** float in [-inf, inf], default 0.0

**min\_x**

Lowest X value to allow

**Type** float in [-inf, inf], default 0.0

**min\_y**

Lowest Y value to allow

**Type** float in [-inf, inf], default 0.0

**use\_max\_x**

Use the maximum X value

**Type** boolean, default False

**use\_max\_y**

Use the maximum Y value

**Type** boolean, default False

**use\_min\_x**

Use the minimum X value

**Type** boolean, default False

**use\_min\_y**

Use the minimum Y value

**Type** boolean, default False

### Inherited Properties

- `bpy_struct.id_data`
- `FModifier.active`
- `FModifier.is_valid`
- `FModifier.show_expanded`
- `FModifier.mute`
- `FModifier.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`

- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.216 FModifierNoise(FModifier)

base classes — bpy\_struct, FModifier

**class** bpy.types.FModifierNoise (*FModifier*)

Gives randomness to the modified F-Curve

**blend\_type**

Method of modifying the existing F-Curve

**Type** enum in ['REPLACE', 'ADD', 'SUBTRACT', 'MULTIPLY'], default 'REPLACE'

**depth**

Amount of fine level detail present in the noise

**Type** int in [0, 32767], default 0

**phase**

A random seed for the noise effect

**Type** float in [-inf, inf], default 0.0

**scale**

Scaling (in time) of the noise

**Type** float in [-inf, inf], default 0.0

**strength**

Amplitude of the noise - the amount that it modifies the underlying curve

**Type** float in [-inf, inf], default 0.0

### Inherited Properties

- bpy\_struct.id\_data
- FModifier.active
- FModifier.is\_valid
- FModifier.show\_expanded
- FModifier.mute
- FModifier.type

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.217 FModifierPython(FModifier)

base classes — `bpy_struct, FModifier`

**class bpy.types.FModifierPython (*FModifier*)**  
Performs user-defined operation on the modified F-Curve

## Inherited Properties

- `bpy_struct.id_data`
- `FModifier.active`
- `FModifier.is_valid`
- `FModifier.show_expanded`
- `FModifier.mute`
- `FModifier.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`

- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.218 FModifierStepped(FModifier)

base classes — `bpy_struct, FModifier`

**class bpy.types.FModifierStepped(FModifier)**

Holds each interpolated value from the F-Curve for several frames without changing the timing

**frame\_end**

Frame that modifier's influence ends (if applicable)

**Type** float in [-inf, inf], default 0.0

**frame\_offset**

Reference number of frames before frames get held. Use to get hold for '1-3' vs '5-7' holding patterns

**Type** float in [-inf, inf], default 0.0

**frame\_start**

Frame that modifier's influence starts (if applicable)

**Type** float in [-inf, inf], default 0.0

**frame\_step**

Number of frames to hold each value

**Type** float in [-inf, inf], default 0.0

**use\_frame\_end**

Restrict modifier to only act before its 'end' frame

**Type** boolean, default False

**use\_frame\_start**

Restrict modifier to only act after its 'start' frame

**Type** boolean, default False

### Inherited Properties

- `bpy_struct.id_data`
- `FModifier.active`
- `FModifier.is_valid`
- `FModifier.show_expanded`
- `FModifier.mute`
- `FModifier.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`

- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.219 FieldSettings(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.FieldSettings (*bpy\_struct*)  
Field settings for an object in physics simulation

**apply\_to\_location**

Effect particles' location

**Type** boolean, default False

**apply\_to\_rotation**

Effect particles' dynamic rotation

**Type** boolean, default False

**distance\_max**

Maximum distance for the field to work

**Type** float in [0, 1000], default 0.0

**distance\_min**

Minimum distance for the field's fall-off

**Type** float in [0, 1000], default 0.0

**falloff\_power**

Falloff power (real gravitational falloff = 2)

**Type** float in [0, 10], default 0.0

**falloff\_type**

**Type** enum in ['SPHERE', 'TUBE', 'CONE'], default 'SPHERE'

**flow**

Convert effector force into air flow velocity

**Type** float in [0, 10], default 0.0

**guide\_clump\_amount**

Amount of clumping

**Type** float in [-1, 1], default 0.0

**guide\_clump\_shape**

Shape of clumping

**Type** float in [-0.999, 0.999], default 0.0

**guide\_free**

Guide-free time from particle life's end

**Type** float in [0, 0.99], default 0.0

**guide\_kink\_amplitude**  
The amplitude of the offset

**Type** float in [0, 10], default 0.0

**guide\_kink\_axis**  
Which axis to use for offset

**Type** enum in ['X', 'Y', 'Z'], default 'X'

**guide\_kink\_frequency**  
The frequency of the offset (1/total length)

**Type** float in [0, 10], default 0.0

**guide\_kink\_shape**  
Adjust the offset to the beginning/end

**Type** float in [-0.999, 0.999], default 0.0

**guide\_kink\_type**  
Type of periodic offset on the curve

**Type** enum in ['NONE', 'CURL', 'RADIAL', 'WAVE', 'BRAID', 'ROTATION', 'ROLL'], default 'NONE'

**guide\_minimum**  
The distance from which particles are affected fully

**Type** float in [0, 1000], default 0.0

**harmonic\_damping**  
Damping of the harmonic force

**Type** float in [0, 10], default 0.0

**inflow**  
Inwards component of the vortex force

**Type** float in [-10, 10], default 0.0

**linear\_drag**  
Drag component proportional to velocity

**Type** float in [-2, 2], default 0.0

**noise**  
Amount of noise for the force strength

**Type** float in [0, 10], default 0.0

**quadratic\_drag**  
Drag component proportional to the square of velocity

**Type** float in [-2, 2], default 0.0

**radial\_falloff**  
Radial falloff power (real gravitational falloff = 2)

**Type** float in [0, 10], default 0.0

**radial\_max**  
Maximum radial distance for the field to work

**Type** float in [0, 1000], default 0.0

**radial\_min**

Minimum radial distance for the field's fall-off

**Type** float in [0, 1000], default 0.0

**rest\_length**

Rest length of the harmonic force

**Type** float in [0, 1000], default 0.0

**seed**

Seed of the noise

**Type** int in [1, 128], default 0

**shape**

Which direction is used to calculate the effector force

**Type** enum in ['POINT', 'PLANE', 'SURFACE', 'POINTS'], default 'POINT'

**size**

Size of the turbulence

**Type** float in [0, 10], default 0.0

**strength**

Strength of force field

**Type** float in [-1000, 1000], default 0.0

**texture**

Texture to use as force

**Type** Texture

**texture\_mode**

How the texture effect is calculated (RGB & Curl need a RGB texture else Gradient will be used instead)

**Type** enum in ['RGB', 'GRADIENT', 'CURL'], default 'RGB'

**texture\_nabla**

Defines size of derivative offset used for calculating gradient and curl

**Type** float in [0.0001, 1], default 0.0

**type**

Type of field

**Type** enum in ['NONE', 'FORCE', 'WIND', 'VORTEX', 'MAGNET', 'HARMONIC', 'CHARGE', 'LENNARDJ', 'TEXTURE', 'GUIDE', 'BOID', 'TURBULENCE', 'DRAG'], default 'NONE'

**use\_2d\_force**

Apply force only in 2d

**Type** boolean, default False

**use\_absorption**

Force gets absorbed by collision objects

**Type** boolean, default False

**use\_global\_coords**

Use effector/global coordinates for turbulence

**Type** boolean, default False

**use\_guide\_path\_add**

Based on distance/falloff it adds a portion of the entire path

**Type** boolean, default False

**use\_guide\_path\_weight**

Use curve weights to influence the particle influence along the curve

**Type** boolean, default False

**use\_max\_distance**

Use a maximum distance for the field to work

**Type** boolean, default False

**use\_min\_distance**

Use a minimum distance for the field's fall-off

**Type** boolean, default False

**use\_multiple\_springs**

Every point is effected by multiple springs

**Type** boolean, default False

**use\_object\_coords**

Use object/global coordinates for texture

**Type** boolean, default False

**use\_radial\_max**

Use a maximum radial distance for the field to work

**Type** boolean, default False

**use\_radial\_min**

Use a minimum radial distance for the field's fall-off

**Type** boolean, default False

**use\_root\_coords**

Texture coordinates from root particle locations

**Type** boolean, default False

**z\_direction**

Effect in full or only positive/negative Z direction

**Type** enum in ['BOTH', 'POSITIVE', 'NEGATIVE'], default 'BOTH'

**Inherited Properties**

- `bpy_struct.id_data`

**Inherited Functions**

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`

- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- Object.field
- ParticleSettings.force\_field\_1
- ParticleSettings.force\_field\_2

## 2.4.220 FileSelectParams(bpy\_struct)

base class — bpy\_struct

```
class bpy.types.FileSelectParams (bpy_struct)
    File Select Parameters

    directory
        Directory displayed in the file browser
        Type string, default ""

    display_type
        Display mode for the file list
        Type enum in ['FILE_SHORTDISPLAY', 'FILE_LONGDISPLAY', 'FILE_IMGDISPLAY'],
        default 'FILE_SHORTDISPLAY'

    filename
        Active file in the file browser
        Type string, default ""

    filter_glob
        Type string, default ""

    show_hidden
        Show hidden dot files
        Type boolean, default False

    sort_method
        Type enum in ['FILE_SORT_ALPHA', 'FILE_SORT_EXTENSION', 'FILE_SORT_TIME',
        'FILE_SORT_SIZE'], default 'FILE_SORT_ALPHA'

    title
        Title for the file browser
        Type string, default "", (readonly)
```

**use\_filter**  
Enable filtering of files  
**Type** boolean, default False

**use\_filter\_blender**  
Show .blend files  
**Type** boolean, default False

**use\_filter\_folder**  
Show folders  
**Type** boolean, default False

**use\_filter\_font**  
Show font files  
**Type** boolean, default False

**use\_filter\_image**  
Show image files  
**Type** boolean, default False

**use\_filter\_movie**  
Show movie files  
**Type** boolean, default False

**use\_filter\_script**  
Show script files  
**Type** boolean, default False

**use\_filter\_sound**  
Show sound files  
**Type** boolean, default False

**use\_filter\_text**  
Show text files  
**Type** boolean, default False

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`

- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `SpaceFileBrowser.params`

### 2.4.221 Filter2DActuator(Actuator)

base classes — `bpy_struct, Actuator`

**class bpy.types.Filter2DActuator(Actuator)**

Actuator to apply screen graphic effects

**filter\_pass**

Set filter order

**Type** int in [0, 99], default 0

**glsl\_shader**

**Type** Text

**mode**

**Type** enum in ['ENABLE', 'DISABLE', 'REMOVE', 'MOTIONBLUR', 'BLUR', 'SHARPEN', 'DILATION', 'EROSION', 'LAPLACIAN', 'SOBEL', 'PREWITT', 'GRAYSCALE', 'SEPIA', 'INVERT', 'CUSTOMFILTER'], default 'REMOVE'

**motion\_blur\_factor**

Set motion blur factor

**Type** float in [0, 1], default 0.0

**use\_motion\_blur**

Enable/Disable Motion Blur

**Type** boolean, default False

## Inherited Properties

- `bpy_struct.id_data`
- `Actuator.name`
- `Actuator.show_expanded`
- `Actuator.pin`
- `Actuator.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`

- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`
- `Actuator.link`
- `Actuator.unlink`

## 2.4.222 FloatProperty(Property)

base classes — `bpy_struct, Property`

**class bpy.types.FloatProperty(Property)**

RNA floating pointer number property definition

**array\_length**

Maximum length of the array, 0 means unlimited

**Type** int in [0, inf], default 0, (readonly)

**default**

Default value for this number

**Type** float in [-inf, inf], default 0.0, (readonly)

**default\_array**

Default value for this array

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0), (readonly)

**hard\_max**

Maximum value used by buttons

**Type** float in [-inf, inf], default 0.0, (readonly)

**hard\_min**

Minimum value used by buttons

**Type** float in [-inf, inf], default 0.0, (readonly)

**precision**

Number of digits after the dot used by buttons

**Type** int in [0, inf], default 0, (readonly)

**soft\_max**

Maximum value used by buttons

**Type** float in [-inf, inf], default 0.0, (readonly)

**soft\_min**

Minimum value used by buttons

**Type** float in [-inf, inf], default 0.0, (readonly)

**step**

Step size used by number buttons, for floats 1/100th of the step size

**Type** float in [0, inf], default 0.0, (readonly)

**Inherited Properties**

- bpy\_struct.id\_data
- Property.name
- Property.srna
- Property.description
- Property.is\_enum\_flag
- Property.is\_hidden
- Property.identifier
- Property.is\_never\_none
- Property.is\_readonly
- Property.is\_registered
- Property.is\_registered\_optional
- Property.is\_required
- Property.is\_output
- Property.is\_runtime
- Property.is\_skip\_save
- Property.subtype
- Property.type
- Property.unit

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.223 FloorConstraint(Constraint)

base classes — bpy\_struct, Constraint

**class** bpy.types.FloorConstraint (*Constraint*)

Uses the target object for location limitation

**floor\_location**

Location of target that object will not pass through

**Type** enum in ['FLOOR\_X', 'FLOOR\_Y', 'FLOOR\_Z', 'FLOOR\_NEGATIVE\_X', 'FLOOR\_NEGATIVE\_Y', 'FLOOR\_NEGATIVE\_Z'], default 'FLOOR\_X'

**offset**

Offset of floor from object origin

**Type** float in [0, 100], default 0.0

**subtarget**

**Type** string, default ""

**target**

Target Object

**Type** Object

**use\_rotation**

Use the target's rotation to determine floor

**Type** boolean, default False

**use\_sticky**

Immobilize object while constrained

**Type** boolean, default False

**Inherited Properties**

- bpy\_struct.id\_data
- Constraint.name
- Constraint.active
- Constraint.mute
- Constraint.show\_expanded
- Constraint.influence
- Constraint.error\_location
- Constraint.owner\_space
- Constraint.is\_proxy\_local
- Constraint.error\_rotation
- Constraint.target\_space
- Constraint.type
- Constraint.is\_valid

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete

- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.224 FluidFluidSettings(FluidSettings)

base classes — bpy\_struct, FluidSettings

**class** bpy.types.**FluidFluidSettings** (*FluidSettings*)

Fluid simulation settings for the fluid in the simulation

**initial\_velocity**

Initial velocity of fluid

**Type** float array of 3 items in [-1000.1, 1000.1], default (0.0, 0.0, 0.0)

**use**

Object contributes to the fluid simulation

**Type** boolean, default False

**use\_animated\_mesh**

Export this mesh as an animated one. Slower, only use if really necessary (e.g. armatures or parented objects), animated pos/rot/scale IPOs do not require it

**Type** boolean, default False

**volume\_INITIALIZATION**

Volume initialization type

**Type** enum in ['VOLUME', 'SHELL', 'BOTH'], default 'VOLUME'

### Inherited Properties

- bpy\_struct.id\_data
- FluidSettings.type

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve

- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.225 FluidMeshVertex(`bpy_struct`)

base class — `bpy_struct`

`class bpy.types.FluidMeshVertex(bpy_struct)`  
Vertex of a simulated fluid mesh

### `velocity`

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0), (readonly)

### Inherited Properties

- `bpy_struct.id_data`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

### References

- `DomainFluidSettings.fluid_mesh_vertices`

## 2.4.226 FluidSettings(`bpy_struct`)

base class — `bpy_struct`

subclasses — `FluidFluidSettings`, `DomainFluidSettings`, `ControlFluidSettings`,  
`InflowFluidSettings`, `ObstacleFluidSettings`, `ParticleFluidSettings`,  
`OutflowFluidSettings`

`class bpy.types.FluidSettings(bpy_struct)`  
Fluid simulation settings for an object taking part in the simulation

**type**

Type of participation in the fluid simulation

**Type** enum in ['NONE', 'DOMAIN', 'FLUID', 'OBSTACLE', 'INFLOW', 'OUTFLOW', 'PARTICLE', 'CONTROL'], default 'NONE'

**Inherited Properties**

- bpy\_struct.id\_data

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

**References**

- FluidSimulationModifier.settings

## 2.4.227 FluidSimulationModifier(Modifier)

base classes — bpy\_struct, Modifier

**class** bpy.types.**FluidSimulationModifier** (*Modifier*)

Fluid simulation modifier

**settings**

Settings for how this object is used in the fluid simulation

**Type** FluidSettings, (readonly, never None)

**Inherited Properties**

- bpy\_struct.id\_data
- Modifier.name
- Modifier.use\_apply\_on\_spline
- Modifier.show\_in\_editmode

- `Modifier.show_expanded`
- `Modifier.show_on_cage`
- `Modifier.show_viewport`
- `Modifier.show_render`
- `Modifier.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.228 FollowPathConstraint(Constraint)

base classes — `bpy_struct, Constraint`

**class** `bpy.types.FollowPathConstraint` (`Constraint`)

Locks motion to the target path

#### **forward\_axis**

Axis that points forward along the path

**Type** enum in ['FORWARD\_X', 'FORWARD\_Y', 'FORWARD\_Z', 'TRACK\_NEGATIVE\_X', 'TRACK\_NEGATIVE\_Y', 'TRACK\_NEGATIVE\_Z'], default 'FORWARD\_X'

#### **offset**

Offset from the position corresponding to the time frame

**Type** float in [-300000, 300000], default 0.0

#### **offset\_factor**

Percentage value defining target position along length of bone

**Type** float in [0, 1], default 0.0

#### **target**

Target Object

**Type** `Object`

#### **up\_axis**

Axis that points upward

**Type** enum in ['UP\_X', 'UP\_Y', 'UP\_Z'], default 'UP\_X'

**use\_curve\_follow**

Object will follow the heading and banking of the curve

**Type** boolean, default False

**use\_curve\_radius**

Objects scale by the curve radius

**Type** boolean, default False

**use\_fixed\_location**

Object will stay locked to a single point somewhere along the length of the curve regardless of time

**Type** boolean, default False

**Inherited Properties**

- bpy\_struct.id\_data
- Constraint.name
- Constraint.active
- Constraint.mute
- Constraint.show\_expanded
- Constraint.influence
- Constraint.error\_location
- Constraint.owner\_space
- Constraint.is\_proxy\_local
- Constraint.error\_rotation
- Constraint.target\_space
- Constraint.type
- Constraint.is\_valid

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.229 Function(bpy\_struct)

base class — bpy\_struct

```
class bpy.types.Function(bpy_struct)
    RNA function definition

    description
        Description of the Function's purpose
        Type string, default "", (readonly)

    identifier
        Unique name used in the code and scripting
        Type string, default "", (readonly)

    is_registered
        Function is registered as callback as part of type registration
        Type boolean, default False, (readonly)

    is_registered_optional
        Function is optionally registered as callback part of type registration
        Type boolean, default False, (readonly)

    parameters
        Parameters for the function
        Type bpy_prop_collection of Property, (readonly)

    use_self
        Function does not pass its self as an argument (becomes a class method in python)
        Type boolean, default False, (readonly)
```

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- Struct.functions

### 2.4.230 GPencilFrame(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.GPencilFrame (*bpy\_struct*)

Collection of related sketches on a particular frame

**frame\_number**

The frame on which this sketch appears

**Type** int in [0, 300000], default 0

**is\_edited**

Frame is being edited (painted on)

**Type** boolean, default False

**select**

Frame is selected for editing in the DopeSheet

**Type** boolean, default False

**strokes**

Freehand curves defining the sketch on this frame

**Type** bpy\_prop\_collection of GPencilStroke, (readonly)

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- `GPencilLayer.active_frame`
- `GPencilLayer.frames`

### 2.4.231 GPencilLayer(bpy\_struct)

base class — `bpy_struct`

`class bpy.types.GPencilLayer(bpy_struct)`

Collection of related sketches

#### `active_frame`

Frame currently being displayed for this layer

**Type** `GPencilFrame`, (readonly)

#### `alpha`

Layer Opacity

**Type** float in [0.3, 1], default 0.0

#### `color`

Color for all strokes in this layer

**Type** float array of 3 items in [0, 1], default (0.0, 0.0, 0.0)

#### `frames`

Sketches for this layer on different frames

**Type** `bpy_prop_collection` of `GPencilFrame`, (readonly)

#### `ghost_range_max`

Maximum number of frames on either side of the active frame to show (0 = show the ‘first’ available sketch on either side)

**Type** int in [0, 120], default 0

#### `hide`

Set layer Visibility

**Type** boolean, default False

#### `info`

Layer name

**Type** string, default “”

#### `line_width`

Thickness of strokes (in pixels)

**Type** int in [1, 10], default 0

#### `lock`

Protect layer from further editing and/or frame changes

**Type** boolean, default False

#### `lock_frame`

Lock current frame displayed by layer

**Type** boolean, default False

**select**

Layer is selected for editing in the DopeSheet

**Type** boolean, default False

**show\_points**

Draw the points which make up the strokes (for debugging purposes)

**Type** boolean, default False

**show\_x\_ray**

**Type** boolean, default False

**use\_onion\_skinning**

Ghost frames on either side of frame

**Type** boolean, default False

**Inherited Properties**

- `bpy_struct.id_data`

**Inherited Functions**

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

**References**

- `GreasePencil.layers`

## 2.4.232 GPencilStroke(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.GPencilStroke` (`bpy_struct`)

Freehand curve defining part of a sketch

**points**

Stroke data points

**Type** bpy\_prop\_collection of GPencilStrokePoint, (readonly)

### Inherited Properties

- bpy\_struct.id\_data

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

### References

- GPencilFrame.strokes

## 2.4.233 GPencilStrokePoint(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.GPencilStrokePoint (*bpy\_struct*)

    Data point for freehand stroke curve

**co**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**pressure**

    Pressure of tablet at point when drawing it

**Type** float in [0, 1], default 0.0

### Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `GPencilStroke.points`

### 2.4.234 GameActuator(Actuator)

base classes — `bpy_struct, Actuator`

`class bpy.types.GameActuator(Actuator)`

#### **filename**

Load this blend file, use the “//” prefix for a path relative to the current blend file

**Type** string, default “”

#### **mode**

**Type** enum in ['START', 'RESTART', 'QUIT', 'SAVECFG', 'LOADCFG'], default 'START'

## Inherited Properties

- `bpy_struct.id_data`
- `Actuator.name`
- `Actuator.show_expanded`
- `Actuator.pin`
- `Actuator.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`

- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`
- `Actuator.link`
- `Actuator.unlink`

## 2.4.235 GameBooleanProperty(GameProperty)

base classes — `bpy_struct, GameProperty`

**class bpy.types.GameBooleanProperty(*GameProperty*)**

Game engine user defined Boolean property

**value**

Property value

**Type** boolean, default False

### Inherited Properties

- `bpy_struct.id_data`
- `GameProperty.name`
- `GameProperty.show_debug`
- `GameProperty.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.236 GameFloatProperty(GameProperty)

base classes — `bpy_struct`, `GameProperty`

**class bpy.types.GameFloatProperty (GameProperty)**  
Game engine user defined floating pointer number property

**value**  
Property value

**Type** float in [-10000, 10000], default 0.0

### Inherited Properties

- `bpy_struct.id_data`
- `GameProperty.name`
- `GameProperty.show_debug`
- `GameProperty.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.237 GameIntProperty(GameProperty)

base classes — `bpy_struct`, `GameProperty`

**class bpy.types.GameIntProperty (GameProperty)**  
Game engine user defined integer number property

**value**  
Property value

**Type** int in [-10000, 10000], default 0

### Inherited Properties

- `bpy_struct.id_data`

- `GameProperty.name`
- `GameProperty.show_debug`
- `GameProperty.type`

#### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

### 2.4.238 GameObjectSettings(bpy\_struct)

base class — `bpy_struct`

**class bpy.types.GameObjectSettings (bpy\_struct)**  
Game engine related settings for the object

**actuators**  
Game engine actuators to act on events  
**Type** `bpy_prop_collection of Actuator`, (readonly)

**collision\_bounds\_type**  
Selects the collision type  
**Type** enum in ['BOX', 'SPHERE', 'CYLINDER', 'CONE', 'CONVEX\_HULL', 'TRIANGLE\_MESH', 'CAPSULE'], default 'BOX'

**collision\_margin**  
Extra margin around object for collision detection, small amount required for stability  
**Type** float in [0, 1], default 0.0

**controllers**  
Game engine controllers to process events, connecting sensor to actuators  
**Type** `bpy_prop_collection of Controller`, (readonly)

**damping**  
General movement damping  
**Type** float in [0, 1], default 0.0

**form\_factor**  
Form factor scales the inertia tensor

**Type** float in [0, 1], default 0.0

**friction\_coefficients**  
Relative friction coefficient in the in the X, Y and Z directions, when anisotropic friction is enabled

**Type** float array of 3 items in [0, 1], default (0.0, 0.0, 0.0)

**lock\_location\_x**  
Disable simulation of linear motion along the X axis

**Type** boolean, default False

**lock\_location\_y**  
Disable simulation of linear motion along the Y axis

**Type** boolean, default False

**lock\_location\_z**  
Disable simulation of linear motion along the Z axis

**Type** boolean, default False

**lock\_rotation\_x**  
Disable simulation of angular motion along the X axis

**Type** boolean, default False

**lock\_rotation\_y**  
Disable simulation of angular motion along the Y axis

**Type** boolean, default False

**lock\_rotation\_z**  
Disable simulation of angular motion along the Z axis

**Type** boolean, default False

**mass**  
Mass of the object

**Type** float in [0.01, 10000], default 0.0

**physics\_type**  
Selects the type of physical representation

**Type** enum in ['NO\_COLLISION', 'STATIC', 'DYNAMIC', 'RIGID\_BODY', 'SOFT\_BODY', 'OCCLUDE', 'SENSOR'], default 'NO\_COLLISION'

**properties**  
Game engine properties

**Type** bpy\_prop\_collection of GameProperty, (readonly)

**radius**  
Radius of bounding sphere and material physics

**Type** float in [0.01, 10], default 0.0

**rotation\_damping**  
General rotation damping

**Type** float in [0, 1], default 0.0

**sensors**  
Game engine sensor to detect events

**Type** bpy\_prop\_collection of Sensor, (readonly)

**show\_actuators**

Shows actuators for this object in the user interface

**Type** boolean, default False

**show\_controllers**

Shows controllers for this object in the user interface

**Type** boolean, default False

**show\_debug\_state**

Print state debug info in the game engine

**Type** boolean, default False

**show\_sensors**

Shows sensors for this object in the user interface

**Type** boolean, default False

**show\_state\_panel**

Show state panel

**Type** boolean, default False

**soft\_body**

Settings for Bullet soft body simulation

**Type** GameSoftBodySettings, (readonly)

**states\_initial**

Initial state when the game starts

**Type** boolean array of 30 items, default (False, False, False)

**states\_visible**

State determining which controllers are displayed

**Type** boolean array of 30 items, default (False, False, False)

**use\_activity\_culling**

Disable simulation of angular motion along the Z axis

**Type** boolean, default False

**use\_actor**

Object is detected by the Near and Radar sensor

**Type** boolean, default False

**use\_all\_states**

Set all state bits

**Type** boolean, default False

**use\_anisotropic\_friction**

Enable anisotropic friction

**Type** boolean, default False

**use\_collision\_bounds**

Specify a collision bounds type other than the default

**Type** boolean, default False

**use\_collision\_compound**  
Add children to form a compound collision object

**Type** boolean, default False

**use\_ghost**  
Object does not restitute collisions, like a ghost

**Type** boolean, default False

**use\_material\_physics\_fh**  
React to force field physics settings in materials

**Type** boolean, default False

**use\_rotate\_from\_normal**  
Use face normal to rotate object, so that it points away from the surface

**Type** boolean, default False

**use\_sleep**  
Disable auto (de)activation in physics simulation

**Type** boolean, default False

**used\_states**  
States which are being used by controllers

**Type** boolean array of 30 items, default (False, False, False), (readonly)

**velocity\_max**  
Clamp velocity to this maximum speed

**Type** float in [0, 1000], default 0.0

**velocity\_min**  
Clamp velocity to this minimum speed (except when totally still)

**Type** float in [0, 1000], default 0.0

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`

- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- Object.game

### 2.4.239 GameProperty(bpy\_struct)

base class — bpy\_struct

subclasses — GameStringProperty, GameIntProperty, GameBooleanProperty, GameFloatProperty, GameTimerProperty

**class** bpy.types.GameProperty(bpy\_struct)  
Game engine user defined object property

#### **name**

Available as GameObject attributes in the game engine's python API

**Type** string, default “”

#### **show\_debug**

Print debug information for this property

**Type** boolean, default False

#### **type**

**Type** enum in ['BOOL', 'INT', 'FLOAT', 'STRING', 'TIMER'], default 'BOOL'

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id

- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `GameObjectSettings.properties`

### 2.4.240 GameSoftBodySettings(`bpy_struct`)

base class — `bpy_struct`

**class bpy.types.GameSoftBodySettings (`bpy_struct`)**

Soft body simulation settings for an object in the game engine

#### **cluster\_iterations**

Specify the number of cluster iterations

**Type** int in [1, 128], default 0

#### **collision\_margin**

Collision margin for soft body. Small value makes the algorithm unstable

**Type** float in [0.01, 1], default 0.0

#### **dynamic\_friction**

Dynamic Friction

**Type** float in [0, 1], default 0.0

#### **linear\_stiffness**

Linear stiffness of the soft body links

**Type** float in [0, 1], default 0.0

#### **location\_iterations**

Position solver iterations

**Type** int in [0, 10], default 0

#### **shape\_threshold**

Shape matching threshold

**Type** float in [0, 1], default 0.0

#### **use\_bending\_constraints**

Enable bending constraints

**Type** boolean, default False

#### **use\_cluster\_rigid\_to\_softbody**

Enable cluster collision between soft and rigid body

**Type** boolean, default False

#### **use\_cluster\_soft\_to\_softbody**

Enable cluster collision between soft and soft body

**Type** boolean, default False

#### **use\_shape\_match**

Enable soft body shape matching goal

**Type** boolean, default False

**weld\_threshold**

Welding threshold: distance between nearby vertices to be considered equal => set to 0.0 to disable welding test and speed up scene loading (ok if the mesh has no duplicates)

**Type** float in [0, 0.01], default 0.0

### Inherited Properties

- `bpy_struct.id_data`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

### References

- `GameObjectSettings.soft_body`

## 2.4.241 GameStringProperty(GameProperty)

base classes — `bpy_struct`, `GameProperty`

**class bpy.types.GameStringProperty (GameProperty)**  
Game engine user defined text string property

**value**

Property value

**Type** string, default “”

### Inherited Properties

- `bpy_struct.id_data`
- `GameProperty.name`
- `GameProperty.show_debug`

- `GameProperty.type`

#### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

### 2.4.242 GameTimerProperty(`GameProperty`)

base classes — `bpy_struct, GameProperty`

**class** `bpy.types.GameTimerProperty` (`GameProperty`)  
Game engine user defined timer property

**value**

Property value

**Type** float in [-10000, 10000], default 0.0

#### Inherited Properties

- `bpy_struct.id_data`
- `GameProperty.name`
- `GameProperty.show_debug`
- `GameProperty.type`

#### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`

- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.243 GlowSequence(EffectSequence)

base classes — bpy\_struct, Sequence, EffectSequence

**class** bpy.types.GlowSequence (*EffectSequence*)

Sequence strip creating a glow effect

**blur\_radius**

Radius of glow effect

**Type** float in [0.5, 20], default 0.0

**boost\_factor**

Brightness multiplier

**Type** float in [0, 10], default 0.0

**clamp**

rightness limit of intensity

**Type** float in [0, 1], default 0.0

**quality**

Accuracy of the blur effect

**Type** int in [1, 5], default 0

**threshold**

Minimum intensity to trigger a glow

**Type** float in [0, 1], default 0.0

**use\_only\_boost**

Show the glow buffer only

**Type** boolean, default False

### Inherited Properties

- bpy\_struct.id\_data
- Sequence.name
- Sequence.blend\_type
- Sequence.blend\_alpha
- Sequence.channel
- Sequence.effect\_fader
- Sequence.frame\_final\_end
- Sequence.frame\_offset\_end
- Sequence.frame\_still\_end
- Sequence.input\_1
- Sequence.input\_2
- Sequence.input\_3
- Sequence.select\_left\_handle

- Sequence.frame\_final\_duration
- Sequence.frame\_duration
- Sequence.lock
- Sequence.mute
- Sequence.select\_right\_handle
- Sequence.select
- Sequence.speed\_factor
- Sequence.frame\_start
- Sequence.frame\_final\_start
- Sequence.frame\_offset\_start
- Sequence.frame\_still\_start
- Sequence.type
- Sequence.use\_default\_fade
- Sequence.input\_count
- EffectSequence.color\_balance
- EffectSequence.use\_float
- EffectSequence.crop
- EffectSequence.use\_deinterlace
- EffectSequence.use\_reverse\_frames
- EffectSequence.use\_flip\_x
- EffectSequence.use\_flip\_y
- EffectSequence.color\_multiply
- EffectSequence.use\_premultiply
- EffectSequence.proxy
- EffectSequence.use\_proxy\_custom\_directory
- EffectSequence.use\_proxy\_custom\_file
- EffectSequence.color\_saturation
- EffectSequence.strobe
- EffectSequence.transform
- EffectSequence.use\_color\_balance
- EffectSequence.use\_crop
- EffectSequence.use\_proxy
- EffectSequence.use\_translation

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- Sequence.getStripElem

- Sequence.swap

## 2.4.244 GreasePencil(ID)

base classes — `bpy_struct, ID`

**class bpy.types.GreasePencil (ID)**

Freehand annotation sketchbook

**draw\_mode**

**Type** enum in ['CURSOR', 'VIEW', 'SURFACE', 'STROKE'], default 'VIEW'

**layers**

**Type** GreasePencilLayers bpy\_prop\_collection of GPencilLayer, (readonly)

**use\_stroke\_endpoints**

Only use the first and last parts of the stroke for snapping

**Type** boolean, default False

### Inherited Properties

- `bpy_struct.id_data`
- `ID.name`
- `ID.use_fake_user`
- `ID.library`
- `ID.tag`
- `ID.users`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`
- `ID.copy`
- `ID.user_clear`
- `ID.animation_data_create`
- `ID.animation_data_clear`
- `ID.update_tag`

## References

- BlendData.grease\_pencil
- GreasePencilLayers.active
- NodeTree.grease\_pencil
- Object.grease\_pencil
- Scene.grease\_pencil
- SpaceImageEditor.grease\_pencil

## 2.4.245 GreasePencilLayers(bpy\_struct)

base class — `bpy_struct`

**class bpy.types.GreasePencilLayers (bpy\_struct)**

Collection of grease pencil layers

**active**

Active grease pencil layer

**Type** GreasePencil

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `GreasePencil.layers`

## 2.4.246 Group(ID)

base classes — `bpy_struct, ID`

**class bpy.types.Group (ID)**

Group of Object datablocks

**dupli\_offset**

Offset from the origin to use when instancing as DupliGroup

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**layers**

Layers visible when this groups is instanced as a dupli

**Type** boolean array of 20 items, default (False, False, False)

**objects**

A collection of this groups objects

**Type** GroupObjects bpy\_prop\_collection of Object, (readonly)

**users\_dupli\_group**

The dupli group this group is used in (readonly)

## Inherited Properties

- bpy\_struct.id\_data
- ID.name
- ID.use\_fake\_user
- ID.library
- ID.tag
- ID.users

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- ID.copy
- ID.user\_clear
- ID.animation\_data\_create
- ID.animation\_data\_clear
- ID.update\_tag

## References

- BlendData.groups
- BlendDataGroups.new
- BlendDataGroups.remove
- ClothCollisionSettings.group
- DopeSheet.filter\_group
- EffectorWeights.group
- Material.light\_group
- Object.dupli\_group
- ParticleSettings.dupli\_group
- RenderLayer.light\_override
- SceneRenderLayer.light\_override
- SmokeDomainSettings.collision\_group
- SmokeDomainSettings.effector\_group
- SmokeDomainSettings.fluid\_group

## 2.4.247 GroupInputs(bpy\_struct)

base class — `bpy_struct`

**class** `bpy.types.GroupInputs` (`bpy_struct`)  
Collection of group sockets

**new** (`name="Socket", type='VALUE'`)  
Add a socket to the group tree.

### Parameters

- **name** (`string, (optional)`) – Name, Name of the socket
- **type** (`enum in ['VALUE', 'VECTOR', 'RGBA'], (optional)`) – Type, Type of socket

**Returns** New socket.

**Return type** `NodeSocket`

**expose** (`sock=None, add_link=True`)  
Expose an internal socket in the group tree.

### Parameters

- **sock** (`NodeSocket, (optional)`) – Socket, Internal node socket to expose
- **add\_link** (`boolean, (optional)`) – Add Link, If TRUE, adds a link to the internal socket

**Returns** New socket.

**Return type** `NodeSocket`

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`

- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- NodeTree.inputs

### 2.4.248 GroupObjects(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.GroupObjects (*bpy\_struct*)

Collection of group objects

**link** (*object*)

Add this object to a group

**Parameters** *object* (*Object*, (never None)) – Object to add.

**unlink** (*object*)

Remove this object to a group

**Parameters** *object* (*Object*) – Object to remove.

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete

- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `Group.objects`

### 2.4.249 GroupOutputs(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.GroupOutputs` (`bpy_struct`)

Collection of group sockets

**new** (`name="Socket", type='VALUE'`)

Add a socket to the group tree.

#### Parameters

- `name` (*string, (optional)*) – Name, Name of the socket
- `type` (*enum in ['VALUE', 'VECTOR', 'RGBA'], (optional)*) – Type, Type of socket

**Returns** New socket.

**Return type** `NodeSocket`

**expose** (`sock=None, add_link=True`)

Expose an internal socket in the group tree.

#### Parameters

- `sock` (`NodeSocket, (optional)`) – Socket, Internal node socket to expose
- `add_link` (*boolean, (optional)*) – Add Link, If TRUE, adds a link to the internal socket

**Returns** New socket.

**Return type** `NodeSocket`

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`

- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `NodeTree.outputs`

## 2.4.250 Header(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.Header` (`bpy_struct`)  
Editor header containing UI elements.

### `bl_idname`

If this is set, the header gets a custom ID, otherwise it takes the name of the class used to define the panel. For example, if the class name is “OBJECT\_HT\_hello”, and `bl_idname` is not set by the script, then `bl_idname = “OBJECT_HT_hello”`

**Type** string, default “”

### `bl_space_type`

The space where the header is going to be used in.

**Type** enum in [‘EMPTY’, ‘VIEW\_3D’, ‘GRAPH\_EDITOR’, ‘OUTLINER’, ‘PROPERTIES’, ‘FILE\_BROWSER’, ‘IMAGE\_EDITOR’, ‘INFO’, ‘SEQUENCE\_EDITOR’, ‘TEXT\_EDITOR’, ‘AUDIO\_WINDOW’, ‘DOPESHEET\_EDITOR’, ‘NLA\_EDITOR’, ‘SCRIPTS\_WINDOW’, ‘TIMELINE’, ‘NODE\_EDITOR’, ‘LOGIC\_EDITOR’, ‘CONSOLE’, ‘USER\_PREFERENCES’], default ‘EMPTY’

### `layout`

Defines the structure of the header in the UI.

**Type** `UILayout`, (readonly)

### `draw(context)`

Draw UI elements into the header UI layout.

### `classmethod append(draw_func)`

Append a draw function to this menu, takes the same arguments as the menus draw function.

### `classmethod prepend(draw_func)`

Prepend a draw function to this menu, takes the same arguments as the menus draw function.

### `classmethod remove(draw_func)`

Remove a draw function that has been added to this menu

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.251 HemiLamp(Lamp)

base classes — bpy\_struct, ID, Lamp

**class** bpy.types.HemiLamp (*Lamp*)  
180 degree constant lamp

## Inherited Properties

- bpy\_struct.id\_data
- ID.name
- ID.use\_fake\_user
- ID.library
- ID.tag
- ID.users
- Lamp.active\_texture
- Lamp.active\_texture\_index
- Lamp.animation\_data
- Lamp.color
- Lamp.use\_diffuse
- Lamp.distance
- Lamp.energy
- Lamp.use\_own\_layer
- Lamp.use\_negative
- Lamp.use\_specular
- Lamp.texture\_slots
- Lamp.type

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`
- `ID.copy`
- `ID.user_clear`
- `ID.animation_data_create`
- `ID.animation_data_clear`
- `ID.update_tag`

## 2.4.252 Histogram(bpy\_struct)

base class — `bpy_struct`

**class bpy.types.Histogram(bpy\_struct)**  
Statistical view of the levels of color in an image

**mode**  
Channels to display when drawing the histogram

**Type** enum in ['LUMA', 'RGB', 'R', 'G', 'B'], default 'LUMA'

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`

- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `Scopes.histogram`
- `SpaceImageEditor.sample_histogram`

## 2.4.253 HookModifier(Modifier)

base classes — `bpy_struct, Modifier`

**class bpy.types.HookModifier (Modifier)**

Hook modifier to modify the location of vertices

**falloff**

If not zero, the distance from the hook where influence ends

**Type** float in [0, inf], default 0.0

**force**

Relative force of the hook

**Type** float in [0, 1], default 0.0

**object**

Parent Object for hook, also recalculates and clears offset

**Type** `Object`

**subtarget**

Name of Parent Bone for hook (if applicable), also recalculates and clears offset

**Type** string, default “”

**vertex\_group**

Name of Vertex Group which determines influence of modifier per point

**Type** string, default “”

## Inherited Properties

- `bpy_struct.id_data`
- `Modifier.name`
- `Modifier.use_apply_on_spline`
- `Modifier.show_in_editmode`
- `Modifier.show_expanded`
- `Modifier.show_on_cage`
- `Modifier.show_viewport`
- `Modifier.show_render`
- `Modifier.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.254 ID(bpy\_struct)

base class — `bpy_struct`

subclasses — `Lattice, Library, Key, NodeTree, MetaBall, Text, Lamp, World, Brush, Object, Armature, Mesh, VectorFont, GreasePencil, Sound, ParticleSettings, Scene, WindowManager, Texture, Curve, Action, Group, Screen, Material, Image, Camera`

**class** `bpy.types.ID(bpy_struct)`

Base type for datablocks, defining a unique name, linking from other libraries and garbage collection

**library**

Library file the datablock is linked from

**Type** `Library`, (readonly)

**name**

Unique datablock ID name

**Type** `string`, default “”

**tag**

Tools can use this to tag data, (initial state is undefined)

**Type** `boolean`, default False

**use\_fake\_user**

Saves this datablock even if it has no users

**Type** `boolean`, default False

**users**

Number of times this datablock is referenced

**Type** `int` in [0, 32767], default 0, (readonly)

**copy()**

Create a copy of this datablock (not supported for all datablocks).

**Returns** New copy of the ID.

**Return type** ID

**user\_clear()**

Clears the user count of a datablock so its not saved, on reload the data will be removed.

This function is for advanced use only, misuse can crash blender since the user count is used to prevent data being removed when it is used.

```
# This example shows what _not_ to do, and will crash blender.
import bpy

# object which is in the scene.
obj = bpy.data.objects["Cube"]

# without this, removal would raise an error.
obj.user_clear()

# runs without an exception
# but will crash on redraw.
bpy.data.objects.remove(obj)
```

**animation\_data\_create()**

Create animation data to this ID, note that not all ID types support this.

**Returns** New animation data or NULL.

**Return type** AnimData

**animation\_data\_clear()**

Clear animation on this this ID.

**update\_tag (refresh=set())**

Tag the id to update its display data.

**Parameters** refresh (enum set in {'OBJECT', 'DATA', 'TIME'}, (optional)) – Type of updates to perform.

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve

- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `BlendData.scripts`
- `BlendDataObjects.new`
- `DopeSheet.source`
- `DriverTarget.id`
- `ID.copy`
- `Key.user`
- `KeyingSetPath.id`
- `KeyingSetPaths.add`
- `Object.data`
- `SpaceNodeEditor.id`
- `SpaceNodeEditor.id_from`
- `SpaceProperties.pin_id`
- `UILayout.template_path_builder`
- `UILayout.template_preview`
- `UILayout.template_preview`

## 2.4.255 **IDMaterials(bpy\_struct)**

base class — `bpy_struct`

**class** `bpy.types.IDMaterials(bpy_struct)`

Collection of materials

**append** (`material`)

Add a new material to the data block.

**Parameters** `material (Material)` – Material to add.

**pop** (`index, update_data=False`)

Remove a material from the data block.

**Parameters**

- `index (int in [0, 32767])` – Index of material to remove.
- `update_data (boolean, (optional))` – Update data by re-adjusting the material slots assigned.

**Returns** Material to remove.

**Return type** `Material`

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`

- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- Curve.materials
- Mesh.materials
- MetaBall.materials

## 2.4.256 IKParam(bpy\_struct)

base class — bpy\_struct

subclasses — Itasc

**class** bpy.types.IKParam(*bpy\_struct*)

Base type for IK solver parameters

**ik\_solver**

IK solver for which these parameters are defined, 0 for Legacy, 1 for iTaSC

**Type** enum in ['LEGACY', 'ITASC'], default 'LEGACY', (readonly)

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert

- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- Pose.ik\_param

### 2.4.257 Image(ID)

base classes — bpy\_struct, ID

#### class bpy.types.Image (ID)

Image datablock referencing an external or packed image

##### bindcode

OpenGL bindcode

**Type** int in [0, inf], default 0, (readonly)

##### depth

Image bit depth

**Type** int in [0, inf], default 0, (readonly)

##### display\_aspect

Display Aspect for this image, does not affect rendering

**Type** float array of 2 items in [0.1, 5000], default (0.0, 0.0)

##### field\_order

Order of video fields. Select which lines are displayed first

**Type** enum in ['EVEN', 'ODD'], default 'EVEN'

##### file\_format

Format used for re-saving this file

**Type** enum in ['BMP', 'IRIS', 'PNG', 'JPEG', 'TARGA', 'TARGA\_RAW', 'AVI\_JPEG', 'AVI\_RAW'], default 'TARGA'

##### filepath

Image/Movie file name

**Type** string, default “”

##### filepath\_raw

Image/Movie file name (without data refreshing)

**Type** string, default “”

##### fps

Speed of the animation in frames per second

**Type** int in [1, 100], default 0

##### frame\_end

End frame of an animated texture

**Type** int in [0, 128], default 0

**frame\_start**

Start frame of an animated texture

**Type** int in [0, 128], default 0

**generated\_height**

Generated image height

**Type** int in [1, 16384], default 0

**generated\_type**

Generated image type

**Type** enum in ['BLANK', 'UV\_GRID', 'COLOR\_GRID'], default 'BLANK'

**generated\_width**

Generated image width

**Type** int in [1, 16384], default 0

**has\_data**

True if this image has data

**Type** boolean, default False, (readonly)

**is\_dirty**

Image has changed and is not saved

**Type** boolean, default False, (readonly)

**mapping**

Mapping type to use for this image in the game engine

**Type** enum in ['UV', 'REFLECTION'], default 'UV'

**packed\_file**

**Type** [PackedFile](#), (readonly)

**pixels**

Image pixels in floating point values

**Type** float in [-inf, inf], default 0.0

**resolution**

X/Y pixels per meter

**Type** float array of 2 items in [-inf, inf], default (0.0, 0.0)

**size**

Width and height in pixels, zero when image data cant be loaded

**Type** int array of 2 items in [-inf, inf], default (0, 0), (readonly)

**source**

Where the image comes from

**Type** enum in ['FILE', 'SEQUENCE', 'MOVIE', 'GENERATED', 'VIEWER'], default 'FILE'

**tiles\_x**

Degree of repetition in the X direction

**Type** int in [1, 16], default 0

**tiles\_y**

Degree of repetition in the Y direction

**Type** int in [1, 16], default 0

**type**

How to generate the image

**Type** enum in ['IMAGE', 'MULTILAYER', 'UV\_TEST', 'RENDER\_RESULT', 'COMPOSITING'], default 'IMAGE', (readonly)

**use\_animation**

Use as animated texture in the game engine

**Type** boolean, default False

**use\_clamp\_x**

Disable texture repeating horizontally

**Type** boolean, default False

**use\_clamp\_y**

Disable texture repeating vertically

**Type** boolean, default False

**use\_fields**

Use fields of the image

**Type** boolean, default False

**use\_generated\_float**

Generate floating point buffer

**Type** boolean, default False

**use\_premultiply**

Convert RGB from key alpha to premultiplied alpha

**Type** boolean, default False

**use\_tiles**

Use of tilemode for faces (default shift-LMB to pick the tile for selected faces)

**Type** boolean, default False

**save\_render (filepath, scene=None)**

Save image to a specific path using a scenes render settings

**Parameters**

- **filepath** (string) – Save path.
- **scene** (Scene, (optional)) – Scene to take image parameters from

**save ()**

Save image to its source path

**reload ()**

Reload the image from its source path

**update ()**

Update the display image from the floating point buffer

**gl\_load (filter=9985, mag=9729)**

Load the image into OpenGL graphics memory

**Parameters**

- **filter** (int in [-inf, inf], (optional)) – Filter, The texture minifying function

- **mag** (*int in [-inf, inf], (optional)*) – Magnification, The texture magnification function

**Returns** Error, OpenGL error value

**Return type** int in [-inf, inf]

#### **gl\_free()**

Free the image from OpenGL graphics memory

### Inherited Properties

- bpy\_struct.id\_data
- ID.name
- ID.use\_fake\_user
- ID.library
- ID.tag
- ID.users

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- ID.copy
- ID.user\_clear
- ID.animation\_data\_create
- ID.animation\_data\_clear
- ID.update\_tag

### References

- BackgroundImage.image
- BlendData.images
- BlendDataImages.load
- BlendDataImages.new
- BlendDataImages.remove
- Brush.clone\_image
- CompositorNodeImage.image
- EnvironmentMapTexture.image
- ImageTexture.image

- `MeshTextureFace.image`
- `SpaceImageEditor.image`
- `TextureNodeImage.image`
- `UILayout.template_image_layers`
- `UVProjectModifier.image`
- `VoxelDataTexture.image`

## 2.4.258 `ImagePaint(Paint)`

base classes — `bpy_struct, Paint`

**class bpy.types.ImagePaint (Paint)**

Properties of image and texture painting mode

**invert\_stencil**

Invert the stencil layer

**Type** boolean, default False

**normal\_angle**

Paint most on faces pointing towards the view according to this angle

**Type** int in [0, 90], default 0

**screen\_grab\_size**

Size to capture the image for re-projecting

**Type** int array of 2 items in [512, 16384], default (0, 0)

**seam\_bleed**

Extend paint beyond the faces UVs to reduce seams (in pixels, slower)

**Type** int in [0, 32767], default 0

**use\_backface\_culling**

Ignore faces pointing away from the view (faster)

**Type** boolean, default False

**use\_clone\_layer**

Use another UV layer as clone source, otherwise use 3D the cursor as the source

**Type** boolean, default False

**use\_normal\_falloff**

Paint most on faces pointing towards the view

**Type** boolean, default False

**use\_occlude**

Only paint onto the faces directly under the brush (slower)

**Type** boolean, default False

**use\_projection**

Use projection painting for improved consistency in the brush strokes

**Type** boolean, default False

**use\_stencil\_layer**

Set the mask layer from the UV layer buttons

**Type** boolean, default False

## Inherited Properties

- `bpy_struct.id_data`
- `Paint.brush`
- `Paint.show_low_resolution`
- `Paint.show_brush`
- `Paint.show_brush_on_surface`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `ToolSettings.image_paint`

## 2.4.259 ImageSequence(Sequence)

base classes — `bpy_struct, Sequence`

**class bpy.types.ImageSequence (Sequence)**  
Sequence strip to load one or more images

**animation\_offset\_end**  
Animation end offset (trim end)  
**Type** int in [0, inf], default 0

**animation\_offset\_start**  
Animation start offset (trim start)  
**Type** int in [0, inf], default 0

**color\_balance**  
**Type** SequenceColorBalance, (readonly)

**color\_multiply**  
**Type** float in [0, 20], default 0.0

**color\_saturation**

**Type** float in [0, 20], default 0.0

**crop**

**Type** SequenceCrop, (readonly)

**directory**

**Type** string, default “”

**elements**

**Type** bpy\_prop\_collection of SequenceElement, (readonly)

**proxy**

**Type** SequenceProxy, (readonly)

**strobe**

Only display every nth frame

**Type** float in [1, 30], default 0.0

**transform**

**Type** SequenceTransform, (readonly)

**use\_color\_balance**

(3-Way color correction) on input

**Type** boolean, default False

**use\_crop**

Crop image before processing

**Type** boolean, default False

**use\_deinterlace**

For video movies to remove fields

**Type** boolean, default False

**use\_flip\_x**

Flip on the X axis

**Type** boolean, default False

**use\_flip\_y**

Flip on the Y axis

**Type** boolean, default False

**use\_float**

Convert input to float data

**Type** boolean, default False

**use\_premultiply**

Convert RGB from key alpha to premultiplied alpha

**Type** boolean, default False

**use\_proxy**

Use a preview proxy for this strip

**Type** boolean, default False

**use\_proxy\_custom\_directory**  
Use a custom directory to store data  
**Type** boolean, default False

**use\_proxy\_custom\_file**  
Use a custom file to read proxy data from  
**Type** boolean, default False

**use\_reverse\_frames**  
Reverse frame order  
**Type** boolean, default False

**use\_translation**  
Translate image before processing  
**Type** boolean, default False

### Inherited Properties

- `bpy_struct.id_data`
- `Sequence.name`
- `Sequence.blend_type`
- `Sequence.blend_alpha`
- `Sequence.channel`
- `Sequence.effect_fader`
- `Sequence.frame_final_end`
- `Sequence.frame_offset_end`
- `Sequence.frame_still_end`
- `Sequence.input_1`
- `Sequence.input_2`
- `Sequence.input_3`
- `Sequence.select_left_handle`
- `Sequence.frame_final_duration`
- `Sequence.frame_duration`
- `Sequence.lock`
- `Sequence.mute`
- `Sequence.select_right_handle`
- `Sequence.select`
- `Sequence.speed_factor`
- `Sequence.frame_start`
- `Sequence.frame_final_start`
- `Sequence.frame_offset_start`
- `Sequence.frame_still_start`
- `Sequence.type`
- `Sequence.use_default_fade`
- `Sequence.input_count`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`

- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`
- `Sequence.getStripElem`
- `Sequence.swap`

## 2.4.260 ImageTexture(Texture)

base classes — `bpy_struct, ID, Texture`

`class bpy.types.ImageTexture (Texture)`

### `checker_distance`

Sets distance between checker tiles

**Type** float in [0, 0.99], default 0.0

### `crop_max_x`

Sets maximum X value to crop the image

**Type** float in [-10, 10], default 0.0

### `crop_max_y`

Sets maximum Y value to crop the image

**Type** float in [-10, 10], default 0.0

### `crop_min_x`

Sets minimum X value to crop the image

**Type** float in [-10, 10], default 0.0

### `crop_min_y`

Sets minimum Y value to crop the image

**Type** float in [-10, 10], default 0.0

### `extension`

Sets how the image is extrapolated past its original bounds

**Type** enum in ['EXTEND', 'CLIP', 'CLIP\_CUBE', 'REPEAT', 'CHECKER'], default 'EXTEND'

### `filter_eccentricity`

Maximum eccentricity. Higher gives less blur at distant/oblique angles, but is also slower

**Type** int in [1, 256], default 0

### `filter_probes`

Maximum number of samples. Higher gives less blur at distant/oblique angles, but is also slower

**Type** int in [1, 256], default 0

**filter\_size**

Multiplies the filter size used by MIP Map and Interpolation

**Type** float in [0.1, 50], default 0.0

**filter\_type**

Texture filter to use for sampling image

**Type** enum in ['BOX', 'EWA', 'FELINE', 'AREA'], default 'BOX'

**image**

**Type** [Image](#)

**image\_user**

Parameters defining which layer, pass and frame of the image is displayed

**Type** [ImageUser](#), (readonly)

**invert\_alpha**

Inverts all the alpha values in the image

**Type** boolean, default False

**repeat\_x**

Sets a repetition multiplier in the X direction

**Type** int in [1, 512], default 0

**repeat\_y**

Sets a repetition multiplier in the Y direction

**Type** int in [1, 512], default 0

**use\_alpha**

Uses the alpha channel information in the image

**Type** boolean, default False

**use\_calculate\_alpha**

Calculates an alpha channel based on RGB values in the image

**Type** boolean, default False

**use\_checker\_even**

Sets even checker tiles

**Type** boolean, default False

**use\_checker\_odd**

Sets odd checker tiles

**Type** boolean, default False

**use\_derivative\_map**

Uses red and green as derivative values

**Type** boolean, default False

**use\_filter\_size\_min**

Use Filter Size as a minimal filter value in pixels

**Type** boolean, default False

**use\_flip\_axis**

Flips the texture's X and Y axis

**Type** boolean, default False  
**use\_interpolation**  
Interpolates pixels using selected filter  
**Type** boolean, default False  
**use\_mipmap**  
Uses auto-generated MIP maps for the image  
**Type** boolean, default False  
**use\_mipmap\_gauss**  
Uses Gauss filter to sample down MIP maps  
**Type** boolean, default False  
**use\_mirror\_x**  
Mirrors the image repetition on the X direction  
**Type** boolean, default False  
**use\_mirror\_y**  
Mirrors the image repetition on the Y direction  
**Type** boolean, default False  
**use\_normal\_map**  
Uses image RGB values for normal mapping  
**Type** boolean, default False  
**users\_material**  
Materials that use this texture (readonly)  
**users\_object\_modifier**  
Object modifiers that use this texture (readonly)

## Inherited Properties

- `bpy_struct.id_data`
- `ID.name`
- `ID.use_fake_user`
- `ID.library`
- `ID.tag`
- `ID.users`
- `Texture.animation_data`
- `Texture.intensity`
- `Texture.color_ramp`
- `Texture.contrast`
- `Texture.factor_blue`
- `Texture.factor_green`
- `Texture.factor_red`
- `Texture.node_tree`
- `Texture.saturation`
- `Texture.use_preview_alpha`
- `Texture.type`
- `Texture.use_color_ramp`
- `Texture.use_nodes`
- `Texture.users_material`

- `Texture.users_object_modifier`
- `Texture.users_material`
- `Texture.users_object_modifier`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`
- `ID.copy`
- `ID.user_clear`
- `ID.animation_data_create`
- `ID.animation_data_clear`
- `ID.update_tag`

## 2.4.261 ImageUser(bpy\_struct)

base class — `bpy_struct`

**class bpy.types.ImageUser (bpy\_struct)**

Parameters defining how an Image datablock is used by another datablock

**fields\_per\_frame**

The number of fields per rendered frame (2 fields is 1 image)

**Type** int in [1, 200], default 0

**frame\_duration**

Sets the number of images of a movie to use

**Type** int in [0, 300000], default 0

**frame\_offset**

Offsets the number of the frame to use in the animation

**Type** int in [-300000, 300000], default 0

**frame\_start**

Sets the global starting frame of the movie/sequence, assuming first picture has a #1

**Type** int in [-300000, 300000], default 0

**multilayer\_layer**

Layer in multilayer image

**Type** int in [0, 32767], default 0, (readonly)

**multilayer\_pass**

Pass in multilayer image

**Type** int in [0, 32767], default 0, (readonly)

**use\_auto\_refresh**

Always refresh image on frame changes

**Type** boolean, default False

**use\_cyclic**

Cycle the images in the movie

**Type** boolean, default False

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- BackgroundImage.image\_user
- EnvironmentMapTexture.image\_user
- ImageTexture.image\_user
- SpaceImageEditor.image\_user
- UILayout.template\_image
- UILayout.template\_image\_layers
- VoxelDataTexture.image\_user

## 2.4.262 InflowFluidSettings(FluidSettings)

base classes — bpy\_struct, FluidSettings

```
class bpy.types.InflowFluidSettings (FluidSettings)
    Fluid simulation settings for objects adding fluids in the simulation

    inflow_velocity
        Initial velocity of fluid
            Type float array of 3 items in [-1000.1, 1000.1], default (0.0, 0.0, 0.0)

    use
        Object contributes to the fluid simulation
            Type boolean, default False

    use_animated_mesh
        Export this mesh as an animated one. Slower, only use if really necessary (e.g. armatures or parented
        objects), animated pos/rot/scale IPOs do not require it
            Type boolean, default False

    use_local_coords
        Use local coordinates for inflow. (e.g. for rotating objects)
            Type boolean, default False

    volume_INITIALIZATION
        Volume initialization type
            Type enum in ['VOLUME', 'SHELL', 'BOTH'], default 'VOLUME'
```

## Inherited Properties

- `bpy_struct.id_data`
- `FluidSettings.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.263 IntProperty(Property)

base classes — `bpy_struct, Property`

```
class bpy.types.IntProperty(Property)
RNA integer number property definition

array_length
    Maximum length of the array, 0 means unlimited
    Type int in [0, inf], default 0, (readonly)

default
    Default value for this number
    Type int in [-inf, inf], default 0, (readonly)

default_array
    Default value for this array
    Type int array of 3 items in [-inf, inf], default (0, 0, 0), (readonly)

hard_max
    Maximum value used by buttons
    Type int in [-inf, inf], default 0, (readonly)

hard_min
    Minimum value used by buttons
    Type int in [-inf, inf], default 0, (readonly)

soft_max
    Maximum value used by buttons
    Type int in [-inf, inf], default 0, (readonly)

soft_min
    Minimum value used by buttons
    Type int in [-inf, inf], default 0, (readonly)

step
    Step size used by number buttons, for floats 1/100th of the step size
    Type int in [0, inf], default 0, (readonly)
```

## Inherited Properties

- `bpy_struct.id_data`
- `Property.name`
- `Property.srna`
- `Property.description`
- `Property.is_enum_flag`
- `Property.is_hidden`
- `Property.identifier`
- `Property.is_never_none`
- `Property.is_readonly`
- `Property.is_registered`
- `Property.is_registered_optional`
- `Property.is_required`
- `Property.is_output`
- `Property.is_runtime`
- `Property.is_skip_save`
- `Property.subtype`

- `Property.type`
- `Property.unit`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.264 Itasc(IKParam)

base classes — `bpy_struct, IKParam`

**class bpy.types.Itasc (IKParam)**

Parameters for the iTaSC IK solver

**damping\_epsilon**

Singular value under which damping is progressively applied. Higher values=more stability, less reactivity.  
Default=0.1

**Type** float in [0, 1], default 0.0

**damping\_max**

Maximum damping coefficient when singular value is nearly 0. Higher values=more stability, less reactivity.  
Default=0.5

**Type** float in [0, 1], default 0.0

**feedback**

Feedback coefficient for error correction. Average response time=1/feedback. Default=20

**Type** float in [0, 100], default 0.0

**iterations**

Maximum number of iterations for convergence in case of reiteration

**Type** int in [1, 1000], default 0

**mode**

**Type** enum in ['ANIMATION', 'SIMULATION'], default 'ANIMATION'

**precision**

Precision of convergence in case of reiteration

**Type** float in [0, 0.1], default 0.0

**reiteration\_method**

Defines if the solver is allowed to reiterate (converges until precision is met) on none, first or all frames

**Type** enum in ['NEVER', 'INITIAL', 'ALWAYS'], default 'NEVER'

**solver**

Solving method selection: Automatic damping or manual damping

**Type** enum in ['SDLS', 'DLS'], default 'SDLS'

**step\_count**

Divides the frame interval into this many steps

**Type** int in [1, 50], default 0

**step\_max**

Higher bound for timestep in second in case of automatic substeps

**Type** float in [0, 1], default 0.0

**step\_min**

Lower bound for timestep in second in case of automatic substeps

**Type** float in [0, 0.1], default 0.0

**use\_auto\_step**

Automatically determine the optimal number of steps for best performance/accuracy trade off

**Type** boolean, default False

**velocity\_max**

Maximum joint velocity in rad/s. Default=50

**Type** float in [0, 100], default 0.0

**Inherited Properties**

- `bpy_struct.id_data`
- `IKParam.ik_solver`

**Inherited Functions**

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.265 JoystickSensor(Sensor)

base classes — `bpy_struct`, `Sensor`

**class bpy.types.JoystickSensor (Sensor)**

Sensor to detect joystick events

**axis\_direction**

The direction of the axis

**Type** enum in ['RIGHTAXIS', 'UPAXIS', 'LEFTAXIS', 'DOWNAXIS'], default 'RIGHTAXIS'

**axis\_number**

Specify which axis pair to use, 1 is usually the main direction input

**Type** int in [1, 8], default 0

**axis\_threshold**

Specify the precision of the axis

**Type** int in [0, 32768], default 0

**button\_number**

Specify which button to use

**Type** int in [0, 18], default 0

**event\_type**

The type of event this joystick sensor is triggered on

**Type** enum in ['BUTTON', 'AXIS', 'HAT', 'AXIS\_SINGLE'], default 'BUTTON'

**hat\_direction**

Specify hat direction

**Type** enum in ['UP', 'DOWN', 'LEFT', 'RIGHT', 'UPRIGHT', 'DOWNLEFT', 'UPLEFT', 'DOWNRIGHT'], default 'UP'

**hat\_number**

Specify which hat to use

**Type** int in [1, 2], default 0

**joystick\_index**

Specify which joystick to use

**Type** int in [0, 7], default 0

**single\_axis\_number**

Specify a single axis (verticle/horizontal/other) to detect

**Type** int in [1, 16], default 0

**use\_all\_events**

Triggered by all events on this joysticks current type (axis/button/hat)

**Type** boolean, default False

### Inherited Properties

- `bpy_struct.id_data`
- `Sensor.name`

- Sensor.show\_expanded
- Sensor.frequency
- Sensor.invert
- Sensor.use\_level
- Sensor.pin
- Sensor.use\_pulse\_false\_level
- Sensor.use\_pulse\_true\_level
- Sensor.use\_tap
- Sensor.type

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- Sensor.link
- Sensor.unlink

## 2.4.266 Key(ID)

base classes — bpy\_struct, ID

### class bpy.types.Key (*ID*)

Shape keys datablock containing different shapes of geometric datablocks

#### animation\_data

Animation data for this datablock

**Type** AnimData, (readonly)

#### key\_blocks

Shape keys

**Type** bpy\_prop\_collection of ShapeKey, (readonly)

#### reference\_key

**Type** ShapeKey, (readonly, never None)

#### slurph

Creates a delay in amount of frames in applying keypositions, first vertex goes first

**Type** int in [-500, 500], default 0

**use\_relative**

Makes shape keys relative

**Type** boolean, default False

**user**

Datablock using these shape keys

**Type** [ID](#), (readonly, never None)

## Inherited Properties

- [bpy\\_struct.id\\_data](#)
- [ID.name](#)
- [ID.use\\_fake\\_user](#)
- [ID.library](#)
- [ID.tag](#)
- [ID.users](#)

## Inherited Functions

- [bpy\\_struct.as\\_pointer](#)
- [bpy\\_struct.callback\\_add](#)
- [bpy\\_struct.callback\\_remove](#)
- [bpy\\_struct.driver\\_add](#)
- [bpy\\_struct.driver\\_remove](#)
- [bpy\\_struct.get](#)
- [bpy\\_struct.is\\_property\\_hidden](#)
- [bpy\\_struct.is\\_property\\_set](#)
- [bpy\\_struct.items](#)
- [bpy\\_struct.keyframe\\_delete](#)
- [bpy\\_struct.keyframe\\_insert](#)
- [bpy\\_struct.keys](#)
- [bpy\\_struct.path\\_from\\_id](#)
- [bpy\\_struct.path\\_resolve](#)
- [bpy\\_struct.type\\_recast](#)
- [bpy\\_struct.values](#)
- [ID.copy](#)
- [ID.user\\_clear](#)
- [ID.animation\\_data\\_create](#)
- [ID.animation\\_data\\_clear](#)
- [ID.update\\_tag](#)

## References

- [BlendData.shape\\_keys](#)
- [Curve.shape\\_keys](#)
- [Lattice.shape\\_keys](#)
- [Mesh.shape\\_keys](#)

## 2.4.267 KeyConfig(bpy\_struct)

base class — `bpy_struct`

**class** `bpy.types.KeyConfig(bpy_struct)`

Input configuration, including keymaps

**is\_user\_defined**

Indicates that a keyconfig was defined by the user

**Type** boolean, default False, (readonly)

**keymaps**

Key maps configured as part of this configuration

**Type** `KeyMaps bpy_prop_collection of KeyMap, (readonly)`

**name**

Name of the key configuration

**Type** string, default “”

### Inherited Properties

- `bpy_struct.id_data`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

### References

- `KeyConfigurations.active`
- `KeyConfigurations.addon`
- `KeyConfigurations.default`
- `KeyConfigurations.new`
- `KeyConfigurations.remove`
- `KeyConfigurations.user`
- `WindowManager.keyconfigs`

## 2.4.268 KeyConfigurations(bpy\_struct)

base class — `bpy_struct`

**class bpy.types.KeyConfigurations (bpy\_struct)**

Collection of KeyConfigs

**active**

Active key configuration (preset)

**Type** `KeyConfig`

**addon**

Key configuration that can be extended by addons, and is added to the active configuration when handling events

**Type** `KeyConfig`, (readonly)

**default**

Default builtin key configuration

**Type** `KeyConfig`, (readonly)

**user**

Final key configuration that combines keymaps from the active and addon configurations, and can be edited by the user

**Type** `KeyConfig`, (readonly)

**new (name)**

new

**Parameters** `name (string)` – Name

**Returns** Key Configuration, Added key configuration.

**Return type** `KeyConfig`

**remove (keyconfig)**

remove

**Parameters** `keyconfig (KeyConfig)` – Key Configuration, Removed key configuration.

### Inherited Properties

- `bpy_struct.id_data`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`

- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- WindowManager.keyconfigs

### 2.4.269 KeyMap(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.KeyMap (bpy\_struct)

Input configuration, including keymaps

**is\_modal**

Indicates that a keymap is used for translate modal events for an operator

**Type** boolean, default False, (readonly)

**is\_user\_modified**

Keymap is defined by the user

**Type** boolean, default False

**keymap\_items**

Items in the keymap, linking an operator to an input event

**Type** KeyMapItems bpy\_prop\_collection of KeyMapItem, (readonly)

**name**

Name of the key map

**Type** string, default "", (readonly)

**region\_type**

Optional region type keymap is associated with

**Type** enum in ['WINDOW', 'HEADER', 'CHANNELS', 'TEMPORARY', 'UI', 'TOOLS', 'TOOL\_PROPS', 'PREVIEW'], default 'WINDOW', (readonly)

**show\_expanded\_children**

Children expanded in the user interface

**Type** boolean, default False

**show\_expanded\_items**

Expanded in the user interface

**Type** boolean, default False

**space\_type**

Optional space type keymap is associated with

**Type** enum in ['EMPTY', 'VIEW\_3D', 'GRAPH\_EDITOR', 'OUTLINER', 'PROPERTIES', 'FILE\_BROWSER', 'IMAGE\_EDITOR', 'INFO', 'SEQUENCE\_EDITOR', 'TEXT\_EDITOR', 'AUDIO\_WINDOW', 'DOPESHEET\_EDITOR', 'NLA\_EDITOR', 'SCRIPTS\_WINDOW', 'TIMELINE', 'NODE\_EDITOR', 'LOGIC\_EDITOR', 'CONSOLE', 'USER\_PREFERENCES'], default 'EMPTY', (readonly)

**active()**  
active

**Returns** Key Map, Active key map.

**Return type** KeyMap

**restore\_to\_default()**  
restore\_to\_default

**restore\_item\_to\_default(item)**  
restore\_item\_to\_default

**Parameters** item (KeyMapItem, (never None)) – Item

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- KeyConfig.keymaps
- KeyMap.active
- KeyMaps.find
- KeyMaps.find\_modal
- KeyMaps.new

## 2.4.270 KeyMapItem(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.KeyMapItem(bpy\_struct)  
Item in a Key Map

**active**

Activate or deactivate item

**Type** boolean, default False

**alt**

Alt key pressed

**Type** boolean, default False

**any**

Any modifier keys pressed

**Type** boolean, default False

**ctrl**

Control key pressed

**Type** boolean, default False

**id**

ID of the item

**Type** int in [-32768, 32767], default 0, (readonly)

**idname**

Identifier of operator to call on input event

**Type** string, default “”

**is\_user\_defined**

Is this keymap item user defined (doesn't just replace a builtin item)

**Type** boolean, default False, (readonly)

**is\_user\_modified**

Is this keymap item modified by the user

**Type** boolean, default False, (readonly)

**key\_modifier**

Regular key pressed as a modifier

**Type** enum in ['NONE', 'LEFTMOUSE', 'MIDDLEMOUSE', 'RIGHTMOUSE', 'BUTTON4MOUSE', 'BUTTON5MOUSE', 'ACTIONMOUSE', 'SELECTMOUSE', 'MOUSEMOVE', 'INBETWEEN\_MOUSEMOVE', 'TRACKPADPAN', 'TRACKPADZOOM', 'MOUSERotate', 'WHEELUPMOUSE', 'WHEELEDOWNMOUSE', 'WHEELINMOUSE', 'WHEELOUTMOUSE', 'EVT\_TWEAK\_L', 'EVT\_TWEAK\_M', 'EVT\_TWEAK\_R', 'EVT\_TWEAK\_A', 'EVT\_TWEAK\_S', 'A', 'B', 'C', 'D', 'E', 'F', 'G', 'H', 'T', 'J', 'K', 'L', 'M', 'N', 'O', 'P', 'Q', 'R', 'S', 'T', 'U', 'V', 'W', 'X', 'Y', 'Z', 'ZERO', 'ONE', 'TWO', 'THREE', 'FOUR', 'FIVE', 'FIVE', 'SIX', 'SEVEN', 'EIGHT', 'NINE', 'LEFT\_CTRL', 'LEFT\_ALT', 'LEFT\_SHIFT', 'RIGHT\_ALT', 'RIGHT\_CTRL', 'RIGHT\_SHIFT', 'OSKEY', 'GRLESS', 'ESC', 'TAB', 'RET', 'SPACE', 'LINE\_FEED', 'BACK\_SPACE', 'DEL', 'SEMI\_COLON', 'PERIOD', 'COMMA', 'QUOTE', 'ACCENT\_GRAVE', 'MINUS', 'SLASH', 'BACK\_SLASH', 'EQUAL', 'LEFT\_BRACKET', 'RIGHT\_BRACKET', 'LEFT\_ARROW', 'DOWN\_ARROW', 'RIGHT\_ARROW', 'UP\_ARROW', 'NUMPAD\_2', 'NUMPAD\_4', 'NUMPAD\_6', 'NUMPAD\_8', 'NUMPAD\_1', 'NUMPAD\_3', 'NUMPAD\_5', 'NUMPAD\_7', 'NUMPAD\_9', 'NUMPAD\_PERIOD', 'NUMPAD\_SLASH', 'NUMPAD\_ASTERIX', 'NUMPAD\_0', 'NUMPAD\_MINUS', 'NUMPAD\_ENTER', 'NUMPAD\_PLUS', 'F1', 'F2', 'F3', 'F4', 'F5', 'F6', 'F7', 'F8', 'F9', 'F10', 'F11', 'F12', 'F13', 'F14', 'F15', 'F16', 'F17', 'F18', 'F19', 'PAUSE', 'INSERT', 'HOME',

‘PAGE\_UP’, ‘PAGE\_DOWN’, ‘END’, ‘MEDIA\_PLAY’, ‘MEDIA\_STOP’, ‘MEDIA\_FIRST’, ‘MEDIA\_LAST’, ‘WINDOW\_DEACTIVATE’, ‘TIMER’, ‘TIMER0’, ‘TIMER1’, ‘TIMER2’, ‘NDOF\_BUTTON\_MENU’, ‘NDOF\_BUTTON\_FIT’, ‘NDOF\_BUTTON\_TOP’, ‘NDOF\_BUTTON\_BOTTOM’, ‘NDOF\_BUTTON\_LEFT’, ‘NDOF\_BUTTON\_RIGHT’, ‘NDOF\_BUTTON\_FRONT’, ‘NDOF\_BUTTON\_BACK’, ‘NDOF\_BUTTON\_ISO1’, ‘NDOF\_BUTTON\_ISO2’, ‘NDOF\_BUTTON\_ROLL\_CW’, ‘NDOF\_BUTTON\_ROLL\_CCW’, ‘NDOF\_BUTTON\_SPIN\_CW’, ‘NDOF\_BUTTON\_SPIN\_CCW’, ‘NDOF\_BUTTON\_TILT\_CW’, ‘NDOF\_BUTTON\_TILT\_CCW’, ‘NDOF\_BUTTON\_ROTATE’, ‘NDOF\_BUTTON\_PANZOOM’, ‘NDOF\_BUTTON\_DOMINANT’, ‘NDOF\_BUTTON\_PLUS’, ‘NDOF\_BUTTON\_MINUS’, ‘NDOF\_BUTTON\_1’, ‘NDOF\_BUTTON\_2’, ‘NDOF\_BUTTON\_3’, ‘NDOF\_BUTTON\_4’, ‘NDOF\_BUTTON\_5’, ‘NDOF\_BUTTON\_6’, ‘NDOF\_BUTTON\_7’, ‘NDOF\_BUTTON\_8’, ‘NDOF\_BUTTON\_9’, ‘NDOF\_BUTTON\_10’], default ‘NONE’

**map\_type**

Type of event mapping

**Type** enum in [‘KEYBOARD’, ‘TWEAK’, ‘MOUSE’, ‘NDOF’, ‘TEXTINPUT’, ‘TIMER’], default ‘KEYBOARD’

**name**

Name of operator to call on input event

**Type** string, default “”, (readonly)

**oskey**

Operating system key pressed

**Type** boolean, default False

**properties**

Properties to set when the operator is called

**Type** `OperatorProperties`, (readonly)

**propvalue**

The value this event translates to in a modal keymap

**Type** enum in [‘NONE’], default ‘NONE’

**shift**

Shift key pressed

**Type** boolean, default False

**show\_expanded**

Show key map event and property details in the user interface

**Type** boolean, default False

**type**

Type of event

**Type** enum in [‘NONE’, ‘LEFTMOUSE’, ‘MIDDLEMOUSE’, ‘RIGHTMOUSE’, ‘BUTTON4MOUSE’, ‘BUTTON5MOUSE’, ‘ACTIONMOUSE’, ‘SELECTMOUSE’, ‘MOUSEMOVE’, ‘INBETWEEN\_MOUSEMOVE’, ‘TRACKPADPAN’, ‘TRACKPADZOOM’, ‘MOUSERotate’, ‘WHEELUPMOUSE’, ‘WHEELEDOWNMOUSE’, ‘WHEELINMOUSE’, ‘WHEELOUTMOUSE’, ‘EVT\_TWEAK\_L’, ‘EVT\_TWEAK\_M’, ‘EVT\_TWEAK\_R’, ‘EVT\_TWEAK\_A’, ‘EVT\_TWEAK\_S’, ‘A’, ‘B’, ‘C’, ‘D’, ‘E’, ‘F’, ‘G’, ‘H’, ‘I’, ‘J’, ‘K’, ‘L’, ‘M’, ‘N’, ‘O’, ‘P’, ‘Q’, ‘R’, ‘S’, ‘T’, ‘U’, ‘V’, ‘W’, ‘X’, ‘Y’, ‘Z’, ‘ZERO’, ‘ONE’, ‘TWO’, ‘THREE’, ‘FOUR’, ‘FIVE’, ‘SIX’, ‘SEVEN’, ‘EIGHT’, ‘NINE’, ‘ZERO’, ‘ONE’, ‘TWO’, ‘THREE’, ‘FOUR’, ‘FIVE’, ‘SIX’, ‘SEVEN’, ‘EIGHT’, ‘NINE’]

```
'EIGHT', 'NINE', 'LEFT_CTRL', 'LEFT_ALT', 'LEFT_SHIFT', 'RIGHT_ALT',
'RIGHT_CTRL', 'RIGHT_SHIFT', 'OSKEY', 'GRLESS', 'ESC', 'TAB', 'RET', 'SPACE',
'LINE_FEED', 'BACK_SPACE', 'DEL', 'SEMI_COLON', 'PERIOD', 'COMMA',
'QUOTE', 'ACCENT_GRAVE', 'MINUS', 'SLASH', 'BACK_SLASH', 'EQUAL',
'LEFT_BRACKET', 'RIGHT_BRACKET', 'LEFT_ARROW', 'DOWN_ARROW',
'RIGHT_ARROW', 'UP_ARROW', 'NUMPAD_2', 'NUMPAD_4', 'NUMPAD_6',
'NUMPAD_8', 'NUMPAD_1', 'NUMPAD_3', 'NUMPAD_5', 'NUMPAD_7',
'NUMPAD_9', 'NUMPAD_PERIOD', 'NUMPAD_SLASH', 'NUMPAD_ASTERIX',
'NUMPAD_0', 'NUMPAD_MINUS', 'NUMPAD_ENTER', 'NUMPAD_PLUS',
'F1', 'F2', 'F3', 'F4', 'F5', 'F6', 'F7', 'F8', 'F9', 'F10', 'F11', 'F12',
'F13', 'F14', 'F15', 'F16', 'F17', 'F18', 'F19', 'PAUSE', 'INSERT', 'HOME',
'PAGE_UP', 'PAGE_DOWN', 'END', 'MEDIA_PLAY', 'MEDIA_STOP', 'MEDIA_FIRST',
'MEDIA_LAST', 'WINDOW_DEACTIVATE', 'TIMER', 'TIMER0',
'TIMER1', 'TIMER2', 'NDOF_BUTTON_MENU', 'NDOF_BUTTON_FIT',
'NDOF_BUTTON_TOP', 'NDOF_BUTTON_BOTTOM', 'NDOF_BUTTON_LEFT',
'NDOF_BUTTON_RIGHT', 'NDOF_BUTTON_FRONT', 'NDOF_BUTTON_BACK',
'NDOF_BUTTON_ISO1', 'NDOF_BUTTON_ISO2', 'NDOF_BUTTON_ROLL_CW',
'NDOF_BUTTON_ROLL_CCW', 'NDOF_BUTTON_SPIN_CW', 'NDOF_BUTTON_TILT_CW',
'NDOF_BUTTON_TILT_CCW', 'NDOF_BUTTON_ROTATE', 'NDOF_BUTTON_DOMINANT',
'NDOF_BUTTON_PANZOOM', 'NDOF_BUTTON_DOMINANT', 'NDOF_BUTTON_PLUS',
'NDOF_BUTTON_MINUS', 'NDOF_BUTTON_1', 'NDOF_BUTTON_2',
'NDOF_BUTTON_3', 'NDOF_BUTTON_4', 'NDOF_BUTTON_5',
'NDOF_BUTTON_6', 'NDOF_BUTTON_7', 'NDOF_BUTTON_8',
'NDOF_BUTTON_9', 'NDOF_BUTTON_10'], default 'NONE'
```

**value**

**Type** enum in ['ANY', 'NOTHING', 'PRESS', 'RELEASE', 'CLICK', 'DOUBLE\_CLICK'], default 'NOTHING'

**compare** (*item*)

compare

**Parameters** *item* ([KeyMapItem](#)) – Item

**Returns** Comparison result

**Return type** boolean

## Inherited Properties

- [bpy\\_struct.id\\_data](#)

## Inherited Functions

- [bpy\\_struct.as\\_pointer](#)
- [bpy\\_struct.callback\\_add](#)
- [bpy\\_struct.callback\\_remove](#)
- [bpy\\_struct.driver\\_add](#)
- [bpy\\_struct.driver\\_remove](#)
- [bpy\\_struct.get](#)
- [bpy\\_struct.is\\_property\\_hidden](#)
- [bpy\\_struct.is\\_property\\_set](#)
- [bpy\\_struct.items](#)

- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `KeyMap.keymap_items`
- `KeyMap.restore_item_to_default`
- `KeyMapItem.compare`
- `KeyMapItems.from_id`
- `KeyMapItems.new`
- `KeyMapItems.new_modal`
- `KeyMapItems.remove`

## 2.4.271 KeyMapItems(bpy\_struct)

base class — `bpy_struct`

**class** `bpy.types.KeyMapItems` (`bpy_struct`)

Collection of keymap items

**new** (`idname`, `type`, `value`, `any=False`, `shift=False`, `ctrl=False`, `alt=False`, `oskey=False`,  
`key_modifier='NONE'`)  
`new`

### Parameters

- `idname` (*string*) – Operator Identifier
- `type` (*enum in* `'NONE'`, `'LEFTMOUSE'`, `'MIDDLEMOUSE'`, `'RIGHTMOUSE'`,  
`'BUTTON4MOUSE'`, `'BUTTON5MOUSE'`, `'ACTIONMOUSE'`, `'SELECTMOUSE'`,  
`'MOUSEMOVE'`, `'INBETWEEN_MOUSEMOVE'`, `'TRACKPADPAN'`, `'TRACKPADZOOM'`,  
`'MOUSERotate'`, `'WHEELUPMOUSE'`, `'WHEELEDOWNMOUSE'`,  
`'WHEELINMOUSE'`, `'WHEELOUTMOUSE'`, `'EVT_TWEAK_L'`, `'EVT_TWEAK_M'`,  
`'EVT_TWEAK_R'`, `'EVT_TWEAK_A'`, `'EVT_TWEAK_S'`, `'A'`, `'B'`, `'C'`, `'D'`, `'E'`,  
`'F'`, `'G'`, `'H'`, `'I'`, `'J'`, `'K'`, `'L'`, `'M'`, `'N'`, `'O'`, `'P'`, `'Q'`, `'R'`, `'S'`, `'T'`, `'U'`, `'V'`, `'W'`,  
`'X'`, `'Y'`, `'Z'`, `'ZERO'`, `'ONE'`, `'TWO'`, `'THREE'`, `'FOUR'`, `'FIVE'`, `'SIX'`, `'SEVEN'`,  
`'EIGHT'`, `'NINE'`, `'LEFT_CTRL'`, `'LEFT_ALT'`, `'LEFT_SHIFT'`, `'RIGHT_ALT'`,  
`'RIGHT_CTRL'`, `'RIGHT_SHIFT'`, `'OSKEY'`, `'GRLESS'`, `'ESC'`, `'TAB'`, `'RET'`, `'SPACE'`,  
`'LINE_FEED'`, `'BACK_SPACE'`, `'DEL'`, `'SEMI_COLON'`, `'PERIOD'`, `'COMMA'`,  
`'QUOTE'`, `'ACCENT_GRAVE'`, `'MINUS'`, `'SLASH'`, `'BACK_SLASH'`, `'EQUAL'`,  
`'LEFT_BRACKET'`, `'RIGHT_BRACKET'`, `'LEFT_ARROW'`, `'DOWN_ARROW'`,  
`'RIGHT_ARROW'`, `'UP_ARROW'`, `'NUMPAD_2'`, `'NUMPAD_4'`, `'NUMPAD_6'`,  
`'NUMPAD_8'`, `'NUMPAD_1'`, `'NUMPAD_3'`, `'NUMPAD_5'`, `'NUMPAD_7'`,  
`'NUMPAD_9'`, `'NUMPAD_PERIOD'`, `'NUMPAD_SLASH'`, `'NUMPAD_ASTERIX'`,  
`'NUMPAD_0'`, `'NUMPAD_MINUS'`, `'NUMPAD_ENTER'`, `'NUMPAD_PLUS'`,  
`'F1'`, `'F2'`, `'F3'`, `'F4'`, `'F5'`, `'F6'`, `'F7'`, `'F8'`, `'F9'`, `'F10'`, `'F11'`, `'F12'`,  
`'F13'`, `'F14'`, `'F15'`, `'F16'`, `'F17'`, `'F18'`, `'F19'`, `'PAUSE'`, `'INSERT'`, `'HOME'`,  
`'PAGE_UP'`, `'PAGE_DOWN'`, `'END'`, `'MEDIA_PLAY'`, `'MEDIA_STOP'`, `'MEDIA_FIRST'`,  
`'MEDIA_LAST'`, `'WINDOW_DEACTIVATE'`, `'TIMER'`, `'TIMER0'`, `'TIMER1'`,  
`'TIMER2'`, `'NDOF_BUTTON_MENU'`, `'NDOF_BUTTON_FIT'`,

'NDOF\_BUTTON\_TOP', 'NDOF\_BUTTON\_BOTTOM', 'NDOF\_BUTTON\_LEFT',  
'NDOF\_BUTTON\_RIGHT', 'NDOF\_BUTTON\_FRONT', 'NDOF\_BUTTON\_BACK',  
'NDOF\_BUTTON\_ISO1', 'NDOF\_BUTTON\_ISO2', 'NDOF\_BUTTON\_ROLL\_CW',  
'NDOF\_BUTTON\_ROLL\_CCW', 'NDOF\_BUTTON\_SPIN\_CW',  
'NDOF\_BUTTON\_SPIN\_CCW', 'NDOF\_BUTTON\_TILT\_CW',  
'NDOF\_BUTTON\_TILT\_CCW', 'NDOF\_BUTTON\_ROTATE',  
'NDOF\_BUTTON\_PANZOOM', 'NDOF\_BUTTON\_DOMINANT',  
'NDOF\_BUTTON\_PLUS', 'NDOF\_BUTTON\_MINUS', 'NDOF\_BUTTON\_1',  
'NDOF\_BUTTON\_2', 'NDOF\_BUTTON\_3', 'NDOF\_BUTTON\_4',  
'NDOF\_BUTTON\_5', 'NDOF\_BUTTON\_6', 'NDOF\_BUTTON\_7',  
'NDOF\_BUTTON\_8', 'NDOF\_BUTTON\_9', 'NDOF\_BUTTON\_10']) – Type

- **value** (*enum in* [‘ANY’, ‘NOTHING’, ‘PRESS’, ‘RELEASE’, ‘CLICK’, ‘DOUBLE\_CLICK’]) – Value
- **any** (*boolean, (optional)*) – Any
- **shift** (*boolean, (optional)*) – Shift
- **ctrl** (*boolean, (optional)*) – Ctrl
- **alt** (*boolean, (optional)*) – Alt
- **oskey** (*boolean, (optional)*) – OS Key
- **key\_modifier** (*enum in* [‘NONE’, ‘LEFTMOUSE’, ‘MIDDLEMOUSE’, ‘RIGHTMOUSE’, ‘BUTTON4MOUSE’, ‘BUTTON5MOUSE’, ‘ACTIONMOUSE’, ‘SELECTMOUSE’, ‘MOUSEMOVE’, ‘INBETWEEN\_MOUSEMOVE’, ‘TRACKPADPAN’, ‘TRACKPADZOOM’, ‘MOUSERotate’, ‘WHEELUPMOUSE’, ‘WHEELDOWNMOUSE’, ‘WHEELINMOUSE’, ‘WHEELOUTMOUSE’, ‘EVT\_TWEAK\_L’, ‘EVT\_TWEAK\_M’, ‘EVT\_TWEAK\_R’, ‘EVT\_TWEAK\_A’, ‘EVT\_TWEAK\_S’, ‘A’, ‘B’, ‘C’, ‘D’, ‘E’, ‘F’, ‘G’, ‘H’, ‘T’, ‘J’, ‘K’, ‘L’, ‘M’, ‘N’, ‘O’, ‘P’, ‘Q’, ‘R’, ‘S’, ‘T’, ‘U’, ‘V’, ‘W’, ‘X’, ‘Y’, ‘Z’, ‘ZERO’, ‘ONE’, ‘TWO’, ‘THREE’, ‘FOUR’, ‘FIVE’, ‘SIX’, ‘SEVEN’, ‘EIGHT’, ‘NINE’, ‘LEFT\_CTRL’, ‘LEFT\_ALT’, ‘LEFT\_SHIFT’, ‘RIGHT\_ALT’, ‘RIGHT\_CTRL’, ‘RIGHT\_SHIFT’, ‘OSKEY’, ‘GRLESS’, ‘ESC’, ‘TAB’, ‘RET’, ‘SPACE’, ‘LINE\_FEED’, ‘BACK\_SPACE’, ‘DEL’, ‘SEMI\_COLON’, ‘PERIOD’, ‘COMMA’, ‘QUOTE’, ‘ACCENT\_GRAVE’, ‘MINUS’, ‘SLASH’, ‘BACK\_SLASH’, ‘EQUAL’, ‘LEFT\_BRACKET’, ‘RIGHT\_BRACKET’, ‘LEFT\_ARROW’, ‘DOWN\_ARROW’, ‘RIGHT\_ARROW’, ‘UP\_ARROW’, ‘NUMPAD\_2’, ‘NUMPAD\_4’, ‘NUMPAD\_6’, ‘NUMPAD\_8’, ‘NUMPAD\_1’, ‘NUMPAD\_3’, ‘NUMPAD\_5’, ‘NUMPAD\_7’, ‘NUMPAD\_9’, ‘NUMPAD\_PERIOD’, ‘NUMPAD\_SLASH’, ‘NUMPAD\_ASTERIX’, ‘NUMPAD\_0’, ‘NUMPAD\_MINUS’, ‘NUMPAD\_ENTER’, ‘NUMPAD\_PLUS’, ‘F1’, ‘F2’, ‘F3’, ‘F4’, ‘F5’, ‘F6’, ‘F7’, ‘F8’, ‘F9’, ‘F10’, ‘F11’, ‘F12’, ‘F13’, ‘F14’, ‘F15’, ‘F16’, ‘F17’, ‘F18’, ‘F19’, ‘PAUSE’, ‘INSERT’, ‘HOME’, ‘PAGE\_UP’, ‘PAGE\_DOWN’, ‘END’, ‘MEDIA\_PLAY’, ‘MEDIA\_STOP’, ‘MEDIA\_FIRST’, ‘MEDIA\_LAST’, ‘WINDOW\_DEACTIVATE’, ‘TIMER’, ‘TIMER0’, ‘TIMER1’, ‘TIMER2’, ‘NDOF\_BUTTON\_MENU’, ‘NDOF\_BUTTON\_FIT’, ‘NDOF\_BUTTON\_TOP’, ‘NDOF\_BUTTON\_BOTTOM’, ‘NDOF\_BUTTON\_LEFT’, ‘NDOF\_BUTTON\_RIGHT’, ‘NDOF\_BUTTON\_FRONT’, ‘NDOF\_BUTTON\_BACK’, ‘NDOF\_BUTTON\_ISO1’, ‘NDOF\_BUTTON\_ISO2’, ‘NDOF\_BUTTON\_ROLL\_CW’, ‘NDOF\_BUTTON\_ROLL\_CCW’, ‘NDOF\_BUTTON\_SPIN\_CW’, ‘NDOF\_BUTTON\_SPIN\_CCW’, ‘NDOF\_BUTTON\_TILT\_CW’, ‘NDOF\_BUTTON\_TILT\_CCW’, ‘NDOF\_BUTTON\_ROTATE’, ‘NDOF\_BUTTON\_PANZOOM’, ‘NDOF\_BUTTON\_DOMINANT’, ‘NDOF\_BUTTON\_PLUS’, ‘NDOF\_BUTTON\_MINUS’, ‘NDOF\_BUTTON\_1’, ‘NDOF\_BUTTON\_2’, ‘NDOF\_BUTTON\_3’, ‘NDOF\_BUTTON\_4’, ‘NDOF\_BUTTON\_5’, ‘NDOF\_BUTTON\_6’, ‘NDOF\_BUTTON\_7’, ‘NDOF\_BUTTON\_8’, ‘NDOF\_BUTTON\_9’, ‘NDOF\_BUTTON\_10’]) – Type

'NDOF\_BUTTON\_8', 'NDOF\_BUTTON\_9', 'NDOF\_BUTTON\_10'], (*optional*) – Key Modifier

**Returns** Item, Added key map item.

**Return type** `KeyMapItem`

**new\_modal** (*propvalue*, *type*, *value*, *any=False*, *shift=False*, *ctrl=False*, *alt=False*, *oskey=False*, *key\_modifier='NONE'*)  
new\_modal

#### Parameters

- **propvalue** (*string*) – Property Value
- **type** (*enum in* ['NONE', 'LEFTMOUSE', 'MIDDLEMOUSE', 'RIGHTMOUSE', 'BUTTON4MOUSE', 'BUTTON5MOUSE', 'ACTIONMOUSE', 'SELECTMOUSE', 'MOUSEMOVE', 'INBETWEEN\_MOUSEMOVE', 'TRACKPADPAN', 'TRACKPADZOOM', 'MOUSERotate', 'WHEELUPMOUSE', 'WHEELEDOWNMOUSE', 'WHEELINMOUSE', 'WHEELOUTMOUSE', 'EVT\_TWEAK\_L', 'EVT\_TWEAK\_M', 'EVT\_TWEAK\_R', 'EVT\_TWEAK\_A', 'EVT\_TWEAK\_S', 'A', 'B', 'C', 'D', 'E', 'F', 'G', 'H', 'T', 'J', 'K', 'L', 'M', 'N', 'O', 'P', 'Q', 'R', 'S', 'T', 'U', 'V', 'W', 'X', 'Y', 'Z', 'ZERO', 'ONE', 'TWO', 'THREE', 'FOUR', 'FIVE', 'SIX', 'SEVEN', 'EIGHT', 'NINE', 'LEFT\_CTRL', 'LEFT\_ALT', 'LEFT\_SHIFT', 'RIGHT\_ALT', 'RIGHT\_CTRL', 'RIGHT\_SHIFT', 'OSKEY', 'GRLESS', 'ESC', 'TAB', 'RET', 'SPACE', 'LINE\_FEED', 'BACK\_SPACE', 'DEL', 'SEMI\_COLON', 'PERIOD', 'COMMA', 'QUOTE', 'ACCENT\_GRAVE', 'MINUS', 'SLASH', 'BACK\_SLASH', 'EQUAL', 'LEFT\_BRACKET', 'RIGHT\_BRACKET', 'LEFT\_ARROW', 'DOWN\_ARROW', 'RIGHT\_ARROW', 'UP\_ARROW', 'NUMPAD\_2', 'NUMPAD\_4', 'NUMPAD\_6', 'NUMPAD\_8', 'NUMPAD\_1', 'NUMPAD\_3', 'NUMPAD\_5', 'NUMPAD\_7', 'NUMPAD\_9', 'NUMPAD\_PERIOD', 'NUMPAD\_SLASH', 'NUMPAD\_ASTERIX', 'NUMPAD\_0', 'NUMPAD\_MINUS', 'NUMPAD\_ENTER', 'NUMPAD\_PLUS', 'F1', 'F2', 'F3', 'F4', 'F5', 'F6', 'F7', 'F8', 'F9', 'F10', 'F11', 'F12', 'F13', 'F14', 'F15', 'F16', 'F17', 'F18', 'F19', 'PAUSE', 'INSERT', 'HOME', 'PAGE\_UP', 'PAGE\_DOWN', 'END', 'MEDIA\_PLAY', 'MEDIA\_STOP', 'MEDIA\_FIRST', 'MEDIA\_LAST', 'WINDOW\_DEACTIVATE', 'TIMER', 'TIMER0', 'TIMER1', 'TIMER2', 'NDOF\_BUTTON\_MENU', 'NDOF\_BUTTON\_FIT', 'NDOF\_BUTTON\_TOP', 'NDOF\_BUTTON\_BOTTOM', 'NDOF\_BUTTON\_LEFT', 'NDOF\_BUTTON\_RIGHT', 'NDOF\_BUTTON\_FRONT', 'NDOF\_BUTTON\_BACK', 'NDOF\_BUTTON\_ISO1', 'NDOF\_BUTTON\_ISO2', 'NDOF\_BUTTON\_ROLL\_CW', 'NDOF\_BUTTON\_ROLL\_CCW', 'NDOF\_BUTTON\_SPIN\_CCW', 'NDOF\_BUTTON\_TILT\_CCW', 'NDOF\_BUTTON\_PANZOOM', 'NDOF\_BUTTON\_DOMINANT', 'NDOF\_BUTTON\_PLUS', 'NDOF\_BUTTON\_MINUS', 'NDOF\_BUTTON\_1', 'NDOF\_BUTTON\_2', 'NDOF\_BUTTON\_3', 'NDOF\_BUTTON\_4', 'NDOF\_BUTTON\_5', 'NDOF\_BUTTON\_6', 'NDOF\_BUTTON\_7', 'NDOF\_BUTTON\_8', 'NDOF\_BUTTON\_9', 'NDOF\_BUTTON\_10']) – Type
- **value** (*enum in* ['ANY', 'NOTHING', 'PRESS', 'RELEASE', 'CLICK', 'DOUBLE\_CLICK']) – Value
- **any** (*boolean, (optional)*) – Any
- **shift** (*boolean, (optional)*) – Shift
- **ctrl** (*boolean, (optional)*) – Ctrl
- **alt** (*boolean, (optional)*) – Alt

- **oskey** (*boolean, (optional)*) – OS Key
- **key\_modifier** (*enum in ['NONE', 'LEFTMOUSE', 'MIDDLEMOUSE', 'RIGHTMOUSE', 'BUTTON4MOUSE', 'BUTTON5MOUSE', 'ACTIONMOUSE', 'SELECTMOUSE', 'MOUSEMOVE', 'INBETWEEN\_MOUSEMOVE', 'TRACKPADPAN', 'TRACKPADZOOM', 'MOUSERotate', 'WHEELUPMOUSE', 'WHEELDOWNMOUSE', 'WHEELINMOUSE', 'WHEELOUTMOUSE', 'EVT\_TWEAK\_L', 'EVT\_TWEAK\_M', 'EVT\_TWEAK\_R', 'EVT\_TWEAK\_A', 'EVT\_TWEAK\_S', 'A', 'B', 'C', 'D', 'E', 'F', 'G', 'H', 'I', 'J', 'K', 'L', 'M', 'N', 'O', 'P', 'Q', 'R', 'S', 'T', 'U', 'V', 'W', 'X', 'Y', 'Z', 'ZERO', 'ONE', 'TWO', 'THREE', 'FOUR', 'FIVE', 'SIX', 'SEVEN', 'EIGHT', 'NINE', 'LEFT\_CTRL', 'LEFT\_ALT', 'LEFT\_SHIFT', 'RIGHT\_ALT', 'RIGHT\_CTRL', 'RIGHT\_SHIFT', 'OSKEY', 'GRLESS', 'ESC', 'TAB', 'RET', 'SPACE', 'LINE\_FEED', 'BACK\_SPACE', 'DEL', 'SEMI\_COLON', 'PERIOD', 'COMMA', 'QUOTE', 'ACCENT\_GRAVE', 'MINUS', 'SLASH', 'BACK\_SLASH', 'EQUAL', 'LEFT\_BRACKET', 'RIGHT\_BRACKET', 'LEFT\_ARROW', 'DOWN\_ARROW', 'RIGHT\_ARROW', 'UP\_ARROW', 'NUMPAD\_2', 'NUMPAD\_4', 'NUMPAD\_6', 'NUMPAD\_8', 'NUMPAD\_1', 'NUMPAD\_3', 'NUMPAD\_5', 'NUMPAD\_7', 'NUMPAD\_9', 'NUMPAD\_PERIOD', 'NUMPAD\_SLASH', 'NUMPAD\_ASTERIX', 'NUMPAD\_0', 'NUMPAD\_MINUS', 'NUMPAD\_ENTER', 'NUMPAD\_PLUS', 'F1', 'F2', 'F3', 'F4', 'F5', 'F6', 'F7', 'F8', 'F9', 'F10', 'F11', 'F12', 'F13', 'F14', 'F15', 'F16', 'F17', 'F18', 'F19', 'PAUSE', 'INSERT', 'HOME', 'PAGE\_UP', 'PAGE\_DOWN', 'END', 'MEDIA\_PLAY', 'MEDIA\_STOP', 'MEDIA\_FIRST', 'MEDIA\_LAST', 'WINDOW\_DEACTIVATE', 'TIMER', 'TIMER0', 'TIMER1', 'TIMER2', 'NDOF\_BUTTON\_MENU', 'NDOF\_BUTTON\_FIT', 'NDOF\_BUTTON\_TOP', 'NDOF\_BUTTON\_BOTTOM', 'NDOF\_BUTTON\_LEFT', 'NDOF\_BUTTON\_RIGHT', 'NDOF\_BUTTON\_FRONT', 'NDOF\_BUTTON\_BACK', 'NDOF\_BUTTON\_ISO1', 'NDOF\_BUTTON\_ISO2', 'NDOF\_BUTTON\_ROLL\_CW', 'NDOF\_BUTTON\_ROLL\_CCW', 'NDOF\_BUTTON\_SPIN\_CW', 'NDOF\_BUTTON\_SPIN\_CCW', 'NDOF\_BUTTON\_TILT\_CW', 'NDOF\_BUTTON\_TILT\_CCW', 'NDOF\_BUTTON\_ROTATE', 'NDOF\_BUTTON\_PANZOOM', 'NDOF\_BUTTON\_DOMINANT', 'NDOF\_BUTTON\_PLUS', 'NDOF\_BUTTON\_MINUS', 'NDOF\_BUTTON\_1', 'NDOF\_BUTTON\_2', 'NDOF\_BUTTON\_3', 'NDOF\_BUTTON\_4', 'NDOF\_BUTTON\_5', 'NDOF\_BUTTON\_6', 'NDOF\_BUTTON\_7', 'NDOF\_BUTTON\_8', 'NDOF\_BUTTON\_9', 'NDOF\_BUTTON\_10'], (optional)) – Key Modifier*

**Returns** Item, Added key map item.

**Return type** `KeyMapItem`

**remove** (*item*)

remove

**Parameters** `item` (`KeyMapItem`) – Item

**from\_id** (*id*)

from\_id

**Parameters** `id` (*int in [-inf, inf]*) – id, ID of the item

**Returns** Item

**Return type** `KeyMapItem`

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `KeyMap.keymap_items`

### 2.4.272 KeyMaps(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.KeyMaps` (`bpy_struct`)

Collection of keymaps

**new** (`name, space_type='EMPTY', region_type='WINDOW', modal=False`)  
new

#### Parameters

- **name** (`string`) – Name
- **space\_type** (`enum in ['EMPTY', 'VIEW_3D', 'GRAPH_EDITOR', 'OUTLINER', 'PROPERTIES', 'FILE_BROWSER', 'IMAGE_EDITOR', 'INFO', 'SEQUENCE_EDITOR', 'TEXT_EDITOR', 'AUDIO_WINDOW', 'DOPESHEET_EDITOR', 'NLA_EDITOR', 'SCRIPTS_WINDOW', 'TIMELINE', 'NODE_EDITOR', 'LOGIC_EDITOR', 'CONSOLE', 'USER_PREFERENCES'], (optional)`) – Space Type
- **region\_type** (`enum in ['WINDOW', 'HEADER', 'CHANNELS', 'TEMPORARY', 'UI', 'TOOLS', 'TOOL_PROPS', 'PREVIEW'], (optional)`) – Region Type
- **modal** (`boolean, (optional)`) – Modal

**Returns** Key Map, Added key map.

**Return type** `KeyMap`

**find** (`name, space_type='EMPTY', region_type='WINDOW'`)  
find

#### Parameters

- **name** (*string*) – Name
- **space\_type** (*enum in* [‘EMPTY’, ‘VIEW\_3D’, ‘GRAPH\_EDITOR’, ‘OUTLINER’, ‘PROPERTIES’, ‘FILE\_BROWSER’, ‘IMAGE\_EDITOR’, ‘INFO’, ‘SEQUENCE\_EDITOR’, ‘TEXT\_EDITOR’, ‘AUDIO\_WINDOW’, ‘DOPESHEET\_EDITOR’, ‘NLA\_EDITOR’, ‘SCRIPTS\_WINDOW’, ‘TIMELINE’, ‘NODE\_EDITOR’, ‘LOGIC\_EDITOR’, ‘CONSOLE’, ‘USER\_PREFERENCES’], (*optional*)) – Space Type
- **region\_type** (*enum in* [‘WINDOW’, ‘HEADER’, ‘CHANNELS’, ‘TEMPORARY’, ‘UI’, ‘TOOLS’, ‘TOOL\_PROPS’, ‘PREVIEW’], (*optional*)) – Region Type

**Returns** Key Map, Corresponding key map.

**Return type** [KeyMap](#)

**find\_modal** (*name*)  
find\_modal

**Parameters** **name** (*string*) – Operator Name

**Returns** Key Map, Corresponding key map.

**Return type** [KeyMap](#)

## Inherited Properties

- [bpy\\_struct.id\\_data](#)

## Inherited Functions

- [bpy\\_struct.as\\_pointer](#)
- [bpy\\_struct.callback\\_add](#)
- [bpy\\_struct.callback\\_remove](#)
- [bpy\\_struct.driver\\_add](#)
- [bpy\\_struct.driver\\_remove](#)
- [bpy\\_struct.get](#)
- [bpy\\_struct.is\\_property\\_hidden](#)
- [bpy\\_struct.is\\_property\\_set](#)
- [bpy\\_struct.items](#)
- [bpy\\_struct.keyframe\\_delete](#)
- [bpy\\_struct.keyframe\\_insert](#)
- [bpy\\_struct.keys](#)
- [bpy\\_struct.path\\_from\\_id](#)
- [bpy\\_struct.path\\_resolve](#)
- [bpy\\_struct.type\\_recast](#)
- [bpy\\_struct.values](#)

## References

- [KeyConfig.keymaps](#)

## 2.4.273 KeyboardSensor(Sensor)

base classes — `bpy_struct, Sensor`

**class bpy.types.KeyboardSensor (Sensor)**

Sensor to detect keyboard events

### key

**Type** enum in ['NONE', 'LEFTMOUSE', 'MIDDLEMOUSE', 'RIGHTMOUSE', 'BUTTON4MOUSE', 'BUTTON5MOUSE', 'ACTIONMOUSE', 'SELECTMOUSE', 'MOUSEMOVE', 'INBETWEEN\_MOUSEMOVE', 'TRACKPADPAN', 'TRACKPADZOOM', 'MOUSERotate', 'WHEELUPMOUSE', 'WHEELEDOWNMOUSE', 'WHEELINMOUSE', 'WHEELOUTMOUSE', 'EVT\_TWEAK\_L', 'EVT\_TWEAK\_M', 'EVT\_TWEAK\_R', 'EVT\_TWEAK\_A', 'EVT\_TWEAK\_S', 'A', 'B', 'C', 'D', 'E', 'F', 'G', 'H', 'T', 'J', 'K', 'L', 'M', 'N', 'O', 'P', 'Q', 'R', 'S', 'T', 'U', 'V', 'W', 'X', 'Y', 'Z', 'ZERO', 'ONE', 'TWO', 'THREE', 'FOUR', 'FIVE', 'SIX', 'SEVEN', 'EIGHT', 'NINE', 'LEFT\_CTRL', 'LEFT\_ALT', 'LEFT\_SHIFT', 'RIGHT\_ALT', 'RIGHT\_CTRL', 'RIGHT\_SHIFT', 'OSKEY', 'GRLESS', 'ESC', 'TAB', 'RET', 'SPACE', 'LINE\_FEED', 'BACK\_SPACE', 'DEL', 'SEMI\_COLON', 'PERIOD', 'COMMA', 'QUOTE', 'ACCENT\_GRAVE', 'MINUS', 'SLASH', 'BACK\_SLASH', 'EQUAL', 'LEFT\_BRACKET', 'RIGHT\_BRACKET', 'LEFT\_ARROW', 'DOWN\_ARROW', 'RIGHT\_ARROW', 'UP\_ARROW', 'NUMPAD\_2', 'NUMPAD\_4', 'NUMPAD\_6', 'NUMPAD\_8', 'NUMPAD\_1', 'NUMPAD\_3', 'NUMPAD\_5', 'NUMPAD\_7', 'NUMPAD\_9', 'NUMPAD\_PERIOD', 'NUMPAD\_SLASH', 'NUMPAD\_ASTERIX', 'NUMPAD\_0', 'NUMPAD\_MINUS', 'NUMPAD\_ENTER', 'NUMPAD\_PLUS', 'F1', 'F2', 'F3', 'F4', 'F5', 'F6', 'F7', 'F8', 'F9', 'F10', 'F11', 'F12', 'F13', 'F14', 'F15', 'F16', 'F17', 'F18', 'F19', 'PAUSE', 'INSERT', 'HOME', 'PAGE\_UP', 'PAGE\_DOWN', 'END', 'MEDIA\_PLAY', 'MEDIA\_STOP', 'MEDIA\_FIRST', 'MEDIA\_LAST', 'WINDOW\_DEACTIVATE', 'TIMER', 'TIMER0', 'TIMER1', 'TIMER2', 'NDOF\_BUTTON\_MENU', 'NDOF\_BUTTON\_FIT', 'NDOF\_BUTTON\_TOP', 'NDOF\_BUTTON\_BOTTOM', 'NDOF\_BUTTON\_LEFT', 'NDOF\_BUTTON\_RIGHT', 'NDOF\_BUTTON\_FRONT', 'NDOF\_BUTTON\_BACK', 'NDOF\_BUTTON\_ISO1', 'NDOF\_BUTTON\_ISO2', 'NDOF\_BUTTON\_ROLL\_CW', 'NDOF\_BUTTON\_ROLL\_CCW', 'NDOF\_BUTTON\_SPIN\_CW', 'NDOF\_BUTTON\_SPIN\_CCW', 'NDOF\_BUTTON\_TILT\_CW', 'NDOF\_BUTTON\_TILT\_CCW', 'NDOF\_BUTTON\_ROTATE', 'NDOF\_BUTTON\_PANZOOM', 'NDOF\_BUTTON\_DOMINANT', 'NDOF\_BUTTON\_PLUS', 'NDOF\_BUTTON\_MINUS', 'NDOF\_BUTTON\_1', 'NDOF\_BUTTON\_2', 'NDOF\_BUTTON\_3', 'NDOF\_BUTTON\_4', 'NDOF\_BUTTON\_5', 'NDOF\_BUTTON\_6', 'NDOF\_BUTTON\_7', 'NDOF\_BUTTON\_8', 'NDOF\_BUTTON\_9', 'NDOF\_BUTTON\_10'], default 'NONE'

### log

Property that indicates whether to log keystrokes as a string

**Type** string, default “”

### modifier\_key\_1

Modifier key code

**Type** enum in ['NONE', 'LEFTMOUSE', 'MIDDLEMOUSE', 'RIGHTMOUSE', 'BUTTON4MOUSE', 'BUTTON5MOUSE', 'ACTIONMOUSE', 'SELECTMOUSE', 'MOUSEMOVE', 'INBETWEEN\_MOUSEMOVE', 'TRACKPADPAN', 'TRACKPADZOOM', 'MOUSERotate', 'WHEELUPMOUSE', 'WHEELEDOWNMOUSE', 'WHEELINMOUSE', 'WHEELOUTMOUSE', 'EVT\_TWEAK\_L', 'EVT\_TWEAK\_M', 'EVT\_TWEAK\_R', 'EVT\_TWEAK\_A', 'EVT\_TWEAK\_S', 'A', 'B', 'C', 'D', 'E',

'F', 'G', 'H', 'T', 'J', 'K', 'L', 'M', 'N', 'O', 'P', 'Q', 'R', 'S', 'T', 'U', 'V', 'W',  
'X', 'Y', 'Z', 'ZERO', 'ONE', 'TWO', 'THREE', 'FOUR', 'FIVE', 'SIX', 'SEVEN',  
'EIGHT', 'NINE', 'LEFT\_CTRL', 'LEFT\_ALT', 'LEFT\_SHIFT', 'RIGHT\_ALT',  
'RIGHT\_CTRL', 'RIGHT\_SHIFT', 'OSKEY', 'GRLESS', 'ESC', 'TAB', 'RET', 'SPACE',  
'LINE\_FEED', 'BACK\_SPACE', 'DEL', 'SEMI\_COLON', 'PERIOD', 'COMMA',  
'QUOTE', 'ACCENT\_GRAVE', 'MINUS', 'SLASH', 'BACK\_SLASH', 'EQUAL',  
'LEFT\_BRACKET', 'RIGHT\_BRACKET', 'LEFT\_ARROW', 'DOWN\_ARROW',  
'RIGHT\_ARROW', 'UP\_ARROW', 'NUMPAD\_2', 'NUMPAD\_4', 'NUMPAD\_6',  
'NUMPAD\_8', 'NUMPAD\_1', 'NUMPAD\_3', 'NUMPAD\_5', 'NUMPAD\_7',  
'NUMPAD\_9', 'NUMPAD\_PERIOD', 'NUMPAD\_SLASH', 'NUMPAD\_ASTERIX',  
'NUMPAD\_0', 'NUMPAD\_MINUS', 'NUMPAD\_ENTER', 'NUMPAD\_PLUS',  
'F1', 'F2', 'F3', 'F4', 'F5', 'F6', 'F7', 'F8', 'F9', 'F10', 'F11', 'F12',  
'F13', 'F14', 'F15', 'F16', 'F17', 'F18', 'F19', 'PAUSE', 'INSERT', 'HOME',  
'PAGE\_UP', 'PAGE\_DOWN', 'END', 'MEDIA\_PLAY', 'MEDIA\_STOP', 'MEDIA\_FIRST',  
'MEDIA\_LAST', 'WINDOW\_DEACTIVATE', 'TIMER', 'TIMER0',  
'TIMER1', 'TIMER2', 'NDOF\_BUTTON\_MENU', 'NDOF\_BUTTON\_FIT',  
'NDOF\_BUTTON\_TOP', 'NDOF\_BUTTON\_BOTTOM', 'NDOF\_BUTTON\_LEFT',  
'NDOF\_BUTTON\_RIGHT', 'NDOF\_BUTTON\_FRONT', 'NDOF\_BUTTON\_BACK',  
'NDOF\_BUTTON\_ISO1', 'NDOF\_BUTTON\_ISO2', 'NDOF\_BUTTON\_ROLL\_CW',  
'NDOF\_BUTTON\_ROLL\_CCW', 'NDOF\_BUTTON\_SPIN\_CW',  
'NDOF\_BUTTON\_SPIN\_CCW', 'NDOF\_BUTTON\_TILT\_CW',  
'NDOF\_BUTTON\_TILT\_CCW', 'NDOF\_BUTTON\_ROTATE',  
'NDOF\_BUTTON\_PANZOOM', 'NDOF\_BUTTON\_DOMINANT',  
'NDOF\_BUTTON\_PLUS', 'NDOF\_BUTTON\_MINUS', 'NDOF\_BUTTON\_1',  
'NDOF\_BUTTON\_2', 'NDOF\_BUTTON\_3', 'NDOF\_BUTTON\_4',  
'NDOF\_BUTTON\_5', 'NDOF\_BUTTON\_6', 'NDOF\_BUTTON\_7',  
'NDOF\_BUTTON\_8', 'NDOF\_BUTTON\_9', 'NDOF\_BUTTON\_10'], default 'NONE'

**modifier\_key\_2**

Modifier key code

**Type** enum in ['NONE', 'LEFTMOUSE', 'MIDDLEMOUSE', 'RIGHTMOUSE', 'BUTTON4MOUSE', 'BUTTON5MOUSE', 'ACTIONMOUSE', 'SELECTMOUSE', 'MOUSEMOVE', 'INBETWEEN\_MOUSEMOVE', 'TRACKPADPAN', 'TRACKPADZOOM', 'MOUSEROTATE', 'WHEELUPMOUSE', 'WHEELEDOWNMOUSE', 'WHEELINMOUSE', 'WHEELOUTMOUSE', 'EVT\_TWEAK\_L', 'EVT\_TWEAK\_M', 'EVT\_TWEAK\_R', 'EVT\_TWEAK\_A', 'EVT\_TWEAK\_S', 'A', 'B', 'C', 'D', 'E', 'F', 'G', 'H', 'T', 'J', 'K', 'L', 'M', 'N', 'O', 'P', 'Q', 'R', 'S', 'T', 'U', 'V', 'W', 'X', 'Y', 'Z', 'ZERO', 'ONE', 'TWO', 'THREE', 'FOUR', 'FIVE', 'SIX', 'SEVEN', 'EIGHT', 'NINE', 'LEFT\_CTRL', 'LEFT\_ALT', 'LEFT\_SHIFT', 'RIGHT\_ALT', 'RIGHT\_CTRL', 'RIGHT\_SHIFT', 'OSKEY', 'GRLESS', 'ESC', 'TAB', 'RET', 'SPACE', 'LINE\_FEED', 'BACK\_SPACE', 'DEL', 'SEMI\_COLON', 'PERIOD', 'COMMA', 'QUOTE', 'ACCENT\_GRAVE', 'MINUS', 'SLASH', 'BACK\_SLASH', 'EQUAL', 'LEFT\_BRACKET', 'RIGHT\_BRACKET', 'LEFT\_ARROW', 'DOWN\_ARROW', 'RIGHT\_ARROW', 'UP\_ARROW', 'NUMPAD\_2', 'NUMPAD\_4', 'NUMPAD\_6', 'NUMPAD\_8', 'NUMPAD\_1', 'NUMPAD\_3', 'NUMPAD\_5', 'NUMPAD\_7', 'NUMPAD\_9', 'NUMPAD\_PERIOD', 'NUMPAD\_SLASH', 'NUMPAD\_ASTERIX', 'NUMPAD\_0', 'NUMPAD\_MINUS', 'NUMPAD\_ENTER', 'NUMPAD\_PLUS', 'F1', 'F2', 'F3', 'F4', 'F5', 'F6', 'F7', 'F8', 'F9', 'F10', 'F11', 'F12', 'F13', 'F14', 'F15', 'F16', 'F17', 'F18', 'F19', 'PAUSE', 'INSERT', 'HOME', 'PAGE\_UP', 'PAGE\_DOWN', 'END', 'MEDIA\_PLAY', 'MEDIA\_STOP', 'MEDIA\_FIRST', 'MEDIA\_LAST', 'WINDOW\_DEACTIVATE', 'TIMER', 'TIMER0', 'TIMER1', 'TIMER2', 'NDOF\_BUTTON\_MENU', 'NDOF\_BUTTON\_FIT', 'NDOF\_BUTTON\_TOP', 'NDOF\_BUTTON\_BOTTOM', 'NDOF\_BUTTON\_LEFT', 'NDOF\_BUTTON\_RIGHT', 'NDOF\_BUTTON\_FRONT', 'NDOF\_BUTTON\_BACK',

```
'NDOF_BUTTON_ISO1', 'NDOF_BUTTON_ISO2', 'NDOF_BUTTON_ROLL_CW',
'NDOF_BUTTON_ROLL_CCW', 'NDOF_BUTTON_SPIN_CCW',
'NDOF_BUTTON_TILT_CCW', 'NDOF_BUTTON_ROTATE',
'NDOF_BUTTON_PANZOOM', 'NDOF_BUTTON_DOMINANT',
'NDOF_BUTTON_PLUS', 'NDOF_BUTTON_MINUS', 'NDOF_BUTTON_1',
'NDOF_BUTTON_2', 'NDOF_BUTTON_3', 'NDOF_BUTTON_4',
'NDOF_BUTTON_5', 'NDOF_BUTTON_6', 'NDOF_BUTTON_7',
'NDOF_BUTTON_8', 'NDOF_BUTTON_9', 'NDOF_BUTTON_10'], default 'NONE'
```

**target**

Property that receive the keystrokes in case a string is logged

**Type** string, default ""

**use\_all\_keys**

Trigger this sensor on any keystroke

**Type** boolean, default False

**Inherited Properties**

- bpy\_struct.id\_data
- Sensor.name
- Sensor.show\_expanded
- Sensor.frequency
- Sensor.invert
- Sensor.use\_level
- Sensor.pin
- Sensor.use\_pulse\_false\_level
- Sensor.use\_pulse\_true\_level
- Sensor.use\_tap
- Sensor.type

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- Sensor.link
- Sensor.unlink

## 2.4.274 Keyframe(bpy\_struct)

base class — `bpy_struct`

**class bpy.types.Keyframe(bpy\_struct)**

Bezier curve point with two handles defining a Keyframe on an F-Curve

**co**

Coordinates of the control point

**Type** float array of 2 items in [-inf, inf], default (0.0, 0.0)

**handle\_left**

Coordinates of the first handle

**Type** float array of 2 items in [-inf, inf], default (0.0, 0.0)

**handle\_left\_type**

Handle types

**Type** enum in ['FREE', 'AUTO', 'VECTOR', 'ALIGNED'], default 'FREE'

**handle\_right**

Coordinates of the second handle

**Type** float array of 2 items in [-inf, inf], default (0.0, 0.0)

**handle\_right\_type**

Handle types

**Type** enum in ['FREE', 'AUTO', 'VECTOR', 'ALIGNED'], default 'FREE'

**interpolation**

Interpolation method to use for segment of the curve from this Keyframe until the next Keyframe

**Type** enum in ['CONSTANT', 'LINEAR', 'BEZIER'], default 'CONSTANT'

**select\_control\_point**

Control point selection status

**Type** boolean, default False

**select\_left\_handle**

Handle 1 selection status

**Type** boolean, default False

**select\_right\_handle**

Handle 2 selection status

**Type** boolean, default False

**type**

The type of keyframe

**Type** enum in ['KEYFRAME', 'BREAKDOWN', 'EXTREME', 'JITTER'], default 'KEYFRAME'

### Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `FCurve.keyframe_points`
- `FCurveKeyframePoints.insert`
- `FCurveKeyframePoints.remove`

## 2.4.275 KeyingSet(`bpy_struct`)

base class — `bpy_struct`

**class bpy.types.KeyingSet (`bpy_struct`)**  
Settings that should be keyframed together

**bl\_options**

Keying set options

**Type** enum set in {‘INSERTKEY\_NEEDED’, ‘INSERTKEY\_VISUAL’, ‘INSERTKEY\_XYZ\_TO\_RGB’}, default {‘INSERTKEY\_NEEDED’}

**is\_path\_absolute**

Keying Set defines specific paths/settings to be keyframed (i.e. is not reliant on context info)

**Type** boolean, default False, (readonly)

**name**

**Type** string, default “”

**paths**

Keying Set Paths to define settings that get keyframed together

**Type** `KeyingSetPaths bpy_prop_collection of KeyingSetPath`, (readonly)

**type\_info**

Callback function defines for built-in Keying Sets

**Type** `KeyingSetInfo`, (readonly)

### Inherited Properties

- bpy\_struct.id\_data

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

### References

- KeyingSetInfo.generate
- KeyingSetInfo.iterator
- KeyingSets.active
- KeyingSets.new
- KeyingSetsAll.active
- Scene.keying\_sets
- Scene.keying\_sets\_all

## 2.4.276 KeyingSetInfo(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.KeyingSetInfo (*bpy\_struct*)  
Callback function defines for builtin Keying Sets

**bl\_idname**

**Type** string, default “”

**bl\_label**

**Type** string, default “”

**bl\_options**

Keying set options

**Type** enum set in {‘INSERTKEY\_NEEDED’, ‘INSERTKEY\_VISUAL’, ‘INSERTKEY\_XYZ\_TO\_RGB’}, default {‘INSERTKEY\_NEEDED’}

**poll** (*context*)

Test if Keying Set can be used or not

**Return type** boolean

**iterator** (*context*, *ks*)

Call generate() on the structs which have properties to be keyframed

**generate** (*context*, *ks*, *data*)

Add Paths to the Keying Set to keyframe the properties of the given data

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- KeyingSet.type\_info

## 2.4.277 KeyingSetPath(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.KeyingSetPath (*bpy\_struct*)

Path to a setting for use in a Keying Set

**array\_index**

Index to the specific setting if applicable

**Type** int in [-inf, inf], default 0

**bl\_options**

Keying set options

**Type** enum set in {'INSERTKEY\_NEEDED', 'INSERTKEY\_VISUAL', 'INSERTKEY\_XYZ\_TO\_RGB'}, default {'INSERTKEY\_NEEDED'}

**data\_path**

Path to property setting

**Type** string, default “”

**group**

Name of Action Group to assign setting(s) for this path to

**Type** string, default “”

**group\_method**

Method used to define which Group-name to use

**Type** enum in ['NAMED', 'NONE', 'KEYINGSET'], default 'NAMED'

**id**

ID-Block that keyframes for Keying Set should be added to (for Absolute Keying Sets only)

**Type** ID

**id\_type**

Type of ID-block that can be used

**Type** enum in ['ACTION', 'ARMATURE', 'BRUSH', 'CAMERA', 'CURVE', 'FONT', 'GREASEPENCIL', 'GROUP', 'IMAGE', 'KEY', 'LAMP', 'LIBRARY', 'LATTICE', 'MATERIAL', 'META', 'MESH', 'NODETREE', 'OBJECT', 'PARTICLE', 'SCENE', 'SCREEN', 'SOUND', 'TEXT', 'TEXTURE', 'WORLD', 'WINDOWMANAGER'], default 'OBJECT'

**use\_entire\_array**

When an ‘array/vector’ type is chosen (Location, Rotation, Color, etc.), entire array is to be used

**Type** boolean, default False

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id

- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `KeyingSet.paths`
- `KeyingSetPaths.active`
- `KeyingSetPaths.add`
- `KeyingSetPaths.remove`

### 2.4.278 KeyingSetPaths(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.KeyingSetPaths` (`bpy_struct`)

Collection of keying set paths

**active**

Active Keying Set used to insert/delete keyframes

**Type** `KeyingSetPath`

**active\_index**

Current Keying Set index

**Type** int in [-inf, inf], default 0

**add** (`target_id`, `data_path`, `index=-1`, `group_method='KEYINGSET'`, `group_name=""`)

Add a new path for the Keying Set.

**Parameters**

- **target\_id** (`ID`) – Target ID, ID-Datablock for the destination.
- **data\_path** (`string`) – Data-Path, RNA-Path to destination property.
- **index** (`int in [-1, inf], (optional)`) – Index, The index of the destination property (i.e. axis of Location/Rotation/etc.), or -1 for the entire array.
- **group\_method** (`enum in ['NAMED', 'NONE', 'KEYINGSET'], (optional)`) – Grouping Method, Method used to define which Group-name to use.
- **group\_name** (`string, (optional)`) – Group Name, Name of Action Group to assign destination to (only if grouping mode is to use this name).

**Returns** New Path, Path created and added to the Keying Set

**Return type** `KeyingSetPath`

**remove** (`path`)

Remove the given path from the Keying Set.

**Parameters** `path` (`KeyingSetPath`, (never None)) – Path

**clear()**

Remove all the paths from the Keying Set.

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `KeyingSet.paths`

## 2.4.279 KeyingSets(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.KeyingSets` (`bpy_struct`)

Scene keying sets

**active**

Active Keying Set used to insert/delete keyframes

**Type** `KeyingSet`

**active\_index**

Current Keying Set index (negative for ‘builtin’ and positive for ‘absolute’)

**Type** int in [-inf, inf], default 0

**new** (`name="KeyingSet"`)

Add a new Keying Set to Scene.

**Parameters** `name` (`string, (optional)`) – Name, Name of Keying Set

**Returns** Newly created Keying Set.

**Return type** `KeyingSet`

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- Scene.keying\_sets

## 2.4.280 KeyingSetsAll(bpy\_struct)

base class — bpy\_struct

**class bpy.types.KeyingSetsAll (bpy\_struct)**

All available keying sets

**active**

Active Keying Set used to insert/delete keyframes

Type KeyingSet

**active\_index**

Current Keying Set index (negative for ‘builtin’ and positive for ‘absolute’)

Type int in [-inf, inf], default 0

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add

- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- Scene.keying\_sets\_all

### 2.4.281 KinematicConstraint(Constraint)

base classes — `bpy_struct, Constraint`

**class bpy.types.KinematicConstraint (Constraint)**

Inverse Kinematics

**chain\_count**

How many bones are included in the IK effect - 0 uses all bones

**Type** int in [0, 255], default 0

**distance**

Radius of limiting sphere

**Type** float in [0, 100], default 0.0

**ik\_type**

**Type** enum in ['COPY\_POSE', 'DISTANCE'], default 'COPY\_POSE'

**iterations**

Maximum number of solving iterations

**Type** int in [1, 10000], default 0

**limit\_mode**

Distances in relation to sphere of influence to allow

**Type** enum in ['LIMITDIST\_INSIDE', 'LIMITDIST\_OUTSIDE', 'LIMITDIST\_ONSURFACE'], default 'LIMITDIST\_INSIDE'

**lock\_location\_x**

Constraint position along X axis

**Type** boolean, default False

**lock\_location\_y**

Constraint position along Y axis

**Type** boolean, default False

**lock\_location\_z**  
Constraint position along Z axis  
**Type** boolean, default False

**lock\_rotation\_x**  
Constraint rotation along X axis  
**Type** boolean, default False

**lock\_rotation\_y**  
Constraint rotation along Y axis  
**Type** boolean, default False

**lock\_rotation\_z**  
Constraint rotation along Z axis  
**Type** boolean, default False

**orient\_weight**  
For Tree-IK: Weight of orientation control for this target  
**Type** float in [0.01, 1], default 0.0

**pole\_angle**  
Pole rotation offset  
**Type** float in [-3.14159, 3.14159], default 0.0

**pole\_subtarget**  
**Type** string, default “”

**pole\_target**  
Object for pole rotation  
**Type** Object

**reference\_axis**  
Constraint axis Lock options relative to Bone or Target reference  
**Type** enum in ['BONE', 'TARGET'], default 'BONE'

**subtarget**  
**Type** string, default “”

**target**  
Target Object  
**Type** Object

**use\_location**  
Chain follows position of target  
**Type** boolean, default False

**use\_rotation**  
Chain follows rotation of target  
**Type** boolean, default False

**use\_stretch**  
Enable IK Stretching  
**Type** boolean, default False

**use\_tail**

Include bone's tail as last element in chain

**Type** boolean, default False

**use\_target**

Disable for targetless IK

**Type** boolean, default False

**weight**

For Tree-IK: Weight of position control for this target

**Type** float in [0.01, 1], default 0.0

## Inherited Properties

- bpy\_struct.id\_data
- Constraint.name
- Constraint.active
- Constraint.mute
- Constraint.show\_expanded
- Constraint.influence
- Constraint.error\_location
- Constraint.owner\_space
- Constraint.is\_proxy\_local
- Constraint.error\_rotation
- Constraint.target\_space
- Constraint.type
- Constraint.is\_valid

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.282 Lamp(ID)

base classes — bpy\_struct, ID

subclasses — `SpotLamp`, `AreaLamp`, `HemiLamp`, `PointLamp`, `SunLamp`

**class bpy.types.Lamp (ID)**

Lamp datablock for lighting a scene

**active\_texture**

Active texture slot being displayed

**Type** `Texture`

**active\_texture\_index**

Index of active texture slot

**Type** int in [0, 17], default 0

**animation\_data**

Animation data for this datablock

**Type** `AnimData`, (readonly)

**color**

Light color

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**distance**

Falloff distance - the light is at half the original intensity at this point

**Type** float in [0, inf], default 0.0

**energy**

Amount of light that the lamp emits

**Type** float in [-inf, inf], default 0.0

**texture\_slots**

Texture slots defining the mapping and influence of textures

**Type** `LampTextureSlots` `bpy_prop_collection` of `LampTextureSlot`, (read-only)

**type**

Type of Lamp

**Type** enum in ['POINT', 'SUN', 'SPOT', 'HEMI', 'AREA'], default 'POINT'

**use\_diffuse**

Lamp does diffuse shading

**Type** boolean, default False

**use\_negative**

Lamp casts negative light

**Type** boolean, default False

**use\_own\_layer**

Illuminates objects only on the same layer the lamp is on

**Type** boolean, default False

**use\_specular**

Lamp creates specular highlights

**Type** boolean, default False

## Inherited Properties

- `bpy_struct.id_data`
- `ID.name`
- `ID.use_fake_user`
- `ID.library`
- `ID.tag`
- `ID.users`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`
- `ID.copy`
- `ID.user_clear`
- `ID.animation_data_create`
- `ID.animation_data_clear`
- `ID.update_tag`

## References

- `BlendData.lamps`
- `BlendDataLamps.new`
- `BlendDataLamps.remove`

## 2.4.283 LampSkySettings(`bpy_struct`)

base class — `bpy_struct`

**class bpy.types.LampSkySettings (`bpy_struct`)**

Sky related settings for a sun lamp

**atmosphere\_distance\_factor**

Multiplier to convert blender units to physical distance

**Type** float in [0, 500], default 0.0

**atmosphere\_extinction**

Extinction scattering contribution factor

**Type** float in [0, 1], default 0.0

**atmosphere\_inscattering**  
Scatter contribution factor

**Type** float in [0, 1], default 0.0

**atmosphere\_turbidity**  
Sky turbidity

**Type** float in [1, 30], default 0.0

**backscattered\_light**  
Backscattered light

**Type** float in [-1, 1], default 0.0

**horizon\_brightness**  
Horizon brightness

**Type** float in [0, 20], default 0.0

**sky\_blend**  
Blend factor with sky

**Type** float in [0, 2], default 0.0

**sky\_blend\_type**  
Blend mode for combining sun sky with world sky

**Type** enum in ['MIX', 'ADD', 'MULTIPLY', 'SUBTRACT', 'SCREEN', 'DIVIDE', 'DIFFERENCE', 'DARKEN', 'LIGHTEN', 'OVERLAY', 'DODGE', 'BURN', 'HUE', 'SATURATION', 'VALUE', 'COLOR', 'SOFT\_LIGHT', 'LINEAR\_LIGHT'], default 'MIX'

**sky\_color\_space**  
Color space to use for internal XYZ->RGB color conversion

**Type** enum in ['SMPTE', 'REC709', 'CIE'], default 'SMPTE'

**sky\_exposure**  
Strength of sky shading exponential exposure correction

**Type** float in [0, 20], default 0.0

**spread**  
Horizon Spread

**Type** float in [0, 10], default 0.0

**sun\_brightness**  
Sun brightness

**Type** float in [0, 10], default 0.0

**sun\_intensity**  
Sun intensity

**Type** float in [0, 10], default 0.0

**sun\_size**  
Sun size

**Type** float in [0, 10], default 0.0

**use\_atmosphere**  
Apply sun effect on atmosphere

**Type** boolean, default False

**use\_sky**

Apply sun effect on sky

**Type** boolean, default False

**Inherited Properties**

- bpy\_struct.id\_data

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

**References**

- SunLamp.sky

## 2.4.284 LampTextureSlot(TextureSlot)

base classes — bpy\_struct, TextureSlot

**class** bpy.types.**LampTextureSlot** (*TextureSlot*)  
Texture slot for textures in a Lamp datablock

**color\_factor**

Amount texture affects color values

**Type** float in [-inf, inf], default 0.0

**object**

Object to use for mapping with Object texture coordinates

**Type** Object

**shadow\_factor**

Amount texture affects shadow

**Type** float in [-inf, inf], default 0.0

**texture\_coords**

**Type** enum in ['GLOBAL', 'VIEW', 'OBJECT'], default 'GLOBAL'

**use\_map\_color**

Lets the texture affect the basic color of the lamp

**Type** boolean, default False

**use\_map\_shadow**

Lets the texture affect the shadow color of the lamp

**Type** boolean, default False

**Inherited Properties**

- bpy\_struct.id\_data
- TextureSlot.name
- TextureSlot.blend\_type
- TextureSlot.color
- TextureSlot.default\_value
- TextureSlot.invert
- TextureSlot.offset
- TextureSlot.output\_node
- TextureSlot.use\_rgb\_to\_intensity
- TextureSlot.scale
- TextureSlot.use\_stencil
- TextureSlot.texture

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

**References**

- Lamp.texture\_slots
- LampTextureSlots.add
- LampTextureSlots.create

## 2.4.285 LampTextureSlots(bpy\_struct)

base class — `bpy_struct`

**class** `bpy.types.LampTextureSlots(bpy_struct)`  
Collection of texture slots

**classmethod add()**  
add

**Returns** The newly initialized mtex.

**Return type** `LampTextureSlot`

**classmethod create(index)**  
create

**Parameters** `index (int in [0, inf])` – Index, Slot index to initialize.

**Returns** The newly initialized mtex.

**Return type** `LampTextureSlot`

**classmethod clear(index)**  
clear

**Parameters** `index (int in [0, inf])` – Index, Slot index to clear.

### Inherited Properties

- `bpy_struct.id_data`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

### References

- `Lamp.texture_slots`

## 2.4.286 Lattice(ID)

base classes — `bpy_struct`, `ID`

**class bpy.types.Lattice(ID)**  
Lattice datablock defining a grid for deforming other objects

**animation\_data**  
Animation data for this datablock

**Type** `AnimData`, (readonly)

**interpolation\_type\_u**

**Type** enum in [‘KEY\_LINEAR’, ‘KEY\_CARDINAL’, ‘KEY\_BSPLINE’], default ‘KEY\_LINEAR’

**interpolation\_type\_v**

**Type** enum in [‘KEY\_LINEAR’, ‘KEY\_CARDINAL’, ‘KEY\_BSPLINE’], default ‘KEY\_LINEAR’

**interpolation\_type\_w**

**Type** enum in [‘KEY\_LINEAR’, ‘KEY\_CARDINAL’, ‘KEY\_BSPLINE’], default ‘KEY\_LINEAR’

**points**  
Points of the lattice

**Type** `bpy_prop_collection` of `LatticePoint`, (readonly)

**points\_u**  
Points in U direction (can’t be changed when there are shape keys)

**Type** int in [1, 64], default 0

**points\_v**  
Points in V direction (can’t be changed when there are shape keys)

**Type** int in [1, 64], default 0

**points\_w**  
Points in W direction (can’t be changed when there are shape keys)

**Type** int in [1, 64], default 0

**shape\_keys**

**Type** `Key`, (readonly)

**use\_outside**  
Only draw, and take into account, the outer vertices

**Type** boolean, default False

**vertex\_group**  
Vertex group to apply the influence of the lattice

**Type** string, default “”

### Inherited Properties

- `bpy_struct.id_data`

- ID.name
- ID.use\_fake\_user
- ID.library
- ID.tag
- ID.users

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- ID.copy
- ID.user\_clear
- ID.animation\_data\_create
- ID.animation\_data\_clear
- ID.update\_tag

### References

- BlendData.lattices
- BlendDataLattices.new
- BlendDataLattices.remove

## 2.4.287 LatticeModifier(Modifier)

base classes — `bpy_struct, Modifier`

**class** `bpy.types.LatticeModifier(Modifier)`  
Lattice deformation modifier

**object**  
Lattice object to deform with  
**Type** `Object`

**vertex\_group**  
Name of Vertex Group which determines influence of modifier per point  
**Type** `string, default “”`

## Inherited Properties

- bpy\_struct.id\_data
- Modifier.name
- Modifier.use\_apply\_on\_spline
- Modifier.show\_in\_editmode
- Modifier.show\_expanded
- Modifier.show\_on\_cage
- Modifier.show\_viewport
- Modifier.show\_render
- Modifier.type

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.288 LatticePoint(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.LatticePoint (*bpy\_struct*)  
Point in the lattice grid

**co**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0), (readonly)

**co\_deform**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**groups**

Weights for the vertex groups this point is member of

**Type** bpy\_prop\_collection of VertexGroupElement, (readonly)

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `Lattice.points`

## 2.4.289 Library(ID)

base classes — `bpy_struct, ID`

**class bpy.types.Library (ID)**

External .blend file from which data is linked

**filepath**

Path to the library .blend file

**Type** string, default “”

**parent**

**Type** `Library`, (readonly)

**users\_id**

ID datablocks which use this library (readonly)

## Inherited Properties

- `bpy_struct.id_data`
- `ID.name`
- `ID.use_fake_user`
- `ID.library`
- `ID.tag`
- `ID.users`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`
- `ID.copy`
- `ID.user_clear`
- `ID.animation_data_create`
- `ID.animation_data_clear`
- `ID.update_tag`

## References

- `BlendData.libraries`
- `ID.library`
- `Library.parent`

## 2.4.290 LimitDistanceConstraint(Constraint)

base classes — `bpy_struct, Constraint`

**class bpy.types.LimitDistanceConstraint (Constraint)**

Limits the distance from target object

### **distance**

Radius of limiting sphere

**Type** float in [0, 100], default 0.0

### **limit\_mode**

Distances in relation to sphere of influence to allow

**Type** enum in ['LIMITDIST\_INSIDE', 'LIMITDIST\_OUTSIDE', 'LIMITDIST\_ONSURFACE'], default 'LIMITDIST\_INSIDE'

### **subtarget**

**Type** string, default ""

### **target**

Target Object

**Type** Object

## Inherited Properties

- bpy\_struct.id\_data
- Constraint.name
- Constraint.active
- Constraint.mute
- Constraint.show\_expanded
- Constraint.influence
- Constraint.error\_location
- Constraint.owner\_space
- Constraint.is\_proxy\_local
- Constraint.error\_rotation
- Constraint.target\_space
- Constraint.type
- Constraint.is\_valid

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.291 LimitLocationConstraint(Constraint)

base classes — bpy\_struct, Constraint

**class bpy.types.LimitLocationConstraint (Constraint)**  
Limits the location of the constrained object

**max\_x**

Highest X value to allow

**Type** float in [-1000, 1000], default 0.0

**max\_y**

Highest Y value to allow

**Type** float in [-1000, 1000], default 0.0

**max\_z**

Highest Z value to allow

**Type** float in [-1000, 1000], default 0.0

**min\_x**

Lowest X value to allow

**Type** float in [-1000, 1000], default 0.0

**min\_y**

Lowest Y value to allow

**Type** float in [-1000, 1000], default 0.0

**min\_z**

Lowest Z value to allow

**Type** float in [-1000, 1000], default 0.0

**use\_max\_x**

Use the maximum X value

**Type** boolean, default False

**use\_max\_y**

Use the maximum Y value

**Type** boolean, default False

**use\_max\_z**

Use the maximum Z value

**Type** boolean, default False

**use\_min\_x**

Use the minimum X value

**Type** boolean, default False

**use\_min\_y**

Use the minimum Y value

**Type** boolean, default False

**use\_min\_z**

Use the minimum Z value

**Type** boolean, default False

**use\_transform\_limit**

Transforms are affected by this constraint as well

**Type** boolean, default False

## Inherited Properties

- `bpy_struct.id_data`
- `Constraint.name`
- `Constraint.active`
- `Constraint.mute`
- `Constraint.show_expanded`
- `Constraint.influence`
- `Constraint.error_location`
- `Constraint.owner_space`
- `Constraint.is_proxy_local`

- Constraint.error\_rotation
- Constraint.target\_space
- Constraint.type
- Constraint.is\_valid

#### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.292 LimitRotationConstraint(Constraint)

base classes — bpy\_struct, Constraint

**class bpy.types.LimitRotationConstraint (Constraint)**  
Limits the rotation of the constrained object

**max\_x**

Highest X value to allow

**Type** float in [-1000, 1000], default 0.0

**max\_y**

Highest Y value to allow

**Type** float in [-1000, 1000], default 0.0

**max\_z**

Highest Z value to allow

**Type** float in [-1000, 1000], default 0.0

**min\_x**

Lowest X value to allow

**Type** float in [-1000, 1000], default 0.0

**min\_y**

Lowest Y value to allow

**Type** float in [-1000, 1000], default 0.0

**min\_z**

Lowest Z value to allow

**Type** float in [-1000, 1000], default 0.0

**use\_limit\_x**

Use the minimum X value

**Type** boolean, default False

**use\_limit\_y**

Use the minimum Y value

**Type** boolean, default False

**use\_limit\_z**

Use the minimum Z value

**Type** boolean, default False

**use\_transform\_limit**

Transforms are affected by this constraint as well

**Type** boolean, default False

## Inherited Properties

- bpy\_struct.id\_data
- Constraint.name
- Constraint.active
- Constraint.mute
- Constraint.show\_expanded
- Constraint.influence
- Constraint.error\_location
- Constraint.owner\_space
- Constraint.is\_proxy\_local
- Constraint.error\_rotation
- Constraint.target\_space
- Constraint.type
- Constraint.is\_valid

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.293 LimitScaleConstraint(Constraint)

base classes — `bpy_struct`, `Constraint`

`class bpy.types.LimitScaleConstraint (Constraint)`  
Limits the scaling of the constrained object

**max\_x**

Highest X value to allow

**Type** float in [-1000, 1000], default 0.0

**max\_y**

Highest Y value to allow

**Type** float in [-1000, 1000], default 0.0

**max\_z**

Highest Z value to allow

**Type** float in [-1000, 1000], default 0.0

**min\_x**

Lowest X value to allow

**Type** float in [-1000, 1000], default 0.0

**min\_y**

Lowest Y value to allow

**Type** float in [-1000, 1000], default 0.0

**min\_z**

Lowest Z value to allow

**Type** float in [-1000, 1000], default 0.0

**use\_max\_x**

Use the maximum X value

**Type** boolean, default False

**use\_max\_y**

Use the maximum Y value

**Type** boolean, default False

**use\_max\_z**

Use the maximum Z value

**Type** boolean, default False

**use\_min\_x**

Use the minimum X value

**Type** boolean, default False

**use\_min\_y**

Use the minimum Y value

**Type** boolean, default False

**use\_min\_z**

Use the minimum Z value

**Type** boolean, default False

**use\_transform\_limit**

Transforms are affected by this constraint as well

**Type** boolean, default False

**Inherited Properties**

- bpy\_struct.id\_data
- Constraint.name
- Constraint.active
- Constraint.mute
- Constraint.show\_expanded
- Constraint.influence
- Constraint.error\_location
- Constraint.owner\_space
- Constraint.is\_proxy\_local
- Constraint.error\_rotation
- Constraint.target\_space
- Constraint.type
- Constraint.is\_valid

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.294 LockedTrackConstraint(Constraint)

base classes — bpy\_struct, Constraint

**class bpy.types.LockedTrackConstraint(Constraint)**

Points toward the target along the track axis, while locking the other axis

**lock\_axis**

Axis that points upward

**Type** enum in ['LOCK\_X', 'LOCK\_Y', 'LOCK\_Z'], default 'LOCK\_X'

**subtarget**

**Type** string, default “”

**target**

Target Object

**Type** Object

**track\_axis**

Axis that points to the target object

**Type** enum in ['TRACK\_X', 'TRACK\_Y', 'TRACK\_Z', 'TRACK\_NEGATIVE\_X', 'TRACK\_NEGATIVE\_Y', 'TRACK\_NEGATIVE\_Z'], default 'TRACK\_X'

## Inherited Properties

- bpy\_struct.id\_data
- Constraint.name
- Constraint.active
- Constraint.mute
- Constraint.show\_expanded
- Constraint.influence
- Constraint.error\_location
- Constraint.owner\_space
- Constraint.is\_proxy\_local
- Constraint.error\_rotation
- Constraint.target\_space
- Constraint.type
- Constraint.is\_valid

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.295 Macro(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.Macro (*bpy\_struct*)

Storage of a macro operator being executed, or registered after execution

**bl\_description**

**Type** string, default “”

**bl\_idname**

**Type** string, default “”

**bl\_label**

**Type** string, default “”

**bl\_options**

Options for this operator type

**Type** enum set in {‘REGISTER’, ‘UNDO’, ‘BLOCKING’, ‘MACRO’, ‘GRAB\_POINTER’, ‘PRESET’, ‘INTERNAL’}, default {‘REGISTER’}

**name**

**Type** string, default “”, (readonly)

**properties**

**Type** `OperatorProperties`, (readonly, never None)

**report** (*type, message*)

report

**Parameters**

- **type** (enum set in {‘DEBUG’, ‘INFO’, ‘OPERATOR’, ‘WARNING’, ‘ERROR’, ‘ERROR\_INVALID\_INPUT’, ‘ERROR\_INVALID\_CONTEXT’, ‘ERROR\_OUT\_OF\_MEMORY’}) – Type
- **message** (string) – Report Message

**classmethod poll** (*context*)

Test if the operator can be called or not.

**Return type** boolean

**draw** (*context*)

Draw function for the operator.

**define** (*opname*)**Inherited Properties**

- `bpy_struct.id_data`

**Inherited Functions**

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`

- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.296 MagicTexture(Texture)

base classes — bpy\_struct, ID, Texture

**class** bpy.types.MagicTexture (*Texture*)

Procedural noise texture

**noise\_depth**

Sets the depth of the cloud calculation

**Type** int in [0, 30], default 0

**turbulence**

Sets the turbulence of the bandnoise and ringnoise types

**Type** float in [0.0001, inf], default 0.0

**users\_material**

Materials that use this texture (readonly)

**users\_object\_modifier**

Object modifiers that use this texture (readonly)

### Inherited Properties

- bpy\_struct.id\_data
- ID.name
- ID.use\_fake\_user
- ID.library
- ID.tag
- ID.users
- Texture.animation\_data
- Texture.intensity
- Texture.color\_ramp
- Texture.contrast
- Texture.factor\_blue
- Texture.factor\_green
- Texture.factor\_red
- Texture.node\_tree
- Texture.saturation
- Texture.use\_preview\_alpha
- Texture.type
- Texture.use\_color\_ramp
- Texture.use\_nodes
- Texture.users\_material
- Texture.users\_object\_modifier

- `Texture.users_material`
- `Texture.users_object_modifier`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`
- `ID.copy`
- `ID.user_clear`
- `ID.animation_data_create`
- `ID.animation_data_clear`
- `ID.update_tag`

## 2.4.297 MaintainVolumeConstraint(Constraint)

base classes — `bpy_struct, Constraint`

`class bpy.types.MaintainVolumeConstraint (Constraint)`

Maintains a constant volume along a single scaling axis

**free\_axis**

The free scaling axis of the object

**Type** enum in ['SAMEVOL\_X', 'SAMEVOL\_Y', 'SAMEVOL\_Z'], default 'SAMEVOL\_X'

**volume**

Volume of the bone at rest

**Type** float in [0.001, 100], default 0.0

### Inherited Properties

- `bpy_struct.id_data`
- `Constraint.name`
- `Constraint.active`
- `Constraint.mute`
- `Constraint.show_expanded`
- `Constraint.influence`
- `Constraint.error_location`
- `Constraint.owner_space`

- Constraint.is\_proxy\_local
- Constraint.error\_rotation
- Constraint.target\_space
- Constraint.type
- Constraint.is\_valid

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.298 MarbleTexture(Texture)

base classes — bpy\_struct, ID, Texture

**class** bpy.types.MarbleTexture (*Texture*)

Procedural noise texture

**marble\_type**

**Type** enum in ['SOFT', 'SHARP', 'SHARPER'], default 'SOFT'

**nabla**

Size of derivative offset used for calculating normal

**Type** float in [0.001, 0.1], default 0.0

**noise\_basis**

Sets the noise basis used for turbulence

**Type** enum in ['BLENDER\_ORIGINAL', 'ORIGINAL\_PERLIN', 'IMPROVED\_PERLIN', 'VORONOI\_F1', 'VORONOI\_F2', 'VORONOI\_F3', 'VORONOI\_F4', 'VORONOI\_F2\_F1', 'VORONOI\_CRACKLE', 'CELL\_NOISE'], default 'BLENDER\_ORIGINAL'

**noise\_basis\_2**

**Type** enum in ['SIN', 'SAW', 'TRI'], default 'SIN'

**noise\_depth**

Sets the depth of the cloud calculation

**Type** int in [0, 30], default 0

**noise\_scale**

Sets scaling for noise input

**Type** float in [0.0001, inf], default 0.0

**noise\_type**

**Type** enum in ['SOFT\_NOISE', 'HARD\_NOISE'], default 'SOFT\_NOISE'

**turbulence**

Sets the turbulence of the bandnoise and ringnoise types

**Type** float in [0.0001, inf], default 0.0

**users\_material**

Materials that use this texture (readonly)

**users\_object\_modifier**

Object modifiers that use this texture (readonly)

**Inherited Properties**

- bpy\_struct.id\_data
- ID.name
- ID.use\_fake\_user
- ID.library
- ID.tag
- ID.users
- Texture.animation\_data
- Texture.intensity
- Texture.color\_ramp
- Texture.contrast
- Texture.factor\_blue
- Texture.factor\_green
- Texture.factor\_red
- Texture.node\_tree
- Texture.saturation
- Texture.use\_preview\_alpha
- Texture.type
- Texture.use\_color\_ramp
- Texture.use\_nodes
- Texture.users\_material
- Texture.users\_object\_modifier
- Texture.users\_material
- Texture.users\_object\_modifier

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set

- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- ID.copy
- ID.user\_clear
- ID.animation\_data\_create
- ID.animation\_data\_clear
- ID.update\_tag

## 2.4.299 MaskModifier(Modifier)

base classes — bpy\_struct, Modifier

**class** bpy.types.**MaskModifier** (*Modifier*)

    Mask modifier to hide parts of the mesh

**armature**

    Armature to use as source of bones to mask

**Type** Object

**invert\_vertex\_group**

    Use vertices that are not part of region defined

**Type** boolean, default False

**mode**

**Type** enum in ['VERTEX\_GROUP', 'ARMATURE'], default 'VERTEX\_GROUP'

**vertex\_group**

    Vertex group name

**Type** string, default ""

### Inherited Properties

- bpy\_struct.id\_data
- Modifier.name
- Modifier.use\_apply\_on\_spline
- Modifier.show\_in\_editmode
- Modifier.show\_expanded
- Modifier.show\_on\_cage
- Modifier.show\_viewport
- Modifier.show\_render
- Modifier.type

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add

- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.300 Material(ID)

base classes — `bpy_struct, ID`

**class bpy.types.Material (ID)**

Material datablock to defined the appearance of geometric objects for rendering

**active\_node\_material**

Active node material

**Type** `Material`

**active\_texture**

Active texture slot being displayed

**Type** `Texture`

**active\_texture\_index**

Index of active texture slot

**Type** int in [0, 17], default 0

**alpha**

Alpha transparency of the material

**Type** float in [0, 1], default 0.0

**ambient**

Amount of global ambient color the material receives

**Type** float in [0, 1], default 0.0

**animation\_data**

Animation data for this datablock

**Type** `AnimData`, (readonly)

**darkness**

Minnaert darkness

**Type** float in [0, 2], default 0.0

**diffuse\_color**

Diffuse color of the material

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**diffuse\_fresnel**

Power of Fresnel

**Type** float in [0, 5], default 0.0

**diffuse\_fresnel\_factor**

Blending factor of Fresnel

**Type** float in [0, 5], default 0.0

**diffuse\_intensity**

Amount of diffuse reflection

**Type** float in [0, 1], default 0.0

**diffuse\_ramp**

Color ramp used to affect diffuse shading

**Type** [ColorRamp](#), (readonly)

**diffuse\_ramp\_blend**

Blending method of the ramp and the diffuse color

**Type** enum in ['MIX', 'ADD', 'MULTIPLY', 'SUBTRACT', 'SCREEN', 'DIVIDE', 'DIFFERENCE', 'DARKEN', 'LIGHTEN', 'OVERLAY', 'DODGE', 'BURN', 'HUE', 'SATURATION', 'VALUE', 'COLOR', 'SOFT\_LIGHT', 'LINEAR\_LIGHT'], default 'MIX'

**diffuse\_ramp\_factor**

Blending factor (also uses alpha in Colorband)

**Type** float in [0, 1], default 0.0

**diffuse\_ramp\_input**

Determines how the ramp maps on the surface

**Type** enum in ['SHADER', 'ENERGY', 'NORMAL', 'RESULT'], default 'SHADER'

**diffuse\_shader**

**Type** enum in ['LAMBERT', 'OREN\_NAYAR', 'TOON', 'MINNAERT', 'FRESNEL'], default 'LAMBERT'

**diffuse\_toon\_size**

Size of diffuse toon area

**Type** float in [0, 3.14], default 0.0

**diffuse\_toon\_smooth**

Smoothness of diffuse toon area

**Type** float in [0, 1], default 0.0

**emit**

Amount of light to emit

**Type** float in [0, inf], default 0.0

**halo**

Halo settings for the material

**Type** [MaterialHalo](#), (readonly, never None)

**invert\_z**

Renders material's faces with an inverted Z buffer (scanline only)

**Type** boolean, default False

**light\_group**

Limit lighting to lamps in this Group

**Type** [Group](#)

**mirror\_color**

Mirror color of the material

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**node\_tree**

Node tree for node based materials

**Type** [NodeTree](#), (readonly)

**offset\_z**

Gives faces an artificial offset in the Z buffer for Z transparency

**Type** float in [-inf, inf], default 0.0

**pass\_index**

Index # for the IndexMA render pass

**Type** int in [0, 32767], default 0

**physics**

Game physics settings

**Type** [MaterialPhysics](#), (readonly, never None)

**preview\_render\_type**

Type of preview render

**Type** enum in ['FLAT', 'SPHERE', 'CUBE', 'MONKEY', 'HAIR', 'SPHERE\_A'], default 'FLAT'

**raytrace\_mirror**

Raytraced reflection settings for the material

**Type** [MaterialRaytraceMirror](#), (readonly, never None)

**raytrace\_transparency**

Raytraced transparency settings for the material

**Type** [MaterialRaytraceTransparency](#), (readonly, never None)

**roughness**

Oren-Nayar Roughness

**Type** float in [0, 3.14], default 0.0

**shadow\_buffer\_bias**

Factor to multiply shadow buffer bias with (0 is ignore.)

**Type** float in [0, 10], default 0.0

**shadow\_cast\_alpha**

Shadow casting alpha, in use for Irregular and Deep shadow buffer

**Type** float in [0.001, 1], default 0.0

**shadow\_only\_type**

How to draw shadows

**Type** enum in ['SHADOW\_ONLY\_OLD', 'SHADOW\_ONLY', 'SHADOW\_ONLY\_SHADED'], default 'SHADOW\_ONLY\_OLD'

**shadow\_ray\_bias**

Shadow raytracing bias to prevent terminator problems on shadow boundary

**Type** float in [0, 0.25], default 0.0

**specular\_alpha**

Alpha transparency for specular areas

**Type** float in [0, 1], default 0.0

**specular\_color**

Specular color of the material

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**specular\_hardness**

How hard (sharp) the specular reflection is

**Type** int in [1, 511], default 0

**specular\_intensity**

How intense (bright) the specular reflection is

**Type** float in [0, 1], default 0.0

**specular\_ior**

Specular index of refraction

**Type** float in [1, 10], default 0.0

**specular\_ramp**

Color ramp used to affect specular shading

**Type** [ColorRamp](#), (readonly)

**specular\_ramp\_blend**

Blending method of the ramp and the specular color

**Type** enum in ['MIX', 'ADD', 'MULTIPLY', 'SUBTRACT', 'SCREEN', 'DIVIDE', 'DIFFERENCE', 'DARKEN', 'LIGHTEN', 'OVERLAY', 'DODGE', 'BURN', 'HUE', 'SATURATION', 'VALUE', 'COLOR', 'SOFT\_LIGHT', 'LINEAR\_LIGHT'], default 'MIX'

**specular\_ramp\_factor**

Blending factor (also uses alpha in Colorband)

**Type** float in [0, 1], default 0.0

**specular\_ramp\_input**

Determines how the ramp maps on the surface

**Type** enum in ['SHADER', 'ENERGY', 'NORMAL', 'RESULT'], default 'SHADER'

**specular\_shader**

**Type** enum in ['COOKTORR', 'PHONG', 'BLINN', 'TOON', 'WARDISO'], default 'COOKTORR'

**specular\_slope**

The standard deviation of surface slope

**Type** float in [0, 0.4], default 0.0

**specular\_toon\_size**

Size of specular toon area

**Type** float in [0, 1.53], default 0.0

**specular\_toon\_smooth**

Smoothness of specular toon area

**Type** float in [0, 1], default 0.0

**strand**

Strand settings for the material

**Type** MaterialStrand, (readonly, never None)

**subsurface\_scattering**

Subsurface scattering settings for the material

**Type** MaterialSubsurfaceScattering, (readonly, never None)

**texture\_slots**

Texture slots defining the mapping and influence of textures

**Type** MaterialTextureSlots      bpy\_prop\_collection  
MaterialTextureSlot, (readonly)

**translucency**

Amount of diffuse shading on the back side

**Type** float in [0, 1], default 0.0

**transparency\_method**

Method to use for rendering transparency

**Type** enum in ['MASK', 'Z\_TRANSPARENCY', 'RAYTRACE'], default 'MASK'

**type**

Material type defining how the object is rendered

**Type** enum in ['SURFACE', 'WIRE', 'VOLUME', 'HALO'], default 'SURFACE'

**use\_cast\_approximate**

Allow this material to cast shadows when using approximate ambient occlusion.

**Type** boolean, default False

**use\_cast\_buffer\_shadows**

Allow this material to cast shadows from shadow buffer lamps

**Type** boolean, default False

**use\_cast\_shadows\_only**

Makes objects with this material appear invisible, only casting shadows (not rendered)

**Type** boolean, default False

**use\_cubic**

Use cubic interpolation for diffuse values, for smoother transitions

**Type** boolean, default False

**use\_diffuse\_ramp**

Toggle diffuse ramp operations

**Type** boolean, default False

**use\_face\_texture**

Replaces the object's base color with color from face assigned image textures

**Type** boolean, default False

**use\_face\_texture\_alpha**

Replaces the object's base alpha value with alpha from face assigned image textures

**Type** boolean, default False

**use\_full\_oversampling**

Force this material to render full shading/textures for all anti-aliasing samples

**Type** boolean, default False

**use\_light\_group\_exclusive**

Material uses the light group exclusively - these lamps are excluded from other scene lighting

**Type** boolean, default False

**use\_mist**

Use mist with this material (in world settings)

**Type** boolean, default False

**use\_nodes**

Use shader nodes to render the material

**Type** boolean, default False

**use\_object\_color**

Modulate the result with a per-object color

**Type** boolean, default False

**use\_only\_shadow**

Renders shadows as the material's alpha value, making materials transparent except for shadowed areas

**Type** boolean, default False

**use\_ray\_shadow\_bias**

Prevents raytraced shadow errors on surfaces with smooth shaded normals (terminator problem)

**Type** boolean, default False

**use\_raytrace**

Include this material and geometry that uses it in ray tracing calculations

**Type** boolean, default False

**use\_shadeless**

Makes this material insensitive to light or shadow

**Type** boolean, default False

**use\_shadows**

Allows this material to receive shadows

**Type** boolean, default False

**use\_sky**

Renders this material with zero alpha, with sky background in place (scanline only)

**Type** boolean, default False

**use\_specular\_ramp**

Toggle specular ramp operations

**Type** boolean, default False

**use\_tangent\_shading**

Use the material's tangent vector instead of the normal for shading - for anisotropic shading effects

**Type** boolean, default False

**use\_textures**  
Enable/Disable each texture

**Type** boolean array of 18 items, default (False, False, False)

**use\_transparency**  
Render material as transparent

**Type** boolean, default False

**use.Transparent\_shadows**  
Allow this object to receive transparent shadows cast through other objects

**Type** boolean, default False

**use.Vertex\_color\_light**  
Add vertex colors as additional lighting

**Type** boolean, default False

**use.Vertex\_color\_paint**  
Replaces object base color with vertex colors (multiplies with ‘texture face’ face assigned textures)

**Type** boolean, default False

**volume**  
Volume settings for the material

**Type** MaterialVolume, (readonly, never None)

## Inherited Properties

- bpy\_struct.id\_data
- ID.name
- ID.use\_fake\_user
- ID.library
- ID.tag
- ID.users

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve

- bpy\_struct.type\_recast
- bpy\_struct.values
- ID.copy
- ID.user\_clear
- ID.animation\_data\_create
- ID.animation\_data\_clear
- ID.update\_tag

## References

- BlendData.materials
- BlendDataMaterials.new
- BlendDataMaterials.remove
- Curve.materials
- IDMaterials.append
- IDMaterials.pop
- Material.active\_node\_material
- MaterialSlot.material
- Mesh.materials
- MetaBall.materials
- Object.active\_material
- RenderLayer.material\_override
- SceneRenderLayer.material\_override
- ShaderNodeExtendedMaterial.material
- ShaderNodeMaterial.material
- TouchSensor.material

### 2.4.301 MaterialHalo(bpy\_struct)

base class — bpy\_struct

**class bpy.types.MaterialHalo (bpy\_struct)**  
Halo particle effect settings for a Material datablock

**add**  
Sets the strength of the add effect  
**Type** float in [0, 1], default 0.0

**flare\_boost**  
Gives the flare extra strength  
**Type** float in [0.1, 10], default 0.0

**flare\_seed**  
Specifies an offset in the flare seed table  
**Type** int in [0, 255], default 0

**flare\_size**  
Sets the factor by which the flare is larger than the halo  
**Type** float in [0.1, 25], default 0.0

**flare\_subflare\_count**  
Sets the number of sub-flares  
**Type** int in [1, 32], default 0

**flare\_subflare\_size**

Sets the dimension of the sub-flares, dots and circles

**Type** float in [0.1, 25], default 0.0

**hardness**

Sets the hardness of the halo

**Type** int in [0, 127], default 0

**line\_count**

Sets the number of star shaped lines rendered over the halo

**Type** int in [0, 250], default 0

**ring\_count**

Sets the number of rings rendered over the halo

**Type** int in [0, 24], default 0

**seed**

Randomizes ring dimension and line location

**Type** int in [0, 255], default 0

**size**

Sets the dimension of the halo

**Type** float in [0, 100], default 0.0

**star\_tip\_count**

Sets the number of points on the star shaped halo

**Type** int in [3, 50], default 0

**use\_extreme\_alpha**

Uses extreme alpha

**Type** boolean, default False

**use\_flare\_mode**

Renders halo as a lens flare

**Type** boolean, default False

**use\_lines**

Renders star shaped lines over halo

**Type** boolean, default False

**use\_ring**

Renders rings over halo

**Type** boolean, default False

**use\_shaded**

Lets halo receive light and shadows from external objects

**Type** boolean, default False

**use\_soft**

Softens the edges of halos at intersections with other geometry

**Type** boolean, default False

**use\_star**

Renders halo as a star

**Type** boolean, default False

**use\_texture**

Gives halo a texture

**Type** boolean, default False

**use\_vertex\_normal**

Uses the vertex normal to specify the dimension of the halo

**Type** boolean, default False

### Inherited Properties

- bpy\_struct.id\_data

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

### References

- Material.halo

## 2.4.302 MaterialPhysics(bpy\_struct)

base class — bpy\_struct

**class bpy.types.MaterialPhysics(bpy\_struct)**

Physics settings for a Material datablock

**elasticity**

Elasticity of collisions

**Type** float in [0, 1], default 0.0

**fh\_damping**

Damping of the spring force, when inside the physics distance area

**Type** float in [0, 1], default 0.0

**fh\_distance**

Distance of the physics area

**Type** float in [0, 20], default 0.0

**fh\_force**

Upward spring force, when inside the physics distance area

**Type** float in [0, 1], default 0.0

**friction**

Coulomb friction coefficient, when inside the physics distance area

**Type** float in [0, 100], default 0.0

**use\_fh\_normal**

Align dynamic game objects along the surface normal, when inside the physics distance area

**Type** boolean, default False

**Inherited Properties**

- bpy\_struct.id\_data

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

**References**

- Material.physics

## 2.4.303 MaterialRaytraceMirror(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.**MaterialRaytraceMirror** (*bpy\_struct*)  
Raytraced reflection settings for a Material datablock

**depth**

Maximum allowed number of light inter-reflections

**Type** int in [0, 32767], default 0

**distance**

Maximum distance of reflected rays. Reflections further than this range fade to sky color or material color

**Type** float in [0, 10000], default 0.0

**fade\_to**

The color that rays with no intersection within the Max Distance take. Material color can be best for indoor scenes, sky color for outdoor

**Type** enum in ['FADE\_TO\_SKY', 'FADE\_TO\_MATERIAL'], default 'FADE\_TO\_SKY'

**fresnel**

Power of Fresnel for mirror reflection

**Type** float in [0, 5], default 0.0

**fresnel\_factor**

Blending factor for Fresnel

**Type** float in [0, 5], default 0.0

**gloss\_anisotropic**

The shape of the reflection, from 0.0 (circular) to 1.0 (fully stretched along the tangent)

**Type** float in [0, 1], default 0.0

**gloss\_factor**

The shininess of the reflection. Values < 1.0 give diffuse, blurry reflections

**Type** float in [0, 1], default 0.0

**gloss\_samples**

Number of cone samples averaged for blurry reflections

**Type** int in [0, 1024], default 0

**gloss\_threshold**

Threshold for adaptive sampling. If a sample contributes less than this amount (as a percentage), sampling is stopped

**Type** float in [0, 1], default 0.0

**reflect\_factor**

Sets the amount mirror reflection for raytrace

**Type** float in [0, 1], default 0.0

**use**

Enable raytraced reflections

**Type** boolean, default False

**Inherited Properties**

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `Material.raytrace_mirror`

### 2.4.304 MaterialRaytraceTransparency(`bpy_struct`)

base class — `bpy_struct`

**class bpy.types.MaterialRaytraceTransparency(`bpy_struct`)**

Raytraced refraction settings for a Material datablock

#### **depth**

Maximum allowed number of light inter-refractions

**Type** int in [0, 32767], default 0

#### **depth\_max**

Maximum depth for light to travel through the transparent material before becoming fully filtered (0.0 is disabled)

**Type** float in [0, 100], default 0.0

#### **falloff**

Falloff power for transmissivity filter effect (1.0 is linear)

**Type** float in [0.1, 10], default 0.0

#### **filter**

Amount to blend in the material's diffuse color in raytraced transparency (simulating absorption)

**Type** float in [0, 1], default 0.0

#### **fresnel**

Power of Fresnel for transparency (Ray or ZTransp)

**Type** float in [0, 5], default 0.0

#### **fresnel\_factor**

Blending factor for Fresnel

**Type** float in [1, 5], default 0.0

**gloss\_factor**

The clarity of the refraction. Values < 1.0 give diffuse, blurry refractions

**Type** float in [0, 1], default 0.0

**gloss\_samples**

Number of cone samples averaged for blurry refractions

**Type** int in [0, 1024], default 0

**gloss\_threshold**

Threshold for adaptive sampling. If a sample contributes less than this amount (as a percentage), sampling is stopped

**Type** float in [0, 1], default 0.0

**ior**

Sets angular index of refraction for raytraced refraction

**Type** float in [0.25, 4], default 0.0

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `Material.raytrace_transparency`

## 2.4.305 MaterialSlot(bpy\_struct)

base class — `bpy_struct`

```
class bpy.types.MaterialSlot(bpy_struct)
    Material slot in an object

    link
        Link material to object or the object's data
        Type enum in ['OBJECT', 'DATA'], default 'DATA'

    material
        Material datablock used by this material slot
        Type Material

    name
        Material slot name
        Type string, default "", (readonly)
```

### Inherited Properties

- bpy\_struct.id\_data

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

### References

- Object.material\_slots

## 2.4.306 MaterialStrand(bpy\_struct)

base class — bpy\_struct

```
class bpy.types.MaterialStrand(bpy_struct)
    Strand settings for a Material datablock

    blend_distance
        Worldspace distance over which to blend in the surface normal
```

**Type** float in [0, 10], default 0.0

**root\_size**

Start size of strands in pixels or Blender units

**Type** float in [0, inf], default 0.0

**shape**

Positive values make strands rounder, negative makes strands spiky

**Type** float in [-0.9, 0.9], default 0.0

**size\_min**

Minimum size of strands in pixels

**Type** float in [0.001, 10], default 0.0

**tip\_size**

End size of strands in pixels or Blender units

**Type** float in [0, inf], default 0.0

**use\_blender\_units**

Use Blender units for widths instead of pixels

**Type** boolean, default False

**use\_surface\_diffuse**

Make diffuse shading more similar to shading the surface

**Type** boolean, default False, (readonly)

**use\_tangent\_shading**

Uses direction of strands as normal for tangent-shading

**Type** boolean, default False

**uv\_layer**

Name of UV layer to override

**Type** string, default “”

**width\_fade**

Transparency along the width of the strand

**Type** float in [0, 2], default 0.0

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`

- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- Material.strand

### 2.4.307 MaterialSubsurfaceScattering(bpy\_struct)

base class — bpy\_struct

**class bpy.types.MaterialSubsurfaceScattering(bpy\_struct)**

Diffuse subsurface scattering settings for a Material datablock

#### **back**

Back scattering weight

**Type** float in [0, 10], default 0.0

#### **color**

Scattering color

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

#### **color\_factor**

Blend factor for SSS colors

**Type** float in [0, 1], default 0.0

#### **error\_threshold**

Error tolerance (low values are slower and higher quality)

**Type** float in [-inf, inf], default 0.0

#### **front**

Front scattering weight

**Type** float in [0, 2], default 0.0

#### **ior**

Index of refraction (higher values are denser)

**Type** float in [-inf, inf], default 0.0

#### **radius**

Mean red/green/blue scattering path length

**Type** float array of 3 items in [0.001, inf], default (0.0, 0.0, 0.0)

#### **scale**

Object scale factor

**Type** float in [-inf, inf], default 0.0

**texture\_factor**

Texture scattering blend factor

**Type** float in [0, 1], default 0.0

**use**

Enable diffuse subsurface scattering effects in a material

**Type** boolean, default False

### Inherited Properties

- bpy\_struct.id\_data

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

### References

- Material.subsurface\_scattering

## 2.4.308 MaterialTextureSlot(TextureSlot)

base classes — bpy\_struct, TextureSlot

class bpy.types.MaterialTextureSlot (*TextureSlot*)

Texture slot for textures in a Material datablock

**alpha\_factor**

Amount texture affects alpha

**Type** float in [-inf, inf], default 0.0

**ambient\_factor**

Amount texture affects ambient

**Type** float in [-inf, inf], default 0.0

**bump\_method**

Method to use for bump mapping

**Type** enum in ['BUMP\_ORIGINAL', 'BUMP\_COMPATIBLE', 'BUMP\_DEFAULT', 'BUMP\_BEST\_QUALITY'], default 'BUMP\_ORIGINAL'

**bump\_objectspace**

Space to apply bump mapping in

**Type** enum in ['BUMP\_VIEWSPACE', 'BUMP\_OBJECTSPACE', 'BUMP\_TEXTURESPACE'], default 'BUMP\_VIEWSPACE'

**density\_factor**

Amount texture affects density

**Type** float in [-inf, inf], default 0.0

**diffuse\_color\_factor**

Amount texture affects diffuse color

**Type** float in [-inf, inf], default 0.0

**diffuse\_factor**

Amount texture affects diffuse reflectivity

**Type** float in [-inf, inf], default 0.0

**displacement\_factor**

Amount texture displaces the surface

**Type** float in [-inf, inf], default 0.0

**emission\_color\_factor**

Amount texture affects emission color

**Type** float in [-inf, inf], default 0.0

**emission\_factor**

Amount texture affects emission

**Type** float in [-inf, inf], default 0.0

**emit\_factor**

Amount texture affects emission

**Type** float in [-inf, inf], default 0.0

**hardness\_factor**

Amount texture affects hardness

**Type** float in [-inf, inf], default 0.0

**mapping**

**Type** enum in ['FLAT', 'CUBE', 'TUBE', 'SPHERE'], default 'FLAT'

**mapping\_x**

**Type** enum in ['NONE', 'X', 'Y', 'Z'], default 'NONE'

**mapping\_y**

**Type** enum in ['NONE', 'X', 'Y', 'Z'], default 'NONE'

**mapping\_z**

**Type** enum in ['NONE', 'X', 'Y', 'Z'], default 'NONE'

**mirror\_factor**

Amount texture affects mirror color

**Type** float in [-inf, inf], default 0.0

**normal\_factor**

Amount texture affects normal values

**Type** float in [-inf, inf], default 0.0

**normal\_map\_space**

Sets space of normal map image

**Type** enum in ['CAMERA', 'WORLD', 'OBJECT', 'TANGENT'], default 'CAMERA'

**object**

Object to use for mapping with Object texture coordinates

**Type** Object

**raymir\_factor**

Amount texture affects ray mirror

**Type** float in [-inf, inf], default 0.0

**reflection\_color\_factor**

Amount texture affects color of out-scattered light

**Type** float in [-inf, inf], default 0.0

**reflection\_factor**

Amount texture affects brightness of out-scattered light

**Type** float in [-inf, inf], default 0.0

**scattering\_factor**

Amount texture affects scattering

**Type** float in [-inf, inf], default 0.0

**specular\_color\_factor**

Amount texture affects specular color

**Type** float in [-inf, inf], default 0.0

**specular\_factor**

Amount texture affects specular reflectivity

**Type** float in [-inf, inf], default 0.0

**texture\_coords**

**Type** enum in ['GLOBAL', 'OBJECT', 'UV', 'ORCO', 'STRAND', 'STICKY', 'WINDOW', 'NORMAL', 'REFLECTION', 'STRESS', 'TANGENT'], default 'GLOBAL'

**translucency\_factor**

Amount texture affects translucency

**Type** float in [-inf, inf], default 0.0

**transmission\_color\_factor**

Amount texture affects result color after light has been scattered/absorbed

**Type** float in [-inf, inf], default 0.0

**use**

Enable this material texture slot

**Type** boolean, default False

**use\_from\_dupli**  
Dupli's instanced from verts, faces or particles, inherit texture coordinate from their parent

**Type** boolean, default False

**use\_from\_original**  
Dupli's derive their object coordinates from the original objects transformation

**Type** boolean, default False

**use\_map\_alpha**  
Causes the texture to affect the alpha value

**Type** boolean, default False

**use\_map\_ambient**  
Causes the texture to affect the value of ambient

**Type** boolean, default False

**use\_map\_color\_diffuse**  
Causes the texture to affect basic color of the material

**Type** boolean, default False

**use\_map\_color\_emission**  
Causes the texture to affect the color of emission

**Type** boolean, default False

**use\_map\_color\_reflection**  
Causes the texture to affect the color of scattered light

**Type** boolean, default False

**use\_map\_color\_spec**  
Causes the texture to affect the specularity color

**Type** boolean, default False

**use\_map\_color\_transmission**  
Causes the texture to affect the result color after other light has been scattered/absorbed

**Type** boolean, default False

**use\_map\_density**  
Causes the texture to affect the volume's density

**Type** boolean, default False

**use\_map\_diffuse**  
Causes the texture to affect the value of the materials diffuse reflectivity

**Type** boolean, default False

**use\_map\_displacement**  
Let the texture displace the surface

**Type** boolean, default False

**use\_map\_emission**  
Causes the texture to affect the volume's emission

**Type** boolean, default False

**use\_map\_emit**

Causes the texture to affect the emit value

**Type** boolean, default False

**use\_map\_hardness**

Causes the texture to affect the hardness value

**Type** boolean, default False

**use\_map\_mirror**

Causes the texture to affect the mirror color

**Type** boolean, default False

**use\_map\_normal**

Causes the texture to affect the rendered normal

**Type** boolean, default False

**use\_map\_raymir**

Causes the texture to affect the ray-mirror value

**Type** boolean, default False

**use\_map\_reflect**

Causes the texture to affect the reflected light's brightness

**Type** boolean, default False

**use\_map\_scatter**

Causes the texture to affect the volume's scattering

**Type** boolean, default False

**use\_map\_specular**

Causes the texture to affect the value of specular reflectivity

**Type** boolean, default False

**use\_map\_translucency**

Causes the texture to affect the translucency value

**Type** boolean, default False

**use\_map\_warp**

Let the texture warp texture coordinates of next channels

**Type** boolean, default False

**uv\_layer**

UV layer to use for mapping with UV texture coordinates

**Type** string, default “”

**warp\_factor**

Amount texture affects texture coordinates of next channels

**Type** float in [-inf, inf], default 0.0

**Inherited Properties**

- `bpy_struct.id_data`
- `TextureSlot.name`

- `TextureSlot.blend_type`
- `TextureSlot.color`
- `TextureSlot.default_value`
- `TextureSlot.invert`
- `TextureSlot.offset`
- `TextureSlot.output_node`
- `TextureSlot.use_rgb_to_intensity`
- `TextureSlot.scale`
- `TextureSlot.use_stencil`
- `TextureSlot.texture`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

### References

- `Material.texture_slots`
- `MaterialTextureSlots.add`
- `MaterialTextureSlots.create`

## 2.4.309 MaterialTextureSlots(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.MaterialTextureSlots(bpy_struct)`  
Collection of texture slots

**classmethod add()**  
add

**Returns** The newly initialized mtex.

**Return type** `MaterialTextureSlot`

**classmethod create(index)**  
create

**Parameters** `index (int in [0, inf])` – Index, Slot index to initialize.

**Returns** The newly initialized mtex.

**Return type** MaterialTextureSlot

**classmethod** **clear** (*index*)  
clear

**Parameters** **index** (*int in [0, inf]*) – Index, Slot index to clear.

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- Material.texture\_slots

## 2.4.310 MaterialVolume(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.**MaterialVolume** (*bpy\_struct*)

Volume rendering settings for a Material datablock

**asymmetry**

Back scattering (-1.0) to Forward scattering (1.0) and the range in between

**Type** float in [-1, 1], default 0.0

**cache\_resolution**

Resolution of the voxel grid, low resolutions are faster, high resolutions use more memory

**Type** int in [1, 1024], default 0

**density**

The base density of the volume

**Type** float in [0, 1], default 0.0

**density\_scale**  
Multiplier for the material's density

**Type** float in [0, inf], default 0.0

**depth\_threshold**  
Stop ray marching early if transmission drops below this luminance - higher values give speedups in dense volumes at the expense of accuracy

**Type** float in [0, 1], default 0.0

**emission**  
Amount of light that gets emitted by the volume

**Type** float in [0, inf], default 0.0

**emission\_color**  
Color of emitted light

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**light\_method**  
Method of shading, attenuating, and scattering light through the volume

**Type** enum in ['SHADELESS', 'SHADOWED', 'SHADED', 'MULTIPLE\_SCATTERING', 'SHADED\_PLUS\_MULTIPLE\_SCATTERING'], default 'SHADELESS'

**ms\_diffusion**  
Diffusion factor, the strength of the blurring effect

**Type** float in [0, inf], default 0.0

**ms\_intensity**  
Multiplier for multiple scattered light energy

**Type** float in [0, inf], default 0.0

**ms\_spread**  
Proportional distance over which the light is diffused

**Type** float in [0, inf], default 0.0

**reflection**  
Multiplier to make out-scattered light brighter or darker (non-physically correct)

**Type** float in [0, inf], default 0.0

**reflection\_color**  
Color of light scattered out of the volume (does not affect transmission)

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**scattering**  
Amount of light that gets scattered out by the volume - the more out-scattering, the shallower the light will penetrate

**Type** float in [0, inf], default 0.0

**step\_method**  
Method of calculating the steps through the volume

**Type** enum in ['RANDOMIZED', 'CONSTANT'], default 'RANDOMIZED'

**step\_size**

Distance between subsequent volume depth samples

**Type** float in [0, inf], default 0.0

**transmission\_color**

Result color of the volume, after other light has been scattered/absorbed

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**use\_external\_shadows**

Receive shadows from sources outside the volume (temporary)

**Type** boolean, default False

**use\_light\_cache**

Pre-calculate the shading information into a voxel grid, speeds up shading at slightly less accuracy

**Type** boolean, default False

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `Material.volume`

## 2.4.311 Menu(`bpy_struct`)

### Basic Menu Example

This script is a simple menu, menus differ from panels in that they must reference from a header, panel or another menu.

Notice the ‘CATEGORY\_MT\_name’ `Menu.bl_idname`, this is a naming convention for menus.

---

**Note:** Menu subclasses must be registered before referencing them from blender.

---

**Note:** Menu’s have their `Layout.operator_context` initialized as ‘EXEC\_REGION\_WIN’ rather than ‘INVOKE\_DEFAULT’, so if the operator context needs to initialize inputs from the `Operator.invoke` function then this needs to be explicitly set.

---

```
import bpy

class BasicMenu(bpy.types.Menu):
    bl_idname = "OBJECT_MT_select_test"
    bl_label = "Select"

    def draw(self, context):
        layout = self.layout

        layout.operator("object.select_all", text="Select/Deselect All")
        layout.operator("object.select_inverse", text="Inverse")
        layout.operator("object.select_random", text="Random")

bpy.utils.register_class(BasicMenu)

# test call to display immediately.
bpy.ops.wm.call_menu(name="OBJECT_MT_select_test")
```

## Submenus

This menu demonstrates some different functions.

```
import bpy

class SubMenu(bpy.types.Menu):
    bl_idname = "OBJECT_MT_select_submenu"
    bl_label = "Select"

    def draw(self, context):
        layout = self.layout

        layout.operator("object.select_all", text="Select/Deselect All")
        layout.operator("object.select_inverse", text="Inverse")
        layout.operator("object.select_random", text="Random")

        # access this operator as a submenu
        layout.operator_menu_enum("object.select_by_type", "type", text="Select All by Type...")

        layout.separator()

        # expand each operator option into this menu
        layout.operator_enum("object.lamp_add", "type")

        layout.separator()
```

```
# use existing menu
layout.menu("VIEW3D_MT_transform")

bpy.utils.register_class(SubMenu)

# test call to display immediately.
bpy.ops.wm.call_menu(name="OBJECT_MT_select_submenu")
```

## Extending Menus

When creating menus for addons you can't reference menus in blenders default scripts.

Instead the addon can add menu items to existing menus.

The function menu\_draw acts like Menu.draw

```
import bpy
```

```
def menu_draw(self, context):
    self.layout.operator("wm.save_homefile")

bpy.types.INFO_MT_file.append(menu_draw)

base class — bpy_struct
class bpy.types.Menu(bpy_struct)
    Editor menu containing buttons

    bl_idname
        If this is set, the menu gets a custom ID, otherwise it takes the name of the class used to define the panel.
        For example, if the class name is "OBJECT_MT_hello", and bl_idname is not set by the script, then
        bl_idname = "OBJECT_MT_hello"

        Type string, default ""

    bl_label
        The menu label

        Type string, default ""

    layout
        Defines the structure of the menu in the UI.

        Type UILayout, (readonly)

    classmethod poll(context)
        If this method returns a non-null output, then the menu can be drawn.

        Return type boolean

    draw(context)
        Draw UI elements into the menu UI layout.

    classmethod append(draw_func)
        Append a draw function to this menu, takes the same arguments as the menus draw function.

    draw_preset(context)
```

**Define these on the subclass**

- preset\_operator
- preset\_subdir

**path\_menu** (*searchpaths, operator, props\_default={}*)**classmethod prepend** (*draw\_func*)

Prepend a draw function to this menu, takes the same arguments as the menus draw function.

**classmethod remove** (*draw\_func*)

Remove a draw function that has been added to this menu

**Inherited Properties**

- bpy\_struct.id\_data

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.312 Mesh(ID)

base classes — `bpy_struct, ID`**class bpy.types.Mesh** (*ID*)

Mesh datablock defining geometric surfaces

**animation\_data**

Animation data for this datablock

**Type** `AnimData`, (readonly)**auto\_smooth\_angle**

Defines maximum angle between face normals that ‘Auto Smooth’ will operate on

**Type** float in [-inf, inf], default 0.0**edges**

Edges of the mesh

**Type** `MeshEdges bpy_prop_collection of MeshEdge`, (readonly)

**faces**  
Faces of the mesh

**Type** `MeshFaces bpy_prop_collection of MeshFace`, (readonly)

**layers\_float**

**Type** `bpy_prop_collection of MeshFloatPropertyLayer`, (readonly)

**layers\_int**

**Type** `bpy_prop_collection of MeshIntPropertyLayer`, (readonly)

**layers\_string**

**Type** `bpy_prop_collection of MeshStringPropertyLayer`, (readonly)

**materials**

**Type** `IDMaterials bpy_prop_collection of Material`, (readonly)

**shape\_keys**

**Type** `Key`, (readonly)

**show\_all\_edges**  
Displays all edges for wireframe in all view modes in the 3D view

**Type** boolean, default False

**show\_double\_sided**  
Render/display the mesh with double or single sided lighting

**Type** boolean, default False

**show\_edge\_bevel\_weight**  
Displays weights created for the Bevel modifier

**Type** boolean, default False

**show\_edge\_creature**  
Displays creases created for subsurf weighting

**Type** boolean, default False

**show\_edge\_seams**  
Displays UV unwrapping seams

**Type** boolean, default False

**show\_edge\_sharp**  
Displays sharp edges, used with the EdgeSplit modifier

**Type** boolean, default False

**show\_edges**  
Displays selected edges using highlights in the 3D view and UV editor

**Type** boolean, default False

**show\_extra\_edge\_length**  
Displays selected edge lengths, Using global values when set in the transform panel

**Type** boolean, default False

**show\_extra\_face\_angle**  
Displays the angles in the selected edges in degrees, Using global values when set in the transform panel  
**Type** boolean, default False

**show\_extra\_face\_area**  
Displays the area of selected faces, Using global values when set in the transform panel  
**Type** boolean, default False

**show\_faces**  
Displays all faces as shades in the 3D view and UV editor  
**Type** boolean, default False

**show\_normal\_face**  
Displays face normals as lines  
**Type** boolean, default False

**show\_normal\_vertex**  
Displays vertex normals as lines  
**Type** boolean, default False

**sticky**  
Sticky texture coordinates  
**Type** bpy\_prop\_collection of MeshSticky, (readonly)

**texco\_mesh**  
Derive texture coordinates from another mesh  
**Type** Mesh

**texspace\_location**  
Texture space location  
**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**texspace\_size**  
Texture space size  
**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**texture\_mesh**  
Use another mesh for texture indices (vertex indices must be aligned)  
**Type** Mesh

**total\_edge\_sel**  
Selected edge count in editmode  
**Type** int in [0, inf], default 0, (readonly)

**total\_face\_sel**  
Selected face count in editmode  
**Type** int in [0, inf], default 0, (readonly)

**total\_vert\_sel**  
Selected vertex count in editmode  
**Type** int in [0, inf], default 0, (readonly)

**use\_auto\_smooth**  
Treats all set-smoothed faces with angles less than the specified angle as ‘smooth’ during render

**Type** boolean, default False

**use\_auto\_texspace**  
Adjusts active object's texture space automatically when transforming object

**Type** boolean, default False

**use\_mirror\_topology**  
Use topology based mirroring. For when both sides of mesh have matching, unique topology

**Type** boolean, default False

**use\_mirror\_x**  
X Axis mirror editing

**Type** boolean, default False

**use\_paint\_mask**  
Face selection masking for painting

**Type** boolean, default False

**uv\_texture\_clone**  
UV texture to be used as cloning source

**Type** MeshTextureFaceLayer

**uv\_texture\_clone\_index**  
Clone UV texture index

**Type** int in [0, inf], default 0

**uv\_texture\_stencil**  
UV texture to mask the painted area

**Type** MeshTextureFaceLayer

**uv\_texture\_stencil\_index**  
Mask UV texture index

**Type** int in [0, inf], default 0

**uv\_textures**

**Type** UVTextures bpy\_prop\_collection of MeshTextureFaceLayer, (readonly)

**vertex\_colors**

**Type** VertexColors bpy\_prop\_collection of MeshColorLayer, (readonly)

**vertices**  
Vertices of the mesh

**Type** MeshVertices bpy\_prop\_collection of MeshVertex, (readonly)

**edge\_keys**  
(readonly)

**transform (matrix)**  
Transform mesh vertices by a matrix.

**Parameters** **matrix** (*float array of 16 items in [-inf, inf]*) – Matrix.

**calc\_normals ()**  
Calculate vertex normals.

**update** (*calc\_edges=False*)  
update

**Parameters** **calc\_edges** (*boolean, (optional)*) – Calculate Edges, Force recalculation of edges.

**validate** (*verbose=False*)

validate geometry, return True when the mesh has had invalid geometry corrected/removed.

**Parameters** **verbose** (*boolean, (optional)*) – Verbose, Output information about the errors found

**Returns** Result

**Return type** boolean

**from\_pydata** (*vertices, edges, faces*)

Make a mesh from a list of verts/edges/faces Until we have a nicer way to make geometry, use this.

**Parameters**

- **vertices** (*iterable object*) – float triplets each representing (X, Y, Z) eg: [(0.0, 1.0, 0.5), ...].
- **edges** (*iterable object*) – int pairs, each pair contains two indices to the *vertices* argument. eg: [(1, 2), ...]
- **faces** (*iterable object*) – iterator of faces, each faces contains three or four indices to the *vertices* argument. eg: [(5, 6, 8, 9), (1, 2, 3), ...]

## Inherited Properties

- bpy\_struct.id\_data
- ID.name
- ID.use\_fake\_user
- ID.library
- ID.tag
- ID.users

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- ID.copy
- ID.user\_clear
- ID.animation\_data\_create

- `ID.animation_data_clear`
- `ID.update_tag`

## References

- `BlendData.meshes`
- `BlendDataMeshes.new`
- `BlendDataMeshes.remove`
- `EditObjectActuator.mesh`
- `Mesh.texco_mesh`
- `Mesh.texture_mesh`
- `Object.to_mesh`

## 2.4.313 MeshColor(bpy\_struct)

base class — `bpy_struct`

```
class bpy.types.MeshColor(bpy_struct)
    Vertex colors for a face in a Mesh

    color1
        Type float array of 3 items in [0, 1], default (0.0, 0.0, 0.0)
    color2
        Type float array of 3 items in [0, 1], default (0.0, 0.0, 0.0)
    color3
        Type float array of 3 items in [0, 1], default (0.0, 0.0, 0.0)
    color4
        Type float array of 3 items in [0, 1], default (0.0, 0.0, 0.0)
```

### Inherited Properties

- `bpy_struct.id_data`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`

- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `MeshColorLayer.data`

### 2.4.314 MeshColorLayer(`bpy_struct`)

base class — `bpy_struct`

**class bpy.types.MeshColorLayer (`bpy_struct`)**

Layer of vertex colors in a Mesh datablock

#### **active**

Sets the layer as active for display and editing

**Type** boolean, default False

#### **active\_render**

Sets the layer as active for rendering

**Type** boolean, default False

#### **data**

**Type** `bpy_prop_collection` of `MeshColor`, (readonly)

#### **name**

Name of Vertex color layer

**Type** string, default “”

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`

- `bpy_struct.values`

## References

- `Mesh.vertex_colors`
- `VertexColors.active`
- `VertexColors.new`

### 2.4.315 MeshDeformModifier(Modifier)

base classes — `bpy_struct, Modifier`

```
class bpy.types.MeshDeformModifier (Modifier)
    Mesh deformation modifier to deform with other meshes

    invert_vertex_group
        Invert vertex group influence
        Type boolean, default False

    is_bound
        Whether geometry has been bound to control cage
        Type boolean, default False, (readonly)

    object
        Mesh object to deform with
        Type Object

    precision
        The grid size for binding
        Type int in [2, 10], default 0

    use_dynamic_bind
        Recompute binding dynamically on top of other deformers (slower and more memory consuming.)
        Type boolean, default False

    vertex_group
        Vertex group name
        Type string, default “”
```

## Inherited Properties

- `bpy_struct.id_data`
- `Modifier.name`
- `Modifier.use_apply_on_spline`
- `Modifier.show_in_editmode`
- `Modifier.show_expanded`
- `Modifier.show_on_cage`
- `Modifier.show_viewport`
- `Modifier.show_render`
- `Modifier.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

### 2.4.316 MeshEdge(bpy\_struct)

base class — `bpy_struct`

**class bpy.types.MeshEdge (bpy\_struct)**

Edge in a Mesh datablock

**bevel\_weight**

Weight used by the Bevel modifier

**Type** float in [-inf, inf], default 0.0

**crease**

Weight used by the Subsurf modifier for creasing

**Type** float in [-inf, inf], default 0.0

**hide**

**Type** boolean, default False

**index**

Index number of the vertex

**Type** int in [0, inf], default 0, (readonly)

**is\_fgon**

Fgon edge

**Type** boolean, default False

**is\_loose**

Loose edge

**Type** boolean, default False

**select**

**Type** boolean, default False

**use\_edge\_sharp**

Sharp edge for the EdgeSplit modifier

**Type** boolean, default False

**use\_seam**

Seam edge for UV unwrapping

**Type** boolean, default False

**vertices**

Vertex indices

**Type** int array of 2 items in [0, inf], default (0, 0)

**key**

(readonly)

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `Mesh.edges`

## 2.4.317 MeshEdges(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.MeshEdges` (`bpy_struct`)

Collection of mesh edges

**add** (`count=0`)

add

**Parameters** `count` (`int in [0, inf], (optional)`) – Count, Number of vertices to add.

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- Mesh.edges

### 2.4.318 MeshFace(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.MeshFace (*bpy\_struct*)

Face in a Mesh datablock

**area**

read only area of the face

**Type** float in [0, inf], default 0.0, (readonly)

**hide**

**Type** boolean, default False

**index**

Index number of the vertex

**Type** int in [0, inf], default 0, (readonly)

**material\_index**

**Type** int in [0, 32767], default 0

**normal**

local space unit length normal vector for this face

**Type** float array of 3 items in [-1, 1], default (0.0, 0.0, 0.0), (readonly)

```
select
    Type boolean, default False
use_smooth
    Type boolean, default False
vertices
    Vertex indices
    Type int array of 4 items in [0, inf], default (0, 0, 0, 0)
vertices_raw
    Fixed size vertex indices array
    Type int array of 4 items in [0, inf], default (0, 0, 0, 0)
center
    The midpoint of the face. (readonly)
edge_keys
    (readonly)
```

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `Mesh.faces`

## 2.4.319 MeshFaces(`bpy_struct`)

base class — `bpy_struct`

```
class bpy.types.MeshFaces (bpy_struct)
    Collection of mesh faces

    active
        The active face for this mesh
        Type int in [-inf, inf], default 0

    active_tface
        Active Texture Face
        Type MeshTextureFace, (readonly)

    add (count=0)
        add
            Parameters count (int in [0, inf], (optional)) – Count, Number of vertices to add.
```

### Inherited Properties

- bpy\_struct.id\_data

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

### References

- Mesh.faces

## 2.4.320 MeshFloatProperty(bpy\_struct)

base class — bpy\_struct

```
class bpy.types.MeshFloatProperty (bpy_struct)
    User defined floating point number value in a float properties layer

    value
        Type float in [-inf, inf], default 0.0
```

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- MeshFloatPropertyLayer.data

### 2.4.321 MeshFloatPropertyLayer(bpy\_struct)

base class — bpy\_struct

**class bpy.types.MeshFloatPropertyLayer (bpy\_struct)**  
User defined layer of floating pointer number values

**data**

**Type** bpy\_prop\_collection of MeshFloatProperty, (readonly)

**name**

**Type** string, default “”

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add

- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- Mesh.layers\_float

### 2.4.322 MeshIntProperty(bpy\_struct)

base class — bpy\_struct

**class bpy.types.MeshIntProperty(bpy\_struct)**

User defined integer number value in an integer properties layer

**value**

**Type** int in [-inf, inf], default 0

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- `MeshIntPropertyLayer.data`

### 2.4.323 `MeshIntPropertyLayer(bpy_struct)`

base class — `bpy_struct`

`class bpy.types.MeshIntPropertyLayer(bpy_struct)`

User defined layer of integer number values

`data`

**Type** `bpy_prop_collection` of `MeshIntProperty`, (readonly)

`name`

**Type** `string`, default “”

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `Mesh.layers_int`

### 2.4.324 `MeshSticky(bpy_struct)`

base class — `bpy_struct`

`class bpy.types.MeshSticky(bpy_struct)`

Stricky texture coordinate

**co**

Sticky texture coordinate location

**Type** float array of 2 items in [-inf, inf], default (0.0, 0.0)

### Inherited Properties

- bpy\_struct.id\_data

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

### References

- Mesh.sticky

## 2.4.325 MeshStringProperty(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.MeshStringProperty (*bpy\_struct*)  
User defined string text value in a string properties layer  
**value**  
**Type** string, default “”

### Inherited Properties

- bpy\_struct.id\_data

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add

- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- MeshStringPropertyLayer.data

### 2.4.326 MeshStringPropertyLayer(bpy\_struct)

base class — `bpy_struct`

`class bpy.types.MeshStringPropertyLayer (bpy_struct)`

User defined layer of string text values

`data`

**Type** `bpy_prop_collection` of `MeshStringProperty`, (readonly)

`name`

**Type** `string`, default “”

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`

- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `Mesh.layers_string`

### 2.4.327 MeshTextureFace(`bpy_struct`)

base class — `bpy_struct`

**class bpy.types.MeshTextureFace (`bpy_struct`)**

UV mapping, texturing and game engine data for a face

**blend\_type**

Transparency blending mode

**Type** enum in ['OPAQUE', 'ADD', 'ALPHA', 'CLIPALPHA'], default 'OPAQUE'

**hide**

Make face invisible

**Type** boolean, default False

**image**

**Type** `Image`

**pin\_uv**

**Type** boolean array of 4 items, default (False, False, False, False)

**select\_uv**

**Type** boolean array of 4 items, default (False, False, False, False)

**use\_alpha\_sort**

Enable sorting of faces for correct alpha drawing (slow, use Clip Alpha instead when possible)

**Type** boolean, default False

**use\_billboard**

Billboard with Z-axis constraint

**Type** boolean, default False

**use\_bitmap\_text**

Enable bitmap text on face

**Type** boolean, default False

**use\_blend\_shared**

Blend vertex colors across face when vertices are shared

**Type** boolean, default False

**use\_collision**

Use face for collision and ray-sensor detection

**Type** boolean, default False

**use\_halo**

Screen aligned billboard

**Type** boolean, default False

**use\_image**

Render face with texture

**Type** boolean, default False

**use\_light**

Use light for face

**Type** boolean, default False

**use\_object\_color**

Use ObColor instead of vertex colors

**Type** boolean, default False

**use\_shadow\_cast**

Face is used for shadow

**Type** boolean, default False

**use\_twoside**

Render face two-sided

**Type** boolean, default False

**uv**

**Type** float array of 8 items in [-inf, inf], default (0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0)

**uv1**

**Type** float array of 2 items in [-inf, inf], default (0.0, 0.0)

**uv2**

**Type** float array of 2 items in [-inf, inf], default (0.0, 0.0)

**uv3**

**Type** float array of 2 items in [-inf, inf], default (0.0, 0.0)

**uv4**

**Type** float array of 2 items in [-inf, inf], default (0.0, 0.0)

**uv\_raw**

Fixed size UV coordinates array

**Type** float array of 8 items in [-inf, inf], default (0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0)

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`

- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `MeshFaces.active_tface`
- `MeshTextureFaceLayer.data`

### 2.4.328 MeshTextureFaceLayer(`bpy_struct`)

base class — `bpy_struct`

**class bpy.types.MeshTextureFaceLayer (`bpy_struct`)**

Layer of texture faces in a Mesh datablock

**active**

Sets the layer as active for display and editing

**Type** boolean, default False

**active\_clone**

Sets the layer as active for cloning

**Type** boolean, default False

**active\_render**

Sets the layer as active for rendering

**Type** boolean, default False

**data**

**Type** `bpy_prop_collection` of `MeshTextureFace`, (readonly)

**name**

Name of UV unwrapping layer

**Type** string, default “”

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `Mesh.uv_texture_clone`
- `Mesh.uv_texture_stencil`
- `Mesh.uv_textures`
- `UVTextures.active`
- `UVTextures.new`

## 2.4.329 MeshVertex(bpy\_struct)

base class — `bpy_struct`

`class bpy.types.MeshVertex (bpy_struct)`

Vertex in a Mesh datablock

### `bevel_weight`

Weight used by the Bevel modifier ‘Only Vertices’ option

**Type** float in [-inf, inf], default 0.0

### `co`

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

### `groups`

Weights for the vertex groups this vertex is member of

**Type** `bpy_prop_collection` of `VertexGroupElement`, (readonly)

### `hide`

**Type** boolean, default False

### `index`

Index number of the vertex

**Type** int in [0, inf], default 0, (readonly)

**normal**

Vertex Normal

**Type** float array of 3 items in [-1, 1], default (0.0, 0.0, 0.0)**select****Type** boolean, default False**Inherited Properties**

- bpy\_struct.id\_data

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

**References**

- Mesh.vertices

## 2.4.330 MeshVertices(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.MeshVertices (*bpy\_struct*)

Collection of mesh vertices

**add** (*count=0*)  
add**Parameters** **count** (*int in [0, inf], (optional)*) – Count, Number of vertices to add.**Inherited Properties**

- bpy\_struct.id\_data

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `Mesh.vertices`

### 2.4.331 MessageActuator(Actuator)

base classes — `bpy_struct, Actuator`

**class bpy.types.MessageActuator(Actuator)**  
Actuator to ..

**body\_message**

Optional message body Text

**Type** string, default “”

**body\_property**

The message body will be set by the Property Value

**Type** string, default “”

**body\_type**

Toggle message type: either Text or aPropertyName

**Type** enum in ['TEXT', 'PROPERTY'], default 'TEXT'

**subject**

Optional message subject. This is what can be filtered on

**Type** string, default “”

**to\_property**

Optional send message to objects with this name only, or empty to broadcast

**Type** string, default “”

## Inherited Properties

- `bpy_struct.id_data`
- `Actuator.name`
- `Actuator.show_expanded`
- `Actuator.pin`
- `Actuator.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`
- `Actuator.link`
- `Actuator.unlink`

## 2.4.332 MessageSensor(Sensor)

base classes — `bpy_struct, Sensor`

**class bpy.types.MessageSensor (Sensor)**

Sensor to detect incoming messages

### **subject**

Optional subject filter: only accept messages with this subject, or empty for all

**Type** string, default “”

## Inherited Properties

- `bpy_struct.id_data`
- `Sensor.name`
- `Sensor.show_expanded`
- `Sensor.frequency`
- `Sensor.invert`
- `Sensor.use_level`
- `Sensor.pin`
- `Sensor.use_pulse_false_level`
- `Sensor.use_pulse_true_level`

- Sensor.use\_tap
- Sensor.type

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- Sensor.link
- Sensor.unlink

## 2.4.333 MetaBall(ID)

base classes — bpy\_struct, ID

**class bpy.types.MetaBall (ID)**

Metaball datablock to defined blobby surfaces

**animation\_data**

Animation data for this datablock

**Type** AnimData, (readonly)

**elements**

Meta elements

**Type** MetaBallElements bpy\_prop\_collection of MetaElement, (readonly)

**materials**

**Type** IDMaterials bpy\_prop\_collection of Material, (readonly)

**render\_resolution**

Polygonization resolution in rendering

**Type** float in [0.05, 1], default 0.0

**resolution**

Polygonization resolution in the 3D viewport

**Type** float in [0.05, 1], default 0.0

**texspace\_location**

Texture space location

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**texspace\_size**

Texture space size

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)**threshold**

Influence of meta elements

**Type** float in [0, 5], default 0.0**update\_method**

Metaball edit update behavior

**Type** enum in ['UPDATE\_ALWAYS', 'HALFRES', 'FAST', 'NEVER'], default 'UPDATE\_ALWAYS'**use\_auto\_texspace**

Adjusts active object's texture space automatically when transforming object

**Type** boolean, default False**Inherited Properties**

- [bpy\\_struct.id\\_data](#)
- [ID.name](#)
- [ID.use\\_fake\\_user](#)
- [ID.library](#)
- [ID.tag](#)
- [ID.users](#)

**Inherited Functions**

- [bpy\\_struct.as\\_pointer](#)
- [bpy\\_struct.callback\\_add](#)
- [bpy\\_struct.callback\\_remove](#)
- [bpy\\_struct.driver\\_add](#)
- [bpy\\_struct.driver\\_remove](#)
- [bpy\\_struct.get](#)
- [bpy\\_struct.is\\_property\\_hidden](#)
- [bpy\\_struct.is\\_property\\_set](#)
- [bpy\\_struct.items](#)
- [bpy\\_struct.keyframe\\_delete](#)
- [bpy\\_struct.keyframe\\_insert](#)
- [bpy\\_struct.keys](#)
- [bpy\\_struct.path\\_from\\_id](#)
- [bpy\\_struct.path\\_resolve](#)
- [bpy\\_struct.type\\_recast](#)
- [bpy\\_struct.values](#)
- [ID.copy](#)
- [ID.user\\_clear](#)
- [ID.animation\\_data\\_create](#)
- [ID.animation\\_data\\_clear](#)
- [ID.update\\_tag](#)

## References

- BlendData.metaballs
- BlendDataMetaBalls.new
- BlendDataMetaBalls.remove

## 2.4.334 MetaBallElements(bpy\_struct)

base class — `bpy_struct`

**class bpy.types.MetaBallElements (bpy\_struct)**  
Collection of metaball elements

### active

Last selected element

**Type** `MetaElement`, (readonly)

### new (type='BALL')

Add a new spline to the curve.

**Parameters** `type` (*enum in ['BALL', 'CAPSULE', 'PLANE', 'ELLIPSOID', 'CUBE'], (optional)*) – type for the new meta-element.

**Returns** The newly created meta-element.

**Return type** `MetaElement`

### remove (element)

Remove a spline from a curve.

**Parameters** `element` (`MetaElement`, (never None)) – The element to remove.

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `MetaBall.elements`

### 2.4.335 MetaElement(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.MetaElement` (`bpy_struct`)  
    Blooby element in a MetaBall datablock

**co**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**hide**

    Hide element

**Type** boolean, default False

**radius**

**Type** float in [0, inf], default 0.0

**rotation**

    Normalized quaternion rotation

**Type** float array of 4 items in [-inf, inf], default (0.0, 0.0, 0.0, 0.0)

**size\_x**

    Size of element, use of components depends on element type

**Type** float in [0, 20], default 0.0

**size\_y**

    Size of element, use of components depends on element type

**Type** float in [0, 20], default 0.0

**size\_z**

    Size of element, use of components depends on element type

**Type** float in [0, 20], default 0.0

**stiffness**

    Stiffness defines how much of the element to fill

**Type** float in [0, 10], default 0.0

**type**

    Metaball types

**Type** enum in ['BALL', 'CAPSULE', 'PLANE', 'ELLIPSOID', 'CUBE'], default 'BALL'

**use\_negative**

    Set metaball as negative one

**Type** boolean, default False

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `MetaBall.elements`
- `MetaBallElements.active`
- `MetaBallElements.new`
- `MetaBallElements.remove`

## 2.4.336 MetaSequence(Sequence)

base classes — `bpy_struct, Sequence`

**class bpy.types.MetaSequence (Sequence)**  
Sequence strip to group other strips as a single sequence strip

**animation\_offset\_end**  
Animation end offset (trim end)  
**Type** int in [0, inf], default 0

**animation\_offset\_start**  
Animation start offset (trim start)  
**Type** int in [0, inf], default 0

**color\_balance**  
**Type** SequenceColorBalance, (readonly)

**color\_multiply**  
**Type** float in [0, 20], default 0.0

**color\_saturation**  
**Type** float in [0, 20], default 0.0

**crop**  
**Type** SequenceCrop, (readonly)

**proxy**

**Type** SequenceProxy, (readonly)

**sequences**

**Type** bpy\_prop\_collection of Sequence, (readonly)

**strobe**

Only display every nth frame

**Type** float in [1, 30], default 0.0

**transform**

**Type** SequenceTransform, (readonly)

**use\_color\_balance**

(3-Way color correction) on input

**Type** boolean, default False

**use\_crop**

Crop image before processing

**Type** boolean, default False

**use\_deinterlace**

For video movies to remove fields

**Type** boolean, default False

**use\_flip\_x**

Flip on the X axis

**Type** boolean, default False

**use\_flip\_y**

Flip on the Y axis

**Type** boolean, default False

**use\_float**

Convert input to float data

**Type** boolean, default False

**use\_premultiply**

Convert RGB from key alpha to premultiplied alpha

**Type** boolean, default False

**use\_proxy**

Use a preview proxy for this strip

**Type** boolean, default False

**use\_proxy\_custom\_directory**

Use a custom directory to store data

**Type** boolean, default False

**use\_proxy\_custom\_file**

Use a custom file to read proxy data from

**Type** boolean, default False

**use\_reverse\_frames**

Reverse frame order

**Type** boolean, default False**use\_translation**

Translate image before processing

**Type** boolean, default False**Inherited Properties**

- bpy\_struct.id\_data
- Sequence.name
- Sequence.blend\_type
- Sequence.blend\_alpha
- Sequence.channel
- Sequence.effect\_fader
- Sequence.frame\_final\_end
- Sequence.frame\_offset\_end
- Sequence.frame\_still\_end
- Sequence.input\_1
- Sequence.input\_2
- Sequence.input\_3
- Sequence.select\_left\_handle
- Sequence.frame\_final\_duration
- Sequence.frame\_duration
- Sequence.lock
- Sequence.mute
- Sequence.select\_right\_handle
- Sequence.select
- Sequence.speed\_factor
- Sequence.frame\_start
- Sequence.frame\_final\_start
- Sequence.frame\_offset\_start
- Sequence.frame\_still\_start
- Sequence.type
- Sequence.use\_default\_fade
- Sequence.input\_count

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys

- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- Sequence.getStripElem
- Sequence.swap

## 2.4.337 MirrorModifier(Modifier)

base classes — bpy\_struct, Modifier

```
class bpy.types.MirrorModifier(Modifier)
    Mirroring modifier

    merge_threshold
        Distance from axis within which mirrored vertices are merged
        Type float in [0, inf], default 0.0

    mirror_object
        Object to use as mirror
        Type Object

    use_clip
        Prevents vertices from going through the mirror during transform
        Type boolean, default False

    use_mirror_merge
        Merge vertices within the merge threshold
        Type boolean, default False

    use_mirror_u
        Mirror the U texture coordinate around the 0.5 point
        Type boolean, default False

    use_mirror_v
        Mirror the V texture coordinate around the 0.5 point
        Type boolean, default False

    use_mirror_vertex_groups
        Mirror vertex groups (e.g. .R->.L)
        Type boolean, default False

    use_x
        Enable X axis mirror
        Type boolean, default False

    use_y
        Enable Y axis mirror
        Type boolean, default False

    use_z
        Enable Z axis mirror
        Type boolean, default False
```

## Inherited Properties

- bpy\_struct.id\_data
- Modifier.name
- Modifier.use\_apply\_on\_spline
- Modifier.show\_in\_editmode
- Modifier.show\_expanded
- Modifier.show\_on\_cage
- Modifier.show\_viewport
- Modifier.show\_render
- Modifier.type

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.338 Modifier(bpy\_struct)

base class — bpy\_struct

subclasses — FluidSimulationModifier, BevelModifier, SolidifyModifier, SmokeModifier, UVProjectModifier, DecimateModifier, ExplodeModifier, SmoothModifier, HookModifier, SoftBodyModifier, BooleanModifier, ArrayModifier, LatticeModifier, BuildModifier, ClothModifier, ParticleSystemModifier, SubsurfModifier, CurveModifier, ScrewModifier, MaskModifier, ShrinkwrapModifier, CollisionModifier, CastModifier, WaveModifier, ParticleInstanceModifier, SurfaceModifier, SimpleDeformModifier, DisplaceModifier, ArmatureModifier, MeshDeformModifier, WarpModifier, EdgeSplitModifier, MultiresModifier, MirrorModifier

**class bpy.types.Modifier(bpy\_struct)**

Modifier affecting the geometry data of an object

**name**

Modifier name

**Type** string, default “”

**show\_expanded**

Set modifier expanded in the user interface

**Type** boolean, default False  
**show\_in\_editmode**  
    Use modifier while in the edit mode  
    **Type** boolean, default False  
**show\_on\_cage**  
    Enable direct editing of modifier control cage  
    **Type** boolean, default False  
**show\_render**  
    Use modifier during rendering  
    **Type** boolean, default False  
**show\_viewport**  
    Realtime display of a modifier  
    **Type** boolean, default False  
**type**  
    **Type** enum in ['ARRAY', 'BEVEL', 'BOOLEAN', 'BUILD', 'DECIMATE', 'EDGE\_SPLIT', 'MASK', 'MIRROR', 'MULTIRES', 'SCREW', 'SOLIDIFY', 'SUBSURF', 'UV\_PROJECT', 'ARMATURE', 'CAST', 'CURVE', 'DISPLACE', 'HOOK', 'LATTICE', 'MESH\_DEFORM', 'SHRINKWRAP', 'SIMPLE\_DEFORM', 'SMOOTH', 'WARP', 'WAVE', 'CLOTH', 'COLLISION', 'EXPLODE', 'FLUID\_SIMULATION', 'PARTICLE\_INSTANCE', 'PARTICLE\_SYSTEM', 'SMOKE', 'SOFT\_BODY', 'SURFACE'], default 'ARRAY', (readonly)  
**use\_apply\_on\_spline**  
    Apply this and all preceding deformation modifiers on splines' points rather than on filled curve/surface  
    **Type** boolean, default False

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`

- `bpy_struct.values`

## References

- `Object.modifiers`
- `ObjectModifiers.new`
- `ObjectModifiers.remove`
- `UILayout.template_modifier`

## 2.4.339 MotionPath(`bpy_struct`)

base class — `bpy_struct`

`class bpy.types.MotionPath (bpy_struct)`

Cache of the worldspace positions of an element over a frame range

### `frame_end`

End frame of the stored range

**Type** int in [-inf, inf], default 0, (readonly)

### `frame_start`

Starting frame of the stored range

**Type** int in [-inf, inf], default 0, (readonly)

### `is_modified`

Path is being edited

**Type** boolean, default False

### `length`

Number of frames cached

**Type** int in [-inf, inf], default 0, (readonly)

### `points`

Cached positions per frame

**Type** `bpy_prop_collection of MotionPathVert`, (readonly)

### `use_bone_head`

For PoseBone paths, use the bone head location when calculating this path

**Type** boolean, default False, (readonly)

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`

- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `Object.motion_path`
- `PoseBone.motion_path`

### 2.4.340 MotionPathVert(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.MotionPathVert` (`bpy_struct`)

Cached location on path

**co**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**select**

Path point is selected for editing

**Type** boolean, default False

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`

- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `MotionPath.points`

### 2.4.341 MouseSensor(Sensor)

base classes — `bpy_struct, Sensor`

**class bpy.types.MouseSensor (Sensor)**

Sensor to detect mouse events

**mouse\_event**

Specify the type of event this mouse sensor should trigger on

**Type** enum in ['LEFTCLICK', 'MIDDLECLICK', 'RIGHTCLICK', 'WHEELUP', 'WHEELDOWN', 'MOVEMENT', 'MOUSEOVER', 'MOUSEOVERANY'], default 'LEFTCLICK'

## Inherited Properties

- `bpy_struct.id_data`
- `Sensor.name`
- `Sensor.show_expanded`
- `Sensor.frequency`
- `Sensor.invert`
- `Sensor.use_level`
- `Sensor.pin`
- `Sensor.use_pulse_false_level`
- `Sensor.use_pulse_true_level`
- `Sensor.use_tap`
- `Sensor.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

- Sensor.link
- Sensor.unlink

## 2.4.342 MovieSequence(Sequence)

base classes — `bpy_struct, Sequence`

**class bpy.types.MovieSequence (Sequence)**

Sequence strip to load a video

**animation\_offset\_end**

Animation end offset (trim end)

**Type** int in [0, inf], default 0

**animation\_offset\_start**

Animation start offset (trim start)

**Type** int in [0, inf], default 0

**color\_balance**

**Type** `SequenceColorBalance`, (readonly)

**color\_multiply**

**Type** float in [0, 20], default 0.0

**color\_saturation**

**Type** float in [0, 20], default 0.0

**crop**

**Type** `SequenceCrop`, (readonly)

**elements**

**Type** `bpy_prop_collection` of `SequenceElement`, (readonly)

**filepath**

**Type** string, default “”

**mpeg\_presseek**

For MPEG movies, preseek this many frames

**Type** int in [0, 50], default 0

**proxy**

**Type** `SequenceProxy`, (readonly)

**strobe**

Only display every nth frame

**Type** float in [1, 30], default 0.0

**transform**

**Type** `SequenceTransform`, (readonly)

**use\_color\_balance**

(3-Way color correction) on input

**Type** boolean, default False

**use\_crop**

Crop image before processing

**Type** boolean, default False

**use\_deinterlace**

For video movies to remove fields

**Type** boolean, default False

**use\_flip\_x**

Flip on the X axis

**Type** boolean, default False

**use\_flip\_y**

Flip on the Y axis

**Type** boolean, default False

**use\_float**

Convert input to float data

**Type** boolean, default False

**use\_premultiply**

Convert RGB from key alpha to premultiplied alpha

**Type** boolean, default False

**use\_proxy**

Use a preview proxy for this strip

**Type** boolean, default False

**use\_proxy\_custom\_directory**

Use a custom directory to store data

**Type** boolean, default False

**use\_proxy\_custom\_file**

Use a custom file to read proxy data from

**Type** boolean, default False

**use\_reverse\_frames**

Reverse frame order

**Type** boolean, default False

**use\_translation**

Translate image before processing

**Type** boolean, default False

## Inherited Properties

- bpy\_struct.id\_data
- Sequence.name
- Sequence.blend\_type
- Sequence.blend\_alpha
- Sequence.channel
- Sequence.effect\_fader

- Sequence.frame\_final\_end
- Sequence.frame\_offset\_end
- Sequence.frame\_still\_end
- Sequence.input\_1
- Sequence.input\_2
- Sequence.input\_3
- Sequence.select\_left\_handle
- Sequence.frame\_final\_duration
- Sequence.frame\_duration
- Sequence.lock
- Sequence.mute
- Sequence.select\_right\_handle
- Sequence.select
- Sequence.speed\_factor
- Sequence.frame\_start
- Sequence.frame\_final\_start
- Sequence.frame\_offset\_start
- Sequence.frame\_still\_start
- Sequence.type
- Sequence.use\_default\_fade
- Sequence.input\_count

#### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- Sequence.getStripElem
- Sequence.swap

#### 2.4.343 MulticamSequence(Sequence)

base classes — bpy\_struct, Sequence

```
class bpy.types.MulticamSequence(Sequence)
    Sequence strip to perform multicam editing: select channel from below

    animation_offset_end
        Animation end offset (trim end)

        Type int in [0, inf], default 0
```

**animation\_offset\_start**  
Animation start offset (trim start)  
**Type** int in [0, inf], default 0

**color\_balance**  
**Type** SequenceColorBalance, (readonly)

**color\_multiply**  
**Type** float in [0, 20], default 0.0

**color\_saturation**  
**Type** float in [0, 20], default 0.0

**crop**  
**Type** SequenceCrop, (readonly)

**multicam\_source**  
**Type** int in [0, 31], default 0

**proxy**  
**Type** SequenceProxy, (readonly)

**strobe**  
Only display every nth frame  
**Type** float in [1, 30], default 0.0

**transform**  
**Type** SequenceTransform, (readonly)

**use\_color\_balance**  
(3-Way color correction) on input  
**Type** boolean, default False

**use\_crop**  
Crop image before processing  
**Type** boolean, default False

**use\_deinterlace**  
For video movies to remove fields  
**Type** boolean, default False

**use\_flip\_x**  
Flip on the X axis  
**Type** boolean, default False

**use\_flip\_y**  
Flip on the Y axis  
**Type** boolean, default False

**use\_float**  
Convert input to float data  
**Type** boolean, default False

**use\_premultiply**  
Convert RGB from key alpha to premultiplied alpha  
**Type** boolean, default False

**use\_proxy**  
Use a preview proxy for this strip  
**Type** boolean, default False

**use\_proxy\_custom\_directory**  
Use a custom directory to store data  
**Type** boolean, default False

**use\_proxy\_custom\_file**  
Use a custom file to read proxy data from  
**Type** boolean, default False

**use\_reverse\_frames**  
Reverse frame order  
**Type** boolean, default False

**use\_translation**  
Translate image before processing  
**Type** boolean, default False

### Inherited Properties

- `bpy_struct.id_data`
- `Sequence.name`
- `Sequence.blend_type`
- `Sequence.blend_alpha`
- `Sequence.channel`
- `Sequence.effect_fader`
- `Sequence.frame_final_end`
- `Sequence.frame_offset_end`
- `Sequence.frame_still_end`
- `Sequence.input_1`
- `Sequence.input_2`
- `Sequence.input_3`
- `Sequence.select_left_handle`
- `Sequence.frame_final_duration`
- `Sequence.frame_duration`
- `Sequence.lock`
- `Sequence.mute`
- `Sequence.select_right_handle`
- `Sequence.select`
- `Sequence.speed_factor`
- `Sequence.frame_start`
- `Sequence.frame_final_start`
- `Sequence.frame_offset_start`
- `Sequence.frame_still_start`
- `Sequence.type`
- `Sequence.use_default_fade`

- Sequence.input\_count

#### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- Sequence.getStripElem
- Sequence.swap

### 2.4.344 MultiresModifier(Modifier)

base classes — bpy\_struct, Modifier

**class bpy.types.MultiresModifier (Modifier)**  
Multiresolution mesh modifier

**filepath**  
Path to external displacements file  
**Type** string, default “”

**is\_external**  
Store multires displacements outside the .blend file, to save memory  
**Type** boolean, default False, (readonly)

**levels**  
Number of subdivisions to use in the viewport  
**Type** int in [0, 255], default 0

**render\_levels**  
The subdivision level visible at render time  
**Type** int in [0, 255], default 0

**sculpt\_levels**  
Number of subdivisions to use in sculpt mode  
**Type** int in [0, 255], default 0

**show\_only\_control\_edges**  
Skip drawing/rendering of interior subdivided edges  
**Type** boolean, default False

**subdivision\_type**

Selects type of subdivision algorithm

**Type** enum in ['CATMULL\_CLARK', 'SIMPLE'], default 'CATMULL\_CLARK'

**total\_levels**

Number of subdivisions for which displacements are stored

**Type** int in [0, 255], default 0, (readonly)

**use\_subsurf\_uv**

Use subsurf to subdivide UVs

**Type** boolean, default False

**Inherited Properties**

- bpy\_struct.id\_data
- Modifier.name
- Modifier.use\_apply\_on\_spline
- Modifier.show\_in\_editmode
- Modifier.show\_expanded
- Modifier.show\_on\_cage
- Modifier.show\_viewport
- Modifier.show\_render
- Modifier.type

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.345 MusgraveTexture(Texture)

base classes — bpy\_struct, ID, Texture

**class** bpy.types.MusgraveTexture (*Texture*)

Procedural musgrave texture

**dimension\_max**

Highest fractal dimension

**Type** float in [0.0001, 2], default 0.0

**gain**

The gain multiplier

**Type** float in [0, 6], default 0.0

**lacunarity**

Gap between successive frequencies

**Type** float in [0, 6], default 0.0

**musgrave\_type**

**Type** enum in ['MULTIFRACTAL', 'RIDGEDED\_MULTIFRACTAL', 'HYBRID\_MULTIFRACTAL', 'FBM', 'HETERO\_TERRAIN'], default 'MULTIFRACTAL'

**nabla**

Size of derivative offset used for calculating normal

**Type** float in [0.001, 0.1], default 0.0

**noise\_basis**

Sets the noise basis used for turbulence

**Type** enum in ['BLENDER\_ORIGINAL', 'ORIGINAL\_PERLIN', 'IMPROVED\_PERLIN', 'VORONOI\_F1', 'VORONOI\_F2', 'VORONOI\_F3', 'VORONOI\_F4', 'VORONOI\_F2\_F1', 'VORONOI\_CRACKLE', 'CELL\_NOISE'], default 'BLENDER\_ORIGINAL'

**noise\_intensity**

Scales the intensity of the noise

**Type** float in [0, 10], default 0.0

**noise\_scale**

Sets scaling for noise input

**Type** float in [0.0001, inf], default 0.0

**octaves**

Number of frequencies used

**Type** float in [0, 8], default 0.0

**offset**

The fractal offset

**Type** float in [0, 6], default 0.0

**users\_material**

Materials that use this texture (readonly)

**users\_object\_modifier**

Object modifiers that use this texture (readonly)

## Inherited Properties

- `bpy_struct.id_data`
- `ID.name`
- `ID.use_fake_user`
- `ID.library`
- `ID.tag`

- `ID.users`
- `Texture.animation_data`
- `Texture.intensity`
- `Texture.color_ramp`
- `Texture.contrast`
- `Texture.factor_blue`
- `Texture.factor_green`
- `Texture.factor_red`
- `Texture.node_tree`
- `Texture.saturation`
- `Texture.use_preview_alpha`
- `Texture.type`
- `Texture.use_color_ramp`
- `Texture.use_nodes`
- `Texture.users_material`
- `Texture.users_object_modifier`
- `Texture.users_material`
- `Texture.users_object_modifier`

#### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`
- `ID.copy`
- `ID.user_clear`
- `ID.animation_data_create`
- `ID.animation_data_clear`
- `ID.update_tag`

#### 2.4.346 NandController(Controller)

base classes — `bpy_struct, Controller`

**class bpy.types.NandController(Controller)**  
Controller passing on events based on a logical NAND operation

## Inherited Properties

- bpy\_struct.id\_data
- Controller.name
- Controller.states
- Controller.show\_expanded
- Controller.use\_priority
- Controller.type

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- Controller.link
- Controller.unlink

## 2.4.347 NearSensor(Sensor)

base classes — bpy\_struct, Sensor

**class** bpy.types.NearSensor (*Sensor*)

Sensor to detect nearby objects

**distance**

Trigger distance

**Type** float in [0, 10000], default 0.0

**property**

Only look for objects with this property (blank = all objects)

**Type** string, default “”

**reset\_distance**

The distance where the sensor forgets the actor

**Type** float in [0, 10000], default 0.0

## Inherited Properties

- bpy\_struct.id\_data

- Sensor.name
- Sensor.show\_expanded
- Sensor.frequency
- Sensor.invert
- Sensor.use\_level
- Sensor.pin
- Sensor.use\_pulse\_false\_level
- Sensor.use\_pulse\_true\_level
- Sensor.use\_tap
- Sensor.type

#### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- Sensor.link
- Sensor.unlink

### 2.4.348 NlaStrip(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.NlaStrip (*bpy\_struct*)

A container referencing an existing Action

**action**

Action referenced by this strip

**Type** Action

**action\_frame\_end**

**Type** float in [-inf, inf], default 0.0

**action\_frame\_start**

**Type** float in [-inf, inf], default 0.0

**active**

NLA Strip is active

**Type** boolean, default False, (readonly)

**blend\_in**

Number of frames at start of strip to fade in influence

**Type** float in [-inf, inf], default 0.0

**blend\_out**

**Type** float in [-inf, inf], default 0.0

**blend\_type**

Method used for combining strip's result with accumulated result

**Type** enum in ['REPLACE', 'ADD', 'SUBTRACT', 'MULTPLY'], default 'REPLACE'

**extrapolation**

Action to take for gaps past the strip extents

**Type** enum in ['NOTHING', 'HOLD', 'HOLD\_FORWARD'], default 'HOLD'

**fcurves**

F-Curves for controlling the strip's influence and timing

**Type** bpy\_prop\_collection of FCurve, (readonly)

**frame\_end**

**Type** float in [-inf, inf], default 0.0

**frame\_start**

**Type** float in [-inf, inf], default 0.0

**influence**

Amount the strip contributes to the current result

**Type** float in [0, 1], default 0.0

**modifiers**

Modifiers affecting all the F-Curves in the referenced Action

**Type** bpy\_prop\_collection of FModifier, (readonly)

**mute**

NLA Strip is not evaluated

**Type** boolean, default False

**name**

**Type** string, default ""

**repeat**

Number of times to repeat the action range

**Type** float in [0.1, 1000], default 0.0

**scale**

Scaling factor for action

**Type** float in [0.0001, 1000], default 0.0

**select**

NLA Strip is selected

**Type** boolean, default False

**strip\_time**

Frame of referenced Action to evaluate

**Type** float in [-inf, inf], default 0.0

**strips**

NLA Strips that this strip acts as a container for (if it is of type Meta)

**Type** bpy\_prop\_collection of NlaStrip, (readonly)

**type**

Type of NLA Strip

**Type** enum in ['CLIP', 'TRANSITION', 'META'], default 'CLIP', (readonly)

**use\_animated\_influence**

Influence setting is controlled by an F-Curve rather than automatically determined

**Type** boolean, default False

**use\_animated\_time**

Strip time is controlled by an F-Curve rather than automatically determined

**Type** boolean, default False

**use\_animated\_time\_cyclic**

Cycle the animated time within the action start & end

**Type** boolean, default False

**use\_auto\_blend**

Number of frames for Blending In/Out is automatically determined from overlapping strips

**Type** boolean, default False

**use\_reverse**

NLA Strip is played back in reverse order (only when timing is automatically determined)

**Type** boolean, default False

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- `NlaStrip.strips`
- `NlaStrips.new`
- `NlaStrips.remove`
- `NlaTrack.strips`

### 2.4.349 `NlaStrips(bpy_struct)`

base class — `bpy_struct`

**class** `bpy.types.NlaStrips(bpy_struct)`

Collection of Nla Strips

**new** (`name, start, action`)

Add a new Action-Clip strip to the track

#### Parameters

- **name** (`string`) – Name for the NLA Strips.
- **start** (`int in [-inf, inf]`) – Start Frame, Start frame for this strip.
- **action** (`Action`, (never None)) – Action to assign to this strip.

**Returns** New NLA Strip.

**Return type** `NlaStrip`

**remove** (`strip`)

Remove a NLA Strip.

**Parameters** `strip (NlaStrip, (never None))` – NLA Strip to remove.

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `NlaTrack.strips`

### 2.4.350 NlaTrack(`bpy_struct`)

base class — `bpy_struct`

`class bpy.types.NlaTrack(bpy_struct)`

A animation layer containing Actions referenced as NLA strips

#### **active**

NLA Track is active

**Type** boolean, default False, (readonly)

#### **is\_solo**

NLA Track is evaluated itself (i.e. active Action and all other NLA Tracks in the same AnimData block are disabled)

**Type** boolean, default False, (readonly)

#### **lock**

NLA Track is locked

**Type** boolean, default False

#### **mute**

NLA Track is not evaluated

**Type** boolean, default False

#### **name**

**Type** string, default “”

#### **select**

NLA Track is selected

**Type** boolean, default False

#### **strips**

NLA Strips on this NLA-track

**Type** `NlaStrips bpy_prop_collection of NlaStrip`, (readonly)

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`

- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- AnimData.nla\_tracks
- NlaTracks.active
- NlaTracks.new
- NlaTracks.new
- NlaTracks.remove

### 2.4.351 NlaTracks(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.NlaTracks (*bpy\_struct*)  
Collection of NLA Tracks

**active**  
Active Object constraint

**Type** NlaTrack

**new** (*prev=None*)  
Add a new NLA Track

**Parameters** *prev* (NlaTrack, (optional)) – NLA Track to add the new one after.

**Returns** New NLA Track.

**Return type** NlaTrack

**remove** (*track*)  
Remove a NLA Track.

**Parameters** *track* (NlaTrack, (never None)) – NLA Track to remove.

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add

- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `AnimData.nla_tracks`

## 2.4.352 Node(`bpy_struct`)

base class — `bpy_struct`

subclasses — `TextureNode`, `ShaderNode`, `CompositorNode`, `NodeGroup`

**class** `bpy.types.Node` (`bpy_struct`)

Node in a node tree

### inputs

**Type** `bpy_prop_collection` of `NodeSocket`, (readonly)

### label

Optional custom node label

**Type** string, default “”

### location

**Type** float array of 2 items in [-10000, 10000], default (0.0, 0.0)

### name

Unique node identifier

**Type** string, default “”

### outputs

**Type** `bpy_prop_collection` of `NodeSocket`, (readonly)

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`

- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- CompositorNodeTree.nodes
- CompositorNodes.new
- CompositorNodes.remove
- NodeLink.from\_node
- NodeLink.to\_node
- ShaderNodeTree.nodes
- ShaderNodes.new
- ShaderNodes.remove
- TextureNodeTree.nodes
- TextureNodes.new
- TextureNodes.remove

### 2.4.353 NodeGroup(Node)

base classes — bpy\_struct, Node

**class** bpy.types.NodeGroup (*Node*)

**node\_tree**

**Type** NodeTree

#### Inherited Properties

- bpy\_struct.id\_data
- Node.name
- Node.inputs
- Node.label
- Node.location
- Node.outputs

#### Inherited Functions

- bpy\_struct.as\_pointer

- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.354 NodeLink(bpy\_struct)

base class — [bpy\\_struct](#)

**class** bpy.types.NodeLink (*bpy\_struct*)  
Link between nodes in a node tree

**from\_node**  
**Type** [Node](#), (readonly)

**from\_socket**  
**Type** [NodeSocket](#), (readonly)

**to\_node**  
**Type** [Node](#), (readonly)

**to\_socket**  
**Type** [NodeSocket](#), (readonly)

### Inherited Properties

- bpy\_struct.id\_data

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert

- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `NodeLinks.new`
- `NodeLinks.remove`
- `NodeTree.links`

### 2.4.355 NodeLinks(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.NodeLinks` (`bpy_struct`)

Collection of Node Links

**new** (*input, output*)

Add a node link to this node tree.

#### Parameters

- **input** (`NodeSocket`) – The input socket.
- **output** (`NodeSocket`) – The output socket.

**Returns** New node link.

**Return type** `NodeLink`

**remove** (*link*)

remove a node link from the node tree.

**Parameters** `link` (`NodeLink`) – The node link to remove.

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`

- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- NodeTree.links

### 2.4.356 NodeSocket(bpy\_struct)

base class — bpy\_struct

subclasses — VectorNodeSocket, RGBANodeSocket, ValueNodeSocket

**class** bpy.types.NodeSocket (*bpy\_struct*)

Input or output socket of a node

**name**

Socket name

**Type** string, default “”

**type**

Node Socket type

**Type** enum in [‘VALUE’, ‘VECTOR’, ‘RGBA’], default ‘VALUE’, (readonly)

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- `GroupInputs.expose`
- `GroupInputs.expose`
- `GroupInputs.new`
- `GroupOutputs.expose`
- `GroupOutputs.expose`
- `GroupOutputs.new`
- `Node.inputs`
- `Node.outputs`
- `NodeLink.from_socket`
- `NodeLink.to_socket`
- `NodeLinks.new`
- `NodeLinks.new`
- `NodeTree.inputs`
- `NodeTree.outputs`

### 2.4.357 NodeTree(*ID*)

base classes — `bpy_struct, ID`

subclasses — `CompositorNodeTree, ShaderNodeTree, TextureNodeTree`

**class** `bpy.types.NodeTree(ID)`

Node tree consisting of linked nodes used for materials, textures and compositing

**animation\_data**

Animation data for this datablock

**Type** `AnimData`, (readonly)

**grease\_pencil**

Grease Pencil datablock

**Type** `GreasePencil`

**inputs**

**Type** `GroupInputs bpy_prop_collection of NodeSocket`, (readonly)

**links**

**Type** `NodeLinks bpy_prop_collection of NodeLink`, (readonly)

**outputs**

**Type** `GroupOutputs bpy_prop_collection of NodeSocket`, (readonly)

**type**

Node Tree type

**Type** enum in ['SHADER', 'COMPOSITE', 'TEXTURE'], default 'SHADER', (readonly)

## Inherited Properties

- `bpy_struct.id_data`
- `ID.name`
- `ID.use_fake_user`
- `ID.library`

- `ID.tag`
- `ID.users`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`
- `ID.copy`
- `ID.user_clear`
- `ID.animation_data_create`
- `ID.animation_data_clear`
- `ID.update_tag`

### References

- `BlendData.node_groups`
- `BlendDataNodeTrees.new`
- `BlendDataNodeTrees.remove`
- `CompositorNodes.new`
- `Material.node_tree`
- `NodeGroup.node_tree`
- `Scene.node_tree`
- `ShaderNodes.new`
- `SpaceNodeEditor.node_tree`
- `Texture.node_tree`
- `TextureNodes.new`

## 2.4.358 NoiseTexture(Texture)

base classes — `bpy_struct, ID, Texture`

**class bpy.types.NoiseTexture (Texture)**

Procedural noise texture

**users\_material**

Materials that use this texture (readonly)

**users\_object\_modifier**

Object modifiers that use this texture (readonly)

**Inherited Properties**

- bpy\_struct.id\_data
- ID.name
- ID.use\_fake\_user
- ID.library
- ID.tag
- ID.users
- Texture.animation\_data
- Texture.intensity
- Texture.color\_ramp
- Texture.contrast
- Texture.factor\_blue
- Texture.factor\_green
- Texture.factor\_red
- Texture.node\_tree
- Texture.saturation
- Texture.use\_preview\_alpha
- Texture.type
- Texture.use\_color\_ramp
- Texture.use\_nodes
- Texture.users\_material
- Texture.users\_object\_modifier
- Texture.users\_material
- Texture.users\_object\_modifier

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- ID.copy
- ID.user\_clear
- ID.animation\_data\_create
- ID.animation\_data\_clear
- ID.update\_tag

## 2.4.359 NorController(Controller)

base classes — `bpy_struct`, `Controller`

**class bpy.types.NorController(Controller)**  
Controller passing on events based on a logical NOR operation

### Inherited Properties

- `bpy_struct.id_data`
- `Controller.name`
- `Controller.states`
- `Controller.show_expanded`
- `Controller.use_priority`
- `Controller.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`
- `Controller.link`
- `Controller.unlink`

## 2.4.360 Object(ID)

base classes — `bpy_struct`, `ID`

**class bpy.types.Object(ID)**  
Object datablock defining an object in a scene

**active\_material**  
Active material being displayed

**Type** `Material`

**active\_material\_index**  
Index of active material slot

**Type** int in [0, inf], default 0

**active\_shape\_key**

Current shape key

**Type** `ShapeKey`, (readonly)

**active\_shape\_key\_index**

Current shape key index

**Type** int in [-32768, 32767], default 0

**animation\_data**

Animation data for this datablock

**Type** `AnimData`, (readonly)

**animation\_visualisation**

Animation data for this datablock

**Type** `AnimViz`, (readonly, never None)

**bound\_box**

Objects bound box in object-space coordinates, all values are -1.0 when not available.

**Type** float array of 24 items in [-inf, inf], default (0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0), (readonly)

**collision**

Settings for using the objects as a collider in physics simulation

**Type** `CollisionSettings`, (readonly)

**color**

Object color and alpha, used when faces have the ObColor mode enabled

**Type** float array of 4 items in [-inf, inf], default (0.0, 0.0, 0.0, 0.0)

**constraints**

Constraints affecting the transformation of the object

**Type** `ObjectConstraints` `bpy_prop_collection` of `Constraint`, (readonly)

**data**

Object data

**Type** `ID`

**delta\_location**

Extra translation added to the location of the object

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**delta\_rotation\_euler**

Extra rotation added to the rotation of the object (when using Euler rotations)

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**delta\_rotation\_quaternion**

Extra rotation added to the rotation of the object (when using Quaternion rotations)

**Type** float array of 4 items in [-inf, inf], default (1.0, 0.0, 0.0, 0.0)

**delta\_scale**

Extra scaling added to the scale of the object

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**dimensions**

Absolute bounding box dimensions of the object

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**draw\_bounds\_type**

Object boundary display type

**Type** enum in ['BOX', 'SPHERE', 'CYLINDER', 'CONE', 'POLYHEDRON', 'CAPSULE'], default 'BOX'

**draw\_type**

Maximum draw type to display object with in viewport

**Type** enum in ['BOUNDS', 'WIRE', 'SOLID', 'TEXTURED'], default 'BOUNDS'

**dupli\_faces\_scale**

Scale the DupliFace objects

**Type** float in [0.001, 10000], default 0.0

**dupli\_frames\_end**

End frame for DupliFrames

**Type** int in [-300000, 300000], default 0

**dupli\_frames\_off**

Recurring frames to exclude from the Dupliframes

**Type** int in [0, 300000], default 0

**dupli\_frames\_on**

Number of frames to use between DupOff frames

**Type** int in [0, 300000], default 0

**dupli\_frames\_start**

Start frame for DupliFrames

**Type** int in [-300000, 300000], default 0

**dupli\_group**

Instance an existing group

**Type** Group

**dupli\_list**

Object duplis

**Type** bpy\_prop\_collection of DupliObject, (readonly)

**dupli\_type**

If not None, object duplication method to use

**Type** enum in ['NONE', 'FRAMES', 'VERTS', 'FACES', 'GROUP'], default 'NONE'

**empty\_draw\_size**

Size of display for empties in the viewport

**Type** float in [0.0001, 1000], default 0.0

**empty\_draw\_type**

Viewport display style for empties

**Type** enum in ['PLAIN\_AXES', 'ARROWS', 'SINGLE\_ARROW', 'CIRCLE', 'CUBE', 'SPHERE', 'CONE', 'IMAGE'], default 'PLAIN\_AXES'

**empty\_image\_offset**

Origin offset distance

**Type** float array of 2 items in [-inf, inf], default (0.0, 0.0)

**field**

Settings for using the objects as a field in physics simulation

**Type** `FieldSettings`, (readonly)

**game**

Game engine related settings for the object

**Type** `GameObjectSettings`, (readonly, never None)

**grease\_pencil**

Grease Pencil datablock

**Type** `GreasePencil`

**hide**

Restrict visibility in the viewport

**Type** boolean, default False

**hide\_render**

Restrict renderability

**Type** boolean, default False

**hide\_select**

Restrict selection in the viewport

**Type** boolean, default False

**is\_duplicator**

**Type** boolean, default False, (readonly)

**layers**

Layers the object is on

**Type** boolean array of 20 items, default (False, False, False)

**location**

Location of the object

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**lock\_location**

Lock editing of location in the interface

**Type** boolean array of 3 items, default (False, False, False)

**lock\_rotation**

Lock editing of rotation in the interface

**Type** boolean array of 3 items, default (False, False, False)

**lock\_rotation\_w**

Lock editing of 'angle' component of four-component rotations in the interface

**Type** boolean, default False

**lock\_rotations\_4d**

Lock editing of four component rotations by components (instead of as Eulers)

**Type** boolean, default False

**lock\_scale**  
Lock editing of scale in the interface

**Type** boolean array of 3 items, default (False, False, False)

**material\_slots**  
Material slots in the object

**Type** bpy\_prop\_collection of MaterialSlot, (readonly)

**matrix\_basis**  
Matrix access to location, rotation and scale (including deltas), before constraints and parenting are applied.

**Type** float array of 16 items in [-inf, inf], default (0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0)

**matrix\_local**  
Parent relative transformation matrix

**Type** float array of 16 items in [-inf, inf], default (0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0)

**matrix\_parent\_inverse**  
Inverse of object's parent matrix at time of parenting

**Type** float array of 16 items in [-inf, inf], default (0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0)

**matrix\_world**  
Worldspace transformation matrix

**Type** float array of 16 items in [-inf, inf], default (0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0)

**mode**  
Object interaction mode

**Type** enum in ['OBJECT', 'EDIT', 'SCULPT', 'VERTEX\_PAINT', 'WEIGHT\_PAINT', 'TEXTURE\_PAINT', 'PARTICLE\_EDIT', 'POSE'], default 'OBJECT', (readonly)

**modifiers**  
Modifiers affecting the geometric data of the object

**Type** ObjectModifiers bpy\_prop\_collection of Modifier, (readonly)

**motion\_path**  
Motion Path for this element

**Type** MotionPath, (readonly)

**parent**  
Parent Object

**Type** Object

**parent\_bone**  
Name of parent bone in case of a bone parenting relation

**Type** string, default “”

**parent\_type**  
Type of parent relation

**Type** enum in ['OBJECT', 'CURVE', 'KEY', 'ARMATURE', 'LATTICE', 'VERTEX', 'VERTEX\_3', 'BONE'], default 'OBJECT'

**parent\_vertices**

Indices of vertices in cases of a vertex parenting relation

**Type** int array of 3 items in [0, inf], default (0, 0, 0)

**particle\_systems**

Particle systems emitted from the object

**Type** `ParticleSystems bpy_prop_collection of ParticleSystem`, (readonly)

**pass\_index**

Index # for the IndexOB render pass

**Type** int in [0, 32767], default 0

**pose**

Current pose for armatures

**Type** `Pose`, (readonly)

**pose\_library**

Action used as a pose library for armatures

**Type** `Action`

**proxy**

Library object this proxy object controls

**Type** `Object`, (readonly)

**proxy\_group**

Library group duplicator object this proxy object controls

**Type** `Object`, (readonly)

**rotation\_axis\_angle**

Angle of Rotation for Axis-Angle rotation representation

**Type** float array of 4 items in [-inf, inf], default (0.0, 0.0, 1.0, 0.0)

**rotation\_euler**

Rotation in Eulers

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**rotation\_mode**

**Type** enum in ['QUATERNION', 'XYZ', 'XZY', 'YXZ', 'YZX', 'ZXY', 'ZYX', 'AXIS\_ANGLE'], default 'QUATERNION'

**rotation\_quaternion**

Rotation in Quaternions

**Type** float array of 4 items in [-inf, inf], default (1.0, 0.0, 0.0, 0.0)

**scale**

Scaling of the object

**Type** float array of 3 items in [-inf, inf], default (1.0, 1.0, 1.0)

**select**

Object selection state

**Type** boolean, default False

**show\_axis**

Displays the object's origin and axis

**Type** boolean, default False

**show\_bounds**

Displays the object's bounds

**Type** boolean, default False

**show\_name**

Displays the object's name

**Type** boolean, default False

**show\_only\_shape\_key**

Always show the current Shape for this Object

**Type** boolean, default False

**show\_texture\_space**

Displays the object's texture space

**Type** boolean, default False

**show\_transparent**

Displays material transparency in the object (unsupported for duplicator drawing)

**Type** boolean, default False

**show\_wire**

Adds the object's wireframe over solid drawing

**Type** boolean, default False

**show\_x\_ray**

Makes the object draw in front of others (unsupported for duplicator drawing)

**Type** boolean, default False

**soft\_body**

Settings for soft body simulation

**Type** SoftBodySettings, (readonly)

**time\_offset**

Animation offset in frames for F-Curve and dupligrp instances

**Type** float in [-300000, 300000], default 0.0

**track\_axis**

Axis that points in 'forward' direction (applies to DupliFrame when parent 'Follow' is enabled)

**Type** enum in ['POS\_X', 'POS\_Y', 'POS\_Z', 'NEG\_X', 'NEG\_Y', 'NEG\_Z'], default 'POS\_X'

**type**

Type of Object

**Type** enum in ['MESH', 'CURVE', 'SURFACE', 'META', 'FONT', 'ARMATURE', 'LATTICE', 'EMPTY', 'CAMERA', 'LAMP'], default 'EMPTY', (readonly)

**up\_axis**

Axis that points in the upward direction (applies to DupliFrame when parent 'Follow' is enabled)

**Type** enum in ['X', 'Y', 'Z'], default 'X'

**use\_dupli\_faces\_scale**

Scale dupli based on face size

**Type** boolean, default False

**use\_dupli\_frames\_speed**

Set dupliframes to use the frame

**Type** boolean, default False

**use\_dupli\_vertices\_rotation**

Rotate dupli according to vertex normal

**Type** boolean, default False

**use\_shape\_key\_edit\_mode**

Apply shape keys in edit mode (for Meshes only)

**Type** boolean, default False

**use\_slow\_parent**

Create a delay in the parent relationship

**Type** boolean, default False

**use\_time\_offset\_add\_parent**

Add the parents time offset value

**Type** boolean, default False

**use\_time\_offset\_edit**

Use time offset when inserting keys and display time offset for F-Curve and action views

**Type** boolean, default False

**use\_time\_offset\_parent**

Apply the time offset to this objects parent relationship

**Type** boolean, default False

**use\_time\_offset\_particle**

Let the time offset work on the particle effect

**Type** boolean, default False

**vertex\_groups**

Vertex groups of the object

**Type** `VertexGroups bpy_prop_collection of VertexGroup`, (readonly)

**children**

All the children of this object (readonly)

**users\_group**

The groups this object is in (readonly)

**users\_scene**

The scenes this object is in (readonly)

**to\_mesh** (*scene, apply\_modifiers, settings*)

Create a Mesh datablock with modifiers applied.

**Parameters**

- **scene** (`Scene`, (never None)) – Scene within which to evaluate modifiers.
- **apply\_modifiers** (`boolean`) – Apply modifiers.

- **settings** (*enum in ['PREVIEW', 'RENDER']*) – Modifier settings to apply.

**Returns** Mesh created from object, remove it if it is only used for export.

**Return type** `Mesh`

**dupli\_list\_create** (*scene*)

Create a list of dupli objects for this object, needs to be freed manually with `free_dupli_list` to restore the objects real matrix and layers.

**Parameters** `scene` (`Scene`, (never None)) – Scene within which to evaluate duplis.

**dupli\_list\_clear** ()

Free the list of dupli objects.

**find\_armature** ()

Find armature influencing this object as a parent or via a modifier.

**Returns** Armature object influencing this object or NULL.

**Return type** `Object`

**shape\_key\_add** (*name="Key"*, *from\_mix=True*)

Add shape key to an object.

**Parameters**

- **name** (*string, (optional)*) – Unique name for the new keylock.
- **from\_mix** (*boolean, (optional)*) – Create new shape from existing mix of shapes.

**Returns** New shape keyblock.

**Return type** `ShapeKey`

**ray\_cast** (*start*, *end*)

Cast a ray onto in object space.

**Return (location, normal, index)** *location*, The hit location of this ray cast, float array of 3 items in [-inf, inf]

*normal*, The face normal at the ray cast hit location, float array of 3 items in [-inf, inf]

*index*, The face index, -1 when no intersection is found., int in [-inf, inf]

**closest\_point\_on\_mesh** (*point*, *max\_dist=1.84467e+19*)

Find the nearest point on the object.

**Return (location, normal, index)** *location*, The location on the object closest to the point, float array of 3 items in [-inf, inf]

*normal*, The face normal at the closest point, float array of 3 items in [-inf, inf]

*index*, The face index, -1 when no closest point is found., int in [-inf, inf]

**is\_visible** (*scene*)

Determine if object is visible in a given scene.

**Returns** Object visibility.

**Return type** `boolean`

**is\_modified** (*scene*, *settings*)

Determine if this object is modified from the base mesh data.

**Parameters** `settings` (*enum in ['PREVIEW', 'RENDER']*) – Modifier settings to apply.

**Returns** Object visibility.

**Return type** boolean

### Inherited Properties

- bpy\_struct.id\_data
- ID.name
- ID.use\_fake\_user
- ID.library
- ID.tag
- ID.users

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- ID.copy
- ID.user\_clear
- ID.animation\_data\_create
- ID.animation\_data\_clear
- ID.update\_tag

### References

- ActionConstraint.target
- ArmatureActuator.secondary\_target
- ArmatureActuator.target
- ArmatureModifier.object
- ArrayModifier.curve
- ArrayModifier.end\_cap
- ArrayModifier.offset\_object
- ArrayModifier.start\_cap
- BlendData.objects
- BlendDataObjects.new
- BlendDataObjects.remove
- BoidRuleAvoid.object
- BoidRuleFollowLeader.object
- BoidRuleGoal.object

- BooleanModifier.object
- Camera.dof\_object
- CameraActuator.object
- CastModifier.object
- ChildOfConstraint.target
- ClampToConstraint.target
- ConstraintTarget.target
- CopyLocationConstraint.target
- CopyRotationConstraint.target
- CopyScaleConstraint.target
- CopyTransformsConstraint.target
- Curve.bevel\_object
- Curve.taper\_object
- CurveModifier.object
- CurveSplines.active
- DampedTrackConstraint.target
- DisplaceModifier.texture\_coords\_object
- DupliObject.object
- EditObjectActuator.object
- EditObjectActuator.track\_object
- EnvironmentMap.viewpoint\_object
- FloorConstraint.target
- FollowPathConstraint.target
- Group.objects
- GroupObjects.link
- GroupObjects.unlink
- HookModifier.object
- KinematicConstraint.pole\_target
- KinematicConstraint.target
- LampTextureSlot.object
- LatticeModifier.object
- LimitDistanceConstraint.target
- LockedTrackConstraint.target
- MaskModifier.armature
- MaterialTextureSlot.object
- MeshDeformModifier.object
- MirrorModifier.mirror\_object
- Object.find\_armature
- Object.parent
- Object.proxy
- Object.proxy\_group
- ObjectActuator.reference\_object
- ObjectBase.object
- ParentActuator.object
- ParticleEdit.object
- ParticleInstanceModifier.object
- ParticleSettings.billboard\_object
- ParticleSettings.dupli\_object
- ParticleSettingsTextureSlot.object
- ParticleSystem.parent
- ParticleSystem.reactor\_target\_object
- ParticleTarget.object
- PivotConstraint.target
- PointDensity.object

- PoseBone.custom\_shape
- PropertyActuator.object
- RigidBodyJointConstraint.child
- RigidBodyJointConstraint.target
- Scene.camera
- Scene.objects
- SceneActuator.camera
- SceneObjects.active
- SceneObjects.link
- SceneObjects.unlink
- SceneSequence.scene\_camera
- ScrewModifier.object
- ShrinkwrapConstraint.target
- ShrinkwrapModifier.assistant\_target
- ShrinkwrapModifier.target
- SimpleDeformModifier.origin
- SpaceView3D.camera
- SpaceView3D.lock\_object
- SplineIKConstraint.target
- StretchToConstraint.target
- TextCurve.follow\_curve
- TimelineMarker.camera
- ToolSettings.etch\_template
- TrackToConstraint.target
- TransformConstraint.target
- UVProjector.object
- VoxelData.domain\_object
- WarpModifier.object\_from
- WarpModifier.object\_to
- WarpModifier.texture\_coords\_object
- WaveModifier.start\_position\_object
- WaveModifier.texture\_coords\_object
- WorldTextureSlot.object

## 2.4.361 ObjectActuator(Actuator)

base classes — `bpy_struct, Actuator`

**class bpy.types.ObjectActuator (Actuator)**

Actuator to control the object movement

**angular\_velocity**

Sets the angular velocity

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**damping**

Number of frames to reach the target velocity

**Type** int in [-32768, 32767], default 0

**derivative\_coefficient**

Not required, high values can cause instability

**Type** float in [-inf, inf], default 0.0

**force**

Sets the force

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**force\_max\_x**

Set the upper limit for force

**Type** float in [-inf, inf], default 0.0

**force\_max\_y**

Set the upper limit for force

**Type** float in [-inf, inf], default 0.0

**force\_max\_z**

Set the upper limit for force

**Type** float in [-inf, inf], default 0.0

**force\_min\_x**

Set the lower limit for force

**Type** float in [-inf, inf], default 0.0

**force\_min\_y**

Set the lower limit for force

**Type** float in [-inf, inf], default 0.0

**force\_min\_z**

Set the lower limit for force

**Type** float in [-inf, inf], default 0.0

**integral\_coefficient**

Low value (0.01) for slow response, high value (0.5) for fast response

**Type** float in [-inf, inf], default 0.0

**linear\_velocity**

Sets the linear velocity (in Servo mode it sets the target relative linear velocity, it will be achieved by automatic application of force. Null velocity is a valid target)

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**mode**

Specify the motion system

**Type** enum in ['OBJECT\_NORMAL', 'OBJECT\_SERVO'], default 'OBJECT\_NORMAL'

**offset\_location**

Sets the location

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**offset\_rotation**

Sets the rotation

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**proportional\_coefficient**

Typical value is 60x integral coefficient

**Type** float in [-inf, inf], default 0.0

**reference\_object**

Reference object for velocity calculation, leave empty for world reference

**Type** [Object](#)

**torque**

Sets the torque

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**use\_add\_linear\_velocity**

Toggles between ADD and SET linV

**Type** boolean, default False

**use\_local\_angular\_velocity**

Angular velocity is defined in local coordinates

**Type** boolean, default False

**use\_local\_force**

Force is defined in local coordinates

**Type** boolean, default False

**use\_local\_linear\_velocity**

Velocity is defined in local coordinates

**Type** boolean, default False

**use\_local\_location**

Location is defined in local coordinates

**Type** boolean, default False

**use\_local\_rotation**

Rotation is defined in local coordinates

**Type** boolean, default False

**use\_local\_torque**

Torque is defined in local coordinates

**Type** boolean, default False

**use\_servo\_limit\_x**

Set limit to force along the X axis

**Type** boolean, default False

**use\_servo\_limit\_y**

Set limit to force along the Y axis

**Type** boolean, default False

**use\_servo\_limit\_z**

Set limit to force along the Z axis

**Type** boolean, default False

**Inherited Properties**

- [bpy\\_struct.id\\_data](#)
- [Actuator.name](#)

- `Actuator.show_expanded`
- `Actuator.pin`
- `Actuator.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`
- `Actuator.link`
- `Actuator.unlink`

## 2.4.362 ObjectBase(bpy\_struct)

base class — `bpy_struct`

**class** `bpy.types.ObjectBase (bpy_struct)`

An object instance in a scene

#### **layers**

Layers the object base is on

**Type** boolean array of 20 items, default (False, False, False)

#### **object**

Object this base links to

**Type** `Object`, (readonly)

#### **select**

Object base selection state

**Type** boolean, default False

#### **layers\_from\_view**(`view`)

Sets the object layers from a 3D View (use when adding an object in local view).

### Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `Scene.object_bases`
- `SceneBases.active`
- `SceneObjects.link`

### 2.4.363 ObjectConstraints(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.ObjectConstraints` (`bpy_struct`)

Collection of object constraints

**active**

Active Object constraint

**Type** `Constraint`

**new** (`type`)

Add a new constraint to this object

**Parameters** `type` (enum in [`'COPY_LOCATION'`, `'COPY_ROTATION'`,  
`'COPY_SCALE'`, `'COPY_TRANSFORMS'`, `'LIMIT_DISTANCE'`, `'LIMIT_LOCATION'`,  
`'LIMIT_ROTATION'`, `'LIMIT_SCALE'`, `'MAINTAIN_VOLUME'`, `'TRANSFORM'`,  
`'CLAMP_TO'`, `'DAMPED_TRACK'`, `'IK'`, `'LOCKED_TRACK'`, `'SPLINE_IK'`,  
`'STRETCH_TO'`, `'TRACK_TO'`, `'ACTION'`, `'CHILD_OF'`, `'FLOOR'`, `'FOLLOW_PATH'`,  
`'PIVOT'`, `'RIGID_BODY_JOINT'`, `'SCRIPT'`, `'SHRINKWRAP'`]) – Constraint type to add.

**Returns** New constraint.

**Return type** `Constraint`

**remove** (`constraint`)

Remove a constraint from this object.

**Parameters** `constraint` (`Constraint`, (never None)) – Removed constraint.

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `Object.constraints`

### 2.4.364 ObjectModifiers(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.ObjectModifiers` (`bpy_struct`)

Collection of object modifiers

**new** (`name, type`)

Add a new modifier.

#### Parameters

- `name` (`string`) – New name for the bone.
- `type` (`enum in ['ARRAY', 'BEVEL', 'BOOLEAN', 'BUILD', 'DECIMATE', 'EDGE_SPLIT', 'MASK', 'MIRROR', 'MULTIRES', 'SCREW', 'SOLIDIFY', 'SUBSURF', 'UV_PROJECT', 'ARMATURE', 'CAST', 'CURVE', 'DISPLACE', 'HOOK', 'LATTICE', 'MESH_DEFORM', 'SHRINKWRAP', 'SIMPLE_DEFORM', 'SMOOTH', 'WARP', 'WAVE', 'CLOTH', 'COLLISION', 'EXPLODE', 'FLUID_SIMULATION', 'PARTICLE_INSTANCE', 'PARTICLE_SYSTEM', 'SMOKE', 'SOFT_BODY', 'SURFACE']`) – Modifier type to add.

**Returns** Newly created modifier.

**Return type** `Modifier`

**remove** (`modifier`)

Remove an existing modifier from the object.

**Parameters** **modifier** ([Modifier](#), (never None)) – Modifier to remove.

### Inherited Properties

- `bpy_struct.id_data`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

### References

- `Object.modifiers`

## 2.4.365 ObstacleFluidSettings(FluidSettings)

base classes — `bpy_struct, FluidSettings`

**class bpy.types.ObstacleFluidSettings (FluidSettings)**

Fluid simulation settings for obstacles in the simulation

#### **impact\_factor**

This is an unphysical value for moving objects - it controls the impact an obstacle has on the fluid, =0 behaves a bit like outflow (deleting fluid), =1 is default, while >1 results in high forces. Can be used to tweak total mass

**Type** float in [-2, 10], default 0.0

#### **partial\_slip\_factor**

Amount of mixing between no- and free-slip, 0 is no slip and 1 is free slip

**Type** float in [0, 1], default 0.0

#### **slip\_type**

**Type** enum in ['NOSLIP', 'PARTIALSLIP', 'FREESLIP'], default 'NOSLIP'

#### **use**

Object contributes to the fluid simulation

**Type** boolean, default False

**use\_animated\_mesh**

Export this mesh as an animated one. Slower, only use if really necessary (e.g. armatures or parented objects), animated pos/rot/scale IPOs do not require it

**Type** boolean, default False

**volume\_INITIALIZATION**

Volume initialization type

**Type** enum in ['VOLUME', 'SHELL', 'BOTH'], default 'VOLUME'

## Inherited Properties

- `bpy_struct.id_data`
- `FluidSettings.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.366 Operator(`bpy_struct`)

### Basic Operator Example

This script shows simple operator which prints a message.

Since the operator only has an `Operator.execute` function it takes no user input.

---

**Note:** Operator subclasses must be registered before accessing them from blender.

---

```
import bpy

class HelloWorldOperator(bpy.types.Operator):
    bl_idname = "wm.hello_world"
    bl_label = "Minimal Operator"
```

```
def execute(self, context):
    print("Hello World")
    return {'FINISHED'}
```

```
bpy.utils.register_class(SimpleOperator)
```

```
# test call to the newly defined operator
bpy.ops.wm.hello_world()
```

## Invoke Function

`Operator.invoke` is used to initialize the operator from the context at the moment the operator is called. `invoke()` is typically used to assign properties which are then used by `execute()`. Some operators don't have an `execute()` function, removing the ability to be repeated from a script or macro.

This example shows how to define an operator which gets mouse input to execute a function and that this operator can be invoked or executed from the python api.

Also notice this operator defines its own properties, these are different to typical class properties because blender registers them with the operator, to use as arguments when called, saved for operator undo/redo and automatically added into the user interface.

```
import bpy
```

```
class SimpleMouseOperator(bpy.types.Operator):
    """ This operator shows the mouse location,
        this string is used for the tooltip and API docs
    """
    bl_idname = "wm.mouse_position"
    bl_label = "Invoke Mouse Operator"

    x = bpy.props.IntProperty()
    y = bpy.props.IntProperty()

    def execute(self, context):
        # rather than printing, use the report function,
        # this way the message appears in the header,
        self.report({'INFO'}, "Mouse coords are %d %d" % (self.x, self.y))
        return {'FINISHED'}
```

```
    def invoke(self, context, event):
        self.x = event.mouse_x
        self.y = event.mouse_y
        return self.execute(context)
```

```
bpy.utils.register_class(SimpleMouseOperator)
```

```
# Test call to the newly defined operator.
# Here we call the operator and invoke it, meaning that the settings are taken
# from the mouse.
bpy.ops.wm.mouse_position('INVOKE_DEFAULT')
```

```
# Another test call, this time call execute() directly with pre-defined settings.
bpy.ops.wm.mouse_position('EXEC_DEFAULT', x=20, y=66)
```

## Calling a File Selector

This example shows how an operator can use the file selector.

Notice the invoke function calls a window manager method and returns RUNNING\_MODAL, this means the file selector stays open and the operator does not exit immediately after invoke finishes.

The file selector runs the operator, calling `Operator.execute` when the user confirms.

The `Operator.poll` function is optional, used to check if the operator can run.

```
import bpy
```

```
class ExportSomeData(bpy.types.Operator):
    """Test exporter which just writes hello world"""
    bl_idname = "export.some_data"
    bl_label = "Export Some Data"

    filepath = bpy.props.StringProperty(subtype="FILE_PATH")

    @classmethod
    def poll(cls, context):
        return context.object is not None

    def execute(self, context):
        file = open(self.filepath, 'w')
        file.write("Hello World " + context.object.name)
        return {'FINISHED'}

    def invoke(self, context, event):
        context.window_manager.fileselect_add(self)
        return {'RUNNING_MODAL'}


# Only needed if you want to add into a dynamic menu
def menu_func(self, context):
    self.layout.operator_context = 'INVOKE_DEFAULT'
    self.layout.operator(ExportSomeData.bl_idname, text="Text Export Operator")

# Register and add to the file selector
bpy.utils.register_class(ExportSomeData)
bpy.types.INFO_MT_file_export.append(menu_func)

# test call
bpy.ops.export.some_data('INVOKE_DEFAULT')
```

## Dialog Box

This operator uses its `Operator.invoke` function to call a popup.

```
import bpy
```

```
class DialogOperator(bpy.types.Operator):
    bl_idname = "object.dialog_operator"
    bl_label = "Simple Dialog Operator"
```

```
my_float = bpy.props.FloatProperty(name="Some Floating Point")
my_bool = bpy.props.BoolProperty(name="Toggle Option")
my_string = bpy.props.StringProperty(name="String Value")

def execute(self, context):
    message = "Popup Values: %f, %d, '%s'" % \
        (self.my_float, self.my_bool, self.my_string)
    self.report({'INFO'}, message)
    return {'FINISHED'}

def invoke(self, context, event):
    wm = context.window_manager
    return wm.invoke_props_dialog(self)

bpy.utils.register_class(DialogOperator)

# test call
bpy.ops.object.dialog_operator('INVOKE_DEFAULT')
```

## Custom Drawing

By default operator properties use an automatic user interface layout. If you need more control you can create your own layout with a `Operator.draw` function.

This works like the `Panel` and `Menu` draw functions, its used for dialogs and file selectors.

```
import bpy

class CustomDrawOperator(bpy.types.Operator):
    bl_idname = "object.custom_draw"
    bl_label = "Simple Modal Operator"

    filepath = bpy.props.StringProperty(subtype="FILE_PATH")

    my_float = bpy.props.FloatProperty(name="Float")
    my_bool = bpy.props.BoolProperty(name="Toggle Option")
    my_string = bpy.props.StringProperty(name="String Value")

    def execute(self, context):
        print()
        return {'FINISHED'}

    def invoke(self, context, event):
        context.window_manager.fileselect_add(self)
        return {'RUNNING_MODAL'}

    def draw(self, context):
        layout = self.layout
        col = layout.column()
        col.label(text="Custom Interface!")

        row = col.row()
        row.prop(self, "my_float")
        row.prop(self, "my_bool")
```

```
    col.prop(self, "my_string")

bpy.utils.register_class(CustomDrawOperator)

# test call
bpy.ops.object.custom_draw('INVOKE_DEFAULT')
```

## Modal Execution

This operator defines a `Operator.modal` function which runs, handling events until it returns {‘FINISHED’} or {‘CANCELLED’}.

Grab, Rotate, Scale and Fly-Mode are examples of modal operators. They are especially useful for interactive tools, your operator can have its own state where keys toggle options as the operator runs.

`Operator.invoke` is used to initialize the operator as being by returning {‘RUNNING\_MODAL’}, initializing the modal loop.

Notice `__init__()` and `__del__()` are declared. For other operator types they are not useful but for modal operators they will be called before the `Operator.invoke` and after the operator finishes.

```
import bpy

class ModalOperator(bpy.types.Operator):
    bl_idname = "object.modal_operator"
    bl_label = "Simple Modal Operator"

    def __init__(self):
        print("Start")

    def __del__(self):
        print("End")

    def execute(self, context):
        context.object.location.x = self.value / 100.0

    def modal(self, context, event):
        if event.type == 'MOUSEMOVE': # Apply
            self.value = event.mouse_x
            self.execute(context)
        elif event.type == 'LEFTMOUSE': # Confirm
            return {'FINISHED'}
        elif event.type in ('RIGHTMOUSE', 'ESC'): # Cancel
            return {'CANCELLED'}

    return {'RUNNING_MODAL'}

    def invoke(self, context, event):
        self.value = event.mouse_x
        self.execute(context)

        print(context.window_manager.modal_handler_add(self))
        return {'RUNNING_MODAL'}
```

bpy.utils.register\_class(ModalOperator)

```
# test call
bpy.ops.object.modal_operator('INVOKE_DEFAULT')

base class — bpy_struct

class bpy.types.Operator(bpy_struct)
    Storage of an operator being executed, or registered after execution

    bl_description
        Type string, default ""

    bl_idname
        Type string, default ""

    bl_label
        Type string, default ""

    bl_options
        Options for this operator type
        Type enum set in {'REGISTER', 'UNDO', 'BLOCKING', 'MACRO', 'GRAB_POINTER',
                           'PRESET', 'INTERNAL'}, default {'REGISTER'}

    has_reports
        Operator has a set of reports (warnings and errors) from last execution
        Type boolean, default False, (readonly)

    layout
        TypeUILayout, (readonly)

    name
        Type string, default "", (readonly)

    properties
        Type OperatorProperties, (readonly, never None)

    report (type, message)
        report

    Parameters
        • type (enum set in {'DEBUG', 'INFO', 'OPERATOR', 'WARNING', 'ERROR',
                           'ERROR_INVALID_INPUT', 'ERROR_INVALID_CONTEXT',
                           'ERROR_OUT_OF_MEMORY'}) – Type
        • message (string) – Report Message

    classmethod poll (context)
        Test if the operator can be called or not.

        Return type boolean

    execute (context)
        Execute the operator.

        Returns result
        Return type enum set in {'RUNNING_MODAL', 'CANCELLED', 'FINISHED',
                               'PASS_THROUGH'}
```

**check** (*context*)

Check the operator settings, return True to signal a change to redraw.

**Returns** result

**Return type** boolean

**invoke** (*context, event*)

Invoke the operator.

**Returns** result

**Return type** enum set in {‘RUNNING\_MODAL’, ‘CANCELLED’, ‘FINISHED’, ‘PASS\_THROUGH’}

**modal** (*context, event*)

Modal operator function.

**Returns** result

**Return type** enum set in {‘RUNNING\_MODAL’, ‘CANCELLED’, ‘FINISHED’, ‘PASS\_THROUGH’}

**draw** (*context*)

Draw function for the operator.

**cancel** (*context*)

Called when the operator is cancelled.

**Returns** result

**Return type** enum set in {‘RUNNING\_MODAL’, ‘CANCELLED’, ‘FINISHED’, ‘PASS\_THROUGH’}

**as\_keywords** (*ignore=()*)

Return a copy of the properties as a dictionary.

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve

- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `SpaceFileBrowser.operator`
- `WindowManager.fileselect_add`
- `WindowManager.invoke_confirm`
- `WindowManager.invoke_popup`
- `WindowManager.invoke_props_dialog`
- `WindowManager.invoke_props_popup`
- `WindowManager.invoke_search_popup`
- `WindowManager.modal_handler_add`
- `WindowManager.operators`

### 2.4.367 OperatorFileListElement(PropertyGroup)

base classes — `bpy_struct, PropertyGroup`

`class bpy.types.OperatorFileListElement (PropertyGroup)`

#### `name`

the name of a file or directory within a file list

**Type** string, default “”

#### Inherited Properties

- `bpy_struct.id_data`
- `PropertyGroup.name`

#### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.368 OperatorMousePath(PropertyGroup)

base classes — `bpy_struct`, `PropertyGroup`

**class bpy.types.OperatorMousePath (PropertyGroup)**

Mouse path values for operators that record such paths

**loc**

Mouse location

**Type** float array of 2 items in [-inf, inf], default (0.0, 0.0)

**time**

Time of mouse location

**Type** float in [-inf, inf], default 0.0

### Inherited Properties

- `bpy_struct.id_data`
- `PropertyGroup.name`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.369 OperatorProperties(bpy\_struct)

base class — `bpy_struct`

**class bpy.types.OperatorProperties (bpy\_struct)**

Input properties of an Operator

### Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `KeyMapItem.properties`
- `Macro.properties`
- `Operator.properties`
- `OperatorTypeMacro.properties`
- `UILayout.operator`

## 2.4.370 OperatorStrokeElement(PropertyGroup)

base classes — `bpy_struct, PropertyGroup`

`class bpy.types.OperatorStrokeElement (PropertyGroup)`

### `is_start`

**Type** boolean, default False

### `location`

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

### `mouse`

**Type** float array of 2 items in [-inf, inf], default (0.0, 0.0)

### `pen_flip`

**Type** boolean, default False

### `pressure`

Tablet pressure

**Type** float in [0, 1], default 0.0

### `time`

**Type** float in [0, inf], default 0.0

## Inherited Properties

- `bpy_struct.id_data`
- `PropertyGroup.name`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.371 OperatorTypeMacro(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.OperatorTypeMacro` (`bpy_struct`)  
Storage of a sub operator in a macro after it has been added

**properties**

**Type** `OperatorProperties`, (readonly, never None)

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`

- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.372 OrController(Controller)

base classes — bpy\_struct, Controller

**class bpy.types.OrController(Controller)**  
Controller passing on events based on a logical OR operation

### Inherited Properties

- bpy\_struct.id\_data
- Controller.name
- Controller.states
- Controller.show\_expanded
- Controller.use\_priority
- Controller.type

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- Controller.link
- Controller.unlink

## 2.4.373 OutflowFluidSettings(FluidSettings)

base classes — bpy\_struct, FluidSettings

**class bpy.types.OutflowFluidSettings(FluidSettings)**  
Fluid simulation settings for objects removing fluids from the simulation

#### use

Object contributes to the fluid simulation

**Type** boolean, default False

**use\_animated\_mesh**

Export this mesh as an animated one. Slower, only use if really necessary (e.g. armatures or parented objects), animated pos/rot/scale IPOs do not require it

**Type** boolean, default False

**volume\_INITIALIZATION**

Volume initialization type

**Type** enum in ['VOLUME', 'SHELL', 'BOTH'], default 'VOLUME'

### Inherited Properties

- `bpy_struct.id_data`
- `FluidSettings.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.374 PackedFile(`bpy_struct`)

base class — `bpy_struct`

**class bpy.types.PackedFile (`bpy_struct`)**

External file packed into the .blend file

**size**

Size of packed file in bytes

**Type** int in [-inf, inf], default 0, (readonly)

### Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `Image.packed_file`
- `Sound.packed_file`
- `VectorFont.packed_file`

### 2.4.375 Paint(bpy\_struct)

base class — `bpy_struct`

subclasses — `VertexPaint`, `Sculpt`, `ImagePaint`

**class** `bpy.types.Paint` (`bpy_struct`)

#### **brush**

Active Brush

**Type** `Brush`

#### **show\_brush**

**Type** boolean, default False

#### **show\_brush\_on\_surface**

**Type** boolean, default False

#### **show\_low\_resolution**

For multires, show low resolution while navigating the view

**Type** boolean, default False

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.376 Panel(`bpy_struct`)

### Basic Panel Example

This script is a simple panel which will draw into the object properties section.

Notice the ‘CATEGORY\_PT\_name’ `Panel.bl_idname`, this is a naming convention for panels.

---

**Note:** Panel subclasses must be registered for blender to use them.

---

```
import bpy

class HelloWorldPanel(bpy.types.Panel):
    bl_idname = "OBJECT_PT_hello_world"
    bl_label = "Hello World"
    bl_space_type = 'PROPERTIES'
    bl_region_type = 'WINDOW'
    bl_context = "object"

    def draw(self, context):
        self.layout.label(text="Hello World")

bpy.utils.register_class(HelloWorldPanel)
```

### Simple Object Panel

This panel has a `Panel.poll` and `Panel.draw_header` function, even though the contents is basic this closely resembles blenders panels.

```
import bpy
```

```
class ObjectSelectPanel(bpy.types.Panel):
    bl_idname = "OBJECT_PT_select"
    bl_label = "Select"
    bl_space_type = 'PROPERTIES'
    bl_region_type = 'WINDOW'
    bl_context = "object"
    bl_options = {'DEFAULT_CLOSED'}

    @classmethod
    def poll(cls, context):
        return (context.object is not None)

    def draw_header(self, context):
        layout = self.layout
        obj = context.object
        layout.prop(obj, "select", text="")

    def draw(self, context):
        layout = self.layout

        obj = context.object
        row = layout.row()
        row.prop(obj, "hide_select")
        row.prop(obj, "hide_render")

        box = layout.box()
        box.label("Selection Tools")
        box.operator("object.select_all")
        row = box.row()
        row.operator("object.select_inverse")
        row.operator("object.select_random")

bpy.utils.register_class(ObjectSelectPanel)
```

## Mix-in Classes

A mix-in parent class can be used to share common properties and `Menu.poll` function.

```
import bpy

class View3DPanel():
    bl_space_type = 'VIEW_3D'
    bl_region_type = 'TOOLS'

    @classmethod
    def poll(cls, context):
        return (context.object is not None)

class PanelOne(View3DPanel, bpy.types.Panel):
    bl_idname = "VIEW3D_PT_test_1"
    bl_label = "Panel One"

    def draw(self, context):
        self.layout.label("Small Class")
```

```
class PanelTwo(View3DPanel, bpy.types.Panel):
    bl_idname = "VIEW3D_PT_test_2"
    bl_label = "Panel Two"

    def draw(self, context):
        self.layout.label("Also Small Class")

bpy.utils.register_class(PanelOne)
bpy.utils.register_class(PanelTwo)

base class — bpy_struct

class bpy.types.Panel (bpy_struct)
    Panel containing UI elements

bl_context
    The context in which the panel belongs to. (TODO: explain the possible combinations
    bl_context/bl_region_type/bl_space_type)
        Type string, default “”

bl_idname
    If this is set, the panel gets a custom ID, otherwise it takes the name of the class used to define the panel. For
    example, if the class name is “OBJECT_PT_hello”, and bl_idname is not set by the script, then bl_idname
    = “OBJECT_PT_hello”
        Type string, default “”

bl_label
    The panel label, shows up in the panel header at the right of the triangle used to collapse the panel.
        Type string, default “”

bl_options
    Options for this panel type
        Type enum set in {‘DEFAULT_CLOSED’, ‘HIDE_HEADER’}, default {‘DE-
            FAULT_CLOSED’}

bl_region_type
    The region where the panel is going to be used in.
        Type enum in [‘WINDOW’, ‘HEADER’, ‘CHANNELS’, ‘TEMPORARY’, ‘UI’, ‘TOOLS’,
            ‘TOOL_PROPS’, ‘PREVIEW’], default ‘WINDOW’

bl_space_type
    The space where the panel is going to be used in.
        Type enum in [‘EMPTY’, ‘VIEW_3D’, ‘GRAPH_EDITOR’, ‘OUTLINER’, ‘PROP-
            ERTIES’, ‘FILE_BROWSER’, ‘IMAGE_EDITOR’, ‘INFO’, ‘SEQUENCE_EDITOR’,
            ‘TEXT_EDITOR’, ‘AUDIO_WINDOW’, ‘DOPESHEET_EDITOR’, ‘NLA_EDITOR’,
            ‘SCRIPTS_WINDOW’, ‘TIMELINE’, ‘NODE_EDITOR’, ‘LOGIC_EDITOR’, ‘CON-
            SOLE’, ‘USER_PREFERENCES’], default ‘EMPTY’

layout
    Defines the structure of the panel in the UI.
        Type UILayout, (readonly)
```

**text**  
XXX todo

**Type** string, default “”

**classmethod poll (context)**

If this method returns a non-null output, then the panel can be drawn.

**Return type** boolean

**draw (context)**

Draw UI elements into the panel UI layout.

**draw\_header (context)**

Draw UI elements into the panel’s header UI layout.

**classmethod append (draw\_func)**

Append a draw function to this menu, takes the same arguments as the menus draw function.

**classmethod prepend (draw\_func)**

Prepend a draw function to this menu, takes the same arguments as the menus draw function.

**classmethod remove (draw\_func)**

Remove a draw function that has been added to this menu

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.377 ParentActuator(Actuator)

base classes — bpy\_struct, Actuator

```
class bpy.types.ParentActuator(Actuator)

    mode
        Type enum in ['SETPARENT', 'REMOVEPARENT'], default 'SETPARENT'

    object
        Set this object as parent
            Type Object

    use_compound
        Add this object shape to the parent shape (only if the parent shape is already compound)
            Type boolean, default False

    use_ghost
        Make this object ghost while parented
            Type boolean, default False
```

### Inherited Properties

- `bpy_struct.id_data`
- `Actuator.name`
- `Actuator.show_expanded`
- `Actuator.pin`
- `Actuator.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`
- `Actuator.link`
- `Actuator.unlink`

## 2.4.378 Particle(`bpy_struct`)

base class — `bpy_struct`

```
class bpy.types.Particle(bpy_struct)
    Particle in a particle system

    alive_state
        Type enum in ['DEAD', 'UNBORN', 'ALIVE', 'DYING'], default 'DEAD'

    angular_velocity
        Type float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

    birth_time
        Type float in [-inf, inf], default 0.0

    die_time
        Type float in [-inf, inf], default 0.0

    hair_keys
        Type bpy_prop_collection of ParticleHairKey, (readonly)

    is_exist
        Type boolean, default False, (readonly)

    is_visible
        Type boolean, default False, (readonly)

    lifetime
        Type float in [-inf, inf], default 0.0

    location
        Type float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

    particle_keys
        Type bpy_prop_collection of ParticleKey, (readonly)

    prev_angular_velocity
        Type float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

    prev_location
        Type float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

    prev_rotation
        Type float array of 4 items in [-inf, inf], default (0.0, 0.0, 0.0, 0.0)

    prev_velocity
        Type float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

    rotation
        Type float array of 4 items in [-inf, inf], default (0.0, 0.0, 0.0, 0.0)

    size
        Type float in [-inf, inf], default 0.0

    velocity
        Type float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)
```

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- ParticleSystem.particles

## 2.4.379 ParticleBrush(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.ParticleBrush (*bpy\_struct*)  
Particle editing brush

**count**  
Particle count

**Type** int in [1, 1000], default 0

**curve**

**Type** CurveMapping, (readonly)

**length\_mode**

**Type** enum in ['GROW', 'SHRINK'], default 'GROW'

**puff\_mode**

**Type** enum in ['ADD', 'SUB'], default 'ADD'

**size**  
Radius of the brush in pixels

**Type** int in [1, 32767], default 0

**steps**

Brush steps

**Type** int in [1, 32767], default 0

**strength**

Brush strength

**Type** float in [0.001, 1], default 0.0

**use\_puff\_volume**

Apply puff to unselected end-points, (helps maintain hair volume when puffing root)

**Type** boolean, default False

**Inherited Properties**

- bpy\_struct.id\_data

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

**References**

- ParticleEdit.brush

## 2.4.380 ParticleDupliWeight(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.ParticleDupliWeight (bpy\_struct)

Weight of a particle dupliobject in a group

**count**

The number of times this object is repeated with respect to other objects

**Type** int in [0, 32767], default 0

**name**

Particle dupliobject name

**Type** string, default "", (readonly)

**Inherited Properties**

- bpy\_struct.id\_data

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

**References**

- ParticleSettings.active\_dupliweight
- ParticleSettings.dupli\_weights

## 2.4.381 ParticleEdit(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.ParticleEdit (bpy\_struct)  
Properties of particle editing mode

**brush**

**Type** ParticleBrush, (readonly)

**default\_key\_count**

How many keys to make new particles with

**Type** int in [2, 32767], default 0

**draw\_step**

How many steps to draw the path with

**Type** int in [2, 10], default 0

**emitter\_distance**

Distance to keep particles away from the emitter

**Type** float in [0, inf], default 0.0

**fade\_frames**

How many frames to fade

**Type** int in [2, 100], default 0

**is\_editable**

A valid edit mode exists

**Type** boolean, default False, (readonly)

**is\_hair**

Editing hair

**Type** boolean, default False, (readonly)

**object**

The edited object

**Type** [Object](#), (readonly)

**select\_mode**

Particle select and display mode

**Type** enum in ['PATH', 'POINT', 'TIP'], default 'PATH'

**show\_particles**

Draw actual particles

**Type** boolean, default False

**tool**

**Type** enum in ['NONE', 'COMB', 'SMOOTH', 'ADD', 'LENGTH', 'PUFF', 'CUT', 'WEIGHT'], default 'COMB'

**type**

**Type** enum in ['PARTICLES', 'SOFT\_BODY', 'CLOTH'], default 'PARTICLES'

**use\_auto\_velocity**

Calculate point velocities automatically

**Type** boolean, default False

**use\_default\_interpolate**

Interpolate new particles from the existing ones

**Type** boolean, default False

**use\_emitter\_deflect**

Keep paths from intersecting the emitter

**Type** boolean, default False

**use\_fade\_time**

Fade paths and keys further away from current frame

**Type** boolean, default False

**use\_preserve\_length**

Keep path lengths constant

**Type** boolean, default False  
**use\_preserve\_root**  
Keep root keys unmodified  
**Type** boolean, default False

### Inherited Properties

- bpy\_struct.id\_data

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

### References

- ToolSettings.particle\_edit

## 2.4.382 ParticleFluidSettings(FluidSettings)

base classes — bpy\_struct, FluidSettings

**class bpy.types.ParticleFluidSettings(FluidSettings)**  
Fluid simulation settings for objects storing fluid particles generated by the simulation

**alpha\_influence**  
Amount of particle alpha change, inverse of size influence: 0=off (all same alpha), 1=full. (large particles get lower alphas, smaller ones higher values)  
**Type** float in [0, 2], default 0.0

**filepath**  
Directory (and/or filename prefix) to store and load particles from  
**Type** string, default “”

**particle\_influence**  
Amount of particle size scaling: 0=off (all same size), 1=full (range 0.2-2.0), >1=stronger

**Type** float in [0, 2], default 0.0

**show\_tracer**

Show tracer particles

**Type** boolean, default False

**use\_drops**

Show drop particles

**Type** boolean, default False

**use\_floats**

Show floating foam particles

**Type** boolean, default False

## Inherited Properties

- `bpy_struct.id_data`
- `FluidSettings.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.383 ParticleHairKey(`bpy_struct`)

base class — `bpy_struct`

**class bpy.types.ParticleHairKey (`bpy_struct`)**

Particle key for hair particle system

**co**

Location of the hair key in object space

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**co\_hair\_space**

Location of the hair key in its internal coordinate system, relative to the emitting face

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**time**

Relative time of key over hair length

**Type** float in [0, inf], default 0.0

**weight**

Weight for cloth simulation

**Type** float in [0, 1], default 0.0

**Inherited Properties**

- bpy\_struct.id\_data

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

**References**

- Particle.hair\_keys

## 2.4.384 ParticleInstanceModifier(Modifier)

base classes — bpy\_struct, Modifier

class bpy.types.ParticleInstanceModifier (*Modifier*)  
Particle system instancing modifier

**axis**

Pole axis for rotation

**Type** enum in ['X', 'Y', 'Z'], default 'X'

**object**

Object that has the particle system

**Type** Object

**particle\_system\_index**

**Type** int in [1, 10], default 0

**position**  
Position along path

**Type** float in [0, 1], default 0.0

**random\_position**  
Randomize position along path

**Type** float in [0, 1], default 0.0

**show\_alive**  
Show instances when particles are alive

**Type** boolean, default False

**show\_dead**  
Show instances when particles are dead

**Type** boolean, default False

**show\_unborn**  
Show instances when particles are unborn

**Type** boolean, default False

**use\_children**  
Create instances from child particles

**Type** boolean, default False

**use\_normal**  
Create instances from normal particles

**Type** boolean, default False

**use\_path**  
Create instances along particle paths

**Type** boolean, default False

**use\_preserve\_shape**  
Don't stretch the object

**Type** boolean, default False

**use\_size**  
Use particle size to scale the instances

**Type** boolean, default False

### Inherited Properties

- `bpy_struct.id_data`
- `Modifier.name`
- `Modifier.use_apply_on_spline`
- `Modifier.show_in_editmode`
- `Modifier.show_expanded`
- `Modifier.show_on_cage`
- `Modifier.show_viewport`
- `Modifier.show_render`
- `Modifier.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.385 ParticleKey(bpy\_struct)

base class — `bpy_struct`

**class** `bpy.types.ParticleKey` (`bpy_struct`)

    Key location for a particle over time

**angular\_velocity**

    Key angular velocity

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**location**

    Key location

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**rotation**

    Key rotation quaternion

**Type** float array of 4 items in [-inf, inf], default (0.0, 0.0, 0.0, 0.0)

**time**

    Time of key over the simulation

**Type** float in [0, inf], default 0.0

**velocity**

    Key velocity

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `Particle.particle_keys`

### 2.4.386 ParticleSettings(*ID*)

base classes — `bpy_struct, ID`

**class** `bpy.types.ParticleSettings(ID)`

Particle settings, reusable by multiple particle systems

**active\_dupliweight**

**Type** `ParticleDupliWeight`, (readonly)

**active\_dupliweight\_index**

**Type** int in [0, inf], default 0

**active\_texture**

Active texture slot being displayed

**Type** `Texture`

**active\_texture\_index**

Index of active texture slot

**Type** int in [0, 17], default 0

**adaptive\_angle**

How many degrees path has to curve to make another render segment

**Type** int in [0, 45], default 0

**adaptive\_pixel**

How many pixels path has to cover to make another render segment

**Type** int in [0, 50], default 0

**angular\_velocity\_factor**

Angular velocity amount

**Type** float in [-200, 200], default 0.0

**angular\_velocity\_mode**

Particle angular velocity mode

**Type** enum in ['NONE', 'SPIN', 'RAND'], default 'NONE'

**animation\_data**

Animation data for this datablock

**Type** [AnimData](#), (readonly)

**apply\_effector\_to\_children**

Apply effectors to children

**Type** boolean, default False

**apply\_guide\_to\_children**

**Type** boolean, default False

**billboard\_align**

In respect to what the billboards are aligned

**Type** enum in ['X', 'Y', 'Z', 'VIEW', 'VEL'], default 'X'

**billboard\_animation**

How to animate billboard textures

**Type** enum in ['NONE', 'AGE', 'FRAME', 'ANGLE'], default 'NONE'

**billboard\_object**

Billboards face this object (default is active camera)

**Type** [Object](#)

**billboard\_offset**

**Type** float array of 2 items in [-100, 100], default (0.0, 0.0)

**billboard\_offset\_split**

How to offset billboard textures

**Type** enum in ['NONE', 'LINEAR', 'RANDOM'], default 'NONE'

**billboard\_size**

Scale billboards relative to particle size

**Type** float array of 2 items in [0.001, 10], default (0.0, 0.0)

**billboard\_tilt**

Tilt of the billboards

**Type** float in [-1, 1], default 0.0

**billboard\_tilt\_random**

Random tilt of the billboards

**Type** float in [0, 1], default 0.0

**billboard\_uv\_split**

Amount of rows/columns to split UV coordinates for billboards

**Type** int in [1, 100], default 0

**billboard\_velocity\_head**

Scale billboards by velocity

**Type** float in [0, 10], default 0.0

**billboard\_velocity\_tail**

Scale billboards by velocity

**Type** float in [0, 10], default 0.0

**boids**

**Type** [BoidSettings](#), (readonly)

**branch\_threshold**

Threshold of branching

**Type** float in [0, 1], default 0.0

**brownian\_factor**

Specify the amount of Brownian motion

**Type** float in [0, 200], default 0.0

**child\_length**

Length of child paths

**Type** float in [0, 1], default 0.0

**child\_length\_threshold**

Amount of particles left untouched by child path length

**Type** float in [0, 1], default 0.0

**child\_nbr**

Amount of children/parent

**Type** int in [0, 100000], default 0

**child\_parting\_factor**

Create parting in the children based on parent strands

**Type** float in [0, 1], default 0.0

**child\_parting\_max**

Maximum root to tip angle (tip distance/root distance for long hair)

**Type** float in [0, 180], default 0.0

**child\_parting\_min**

Minimum root to tip angle (tip distance/root distance for long hair)

**Type** float in [0, 180], default 0.0

**child\_radius**

Radius of children around parent

**Type** float in [0, 10], default 0.0

**child\_roundness**

Roundness of children around parent

**Type** float in [0, 1], default 0.0

**child\_size**

A multiplier for the child particle size

**Type** float in [0.001, 100000], default 0.0

**child\_size\_random**  
Random variation to the size of the child particles

**Type** float in [0, 1], default 0.0

**child\_type**  
Create child particles

**Type** enum in ['NONE', 'SIMPLE', 'INTERPOLATED'], default 'NONE'

**clump\_factor**  
Amount of clumping

**Type** float in [-1, 1], default 0.0

**clump\_shape**  
Shape of clumping

**Type** float in [-0.999, 0.999], default 0.0

**color\_maximum**  
Maximum length of the particle color vector

**Type** float in [0.01, 100], default 0.0

**count**  
Total number of particles

**Type** int in [0, 10000000], default 0

**create\_long\_hair\_children**  
Calculate children that suit long hair well

**Type** boolean, default False

**damping**  
Specify the amount of damping

**Type** float in [0, 1], default 0.0

**distribution**  
How to distribute particles on selected element

**Type** enum in ['NONE', 'RENDER', 'DOT', 'CIRC', 'CROSS', 'AXIS'], default 'NONE'

**drag\_factor**  
Specify the amount of air-drag

**Type** float in [0, 1], default 0.0

**draw\_color**  
Draw additional particle data as a color

**Type** enum in ['NONE', 'MATERIAL', 'VELOCITY', 'ACCELERATION'], default 'NONE'

**draw\_method**  
How particles are drawn in viewport

**Type** enum in ['NONE', 'RENDER', 'DOT', 'CIRC', 'CROSS', 'AXIS'], default 'NONE'

**draw\_percentage**  
Percentage of particles to display in 3D view

**Type** int in [0, 100], default 0

**draw\_size**  
Size of particles on viewport in pixels (0=default)  
**Type** int in [0, 1000], default 0

**draw\_step**  
How many steps paths are drawn with (power of 2)  
**Type** int in [0, 10], default 0

**dupli\_group**  
Show Objects in this Group in place of particles  
**Type** Group

**dupli\_object**  
Show this Object in place of particles  
**Type** Object

**dupli\_weights**  
Weights for all of the objects in the dupli group  
**Type** bpy\_prop\_collection of ParticleDupliWeight, (readonly)

**effect\_hair**  
Hair stiffness for effectors  
**Type** float in [0, 1], default 0.0

**effector\_amount**  
How many particles are effectors (0 is all particles)  
**Type** int in [0, 10000], default 0

**effector\_weights**  
**Type** EffectorWeights, (readonly)

**emit\_from**  
Where to emit particles from  
**Type** enum in ['VERT', 'FACE', 'VOLUME'], default 'VERT'

**factor\_random**  
Give the starting speed a random variation  
**Type** float in [0, 200], default 0.0

**fluid**  
**Type** SPHFluidSettings, (readonly)

**force\_field\_1**  
**Type** FieldSettings, (readonly)

**force\_field\_2**  
**Type** FieldSettings, (readonly)

**frame\_end**  
Frame # to stop emitting particles  
**Type** float in [-300000, 300000], default 0.0

**frame\_start**  
Frame # to start emitting particles

**Type** float in [-300000, 300000], default 0.0

**grid\_random**  
Add random offset to the grid locations

**Type** float in [0, 1], default 0.0

**grid\_resolution**  
The resolution of the particle grid

**Type** int in [1, 250], default 0

**hair\_length**  
Length of the hair

**Type** float in [0, 1000], default 0.0

**hair\_step**  
Number of hair segments

**Type** int in [2, 50], default 0

**hexagonal\_grid**  
Create the grid in a hexagonal pattern

**Type** boolean, default False

**integrator**  
Algorithm used to calculate physics. Fastest to most stable/accurate: Midpoint, Euler, Verlet, RK4 (Old)

**Type** enum in ['EULER', 'VERLET', 'MIDPOINT', 'RK4'], default 'EULER'

**invert\_grid**  
Invert what is considered object and what is not

**Type** boolean, default False

**is\_fluid**  
Particles were created by a fluid simulation

**Type** boolean, default False, (readonly)

**jitter\_factor**  
Amount of jitter applied to the sampling

**Type** float in [0, 2], default 0.0

**keyed\_loops**  
Number of times the keys are looped

**Type** int in [1, 10000], default 0

**keys\_step**  
**Type** int in [0, 32767], default 0

**kink**  
Type of periodic offset on the path

**Type** enum in ['NO', 'CURL', 'RADIAL', 'WAVE', 'BRAID'], default 'NO'

**kink\_amplitude**  
The amplitude of the offset

**Type** float in [-100000, 100000], default 0.0

**kink\_amplitude\_clump**

How much clump effects kink amplitude

**Type** float in [0, 1], default 0.0

**kink\_axis**

Which axis to use for offset

**Type** enum in ['X', 'Y', 'Z'], default 'X'

**kink\_flat**

How flat the hairs are

**Type** float in [0, 1], default 0.0

**kink\_frequency**

The frequency of the offset (1/total length)

**Type** float in [-100000, 100000], default 0.0

**kink\_shape**

Adjust the offset to the beginning/end

**Type** float in [-0.999, 0.999], default 0.0

**length\_random**

Give path length a random variation

**Type** float in [0, 1], default 0.0

**lifetime**

Specify the life span of the particles

**Type** float in [1, 300000], default 0.0

**lifetime\_random**

Give the particle life a random variation

**Type** float in [0, 1], default 0.0

**line\_length\_head**

Length of the line's head

**Type** float in [0, 100000], default 0.0

**line\_length\_tail**

Length of the line's tail

**Type** float in [0, 100000], default 0.0

**lock\_billboard**

Lock the billboards align axis

**Type** boolean, default False

**lock\_boids\_to\_surface**

Constrain boids to a surface

**Type** boolean, default False

**mass**

Specify the mass of the particles

**Type** float in [0.001, 100000], default 0.0

**material**

Specify material used for the particles

**Type** int in [1, 32767], default 0

**normal\_factor**  
Let the surface normal give the particle a starting speed

**Type** float in [-1000, 1000], default 0.0

**object\_align\_factor**  
Let the emitter object orientation give the particle a starting speed

**Type** float array of 3 items in [-200, 200], default (0.0, 0.0, 0.0)

**object\_factor**  
Let the object give the particle a starting speed

**Type** float in [-200, 200], default 0.0

**particle\_factor**  
Let the target particle give the particle a starting speed

**Type** float in [-200, 200], default 0.0

**particle\_size**  
The size of the particles

**Type** float in [0.001, 100000], default 0.0

**path\_end**  
End time of drawn path

**Type** float in [-inf, inf], default 0.0

**path\_start**  
Starting time of drawn path

**Type** float in [-inf, inf], default 0.0

**phase\_factor**  
Initial rotation phase

**Type** float in [-1, 1], default 0.0

**phase\_factor\_random**  
Randomize rotation phase

**Type** float in [0, 1], default 0.0

**physics\_type**  
Particle physics type

**Type** enum in ['NO', 'NEWTON', 'KEYED', 'BOIDS', 'FLUID'], default 'NO'

**react\_event**  
The event of target particles to react on

**Type** enum in ['DEATH', 'COLLIDE', 'NEAR'], default 'DEATH'

**reactor\_factor**  
Let the vector away from the target particles location give the particle a starting speed

**Type** float in [-10, 10], default 0.0

**regrow\_hair**  
Regrow hair for each frame

**Type** boolean, default False

**render\_step**

How many steps paths are rendered with (power of 2)

**Type** int in [0, 20], default 0

**render\_type**

How particles are rendered

**Type** enum in ['NONE', 'HALO', 'LINE', 'PATH', 'OBJECT', 'GROUP', 'BILLBOARD'], default 'NONE'

**rendered\_child\_count**

Amount of children/parent for rendering

**Type** int in [0, 100000], default 0

**rotation\_factor\_random**

Randomize rotation

**Type** float in [0, 1], default 0.0

**rotation\_mode**

Particles initial rotation

**Type** enum in ['NONE', 'NOR', 'VEL', 'GLOB\_X', 'GLOB\_Y', 'GLOB\_Z', 'OB\_X', 'OB\_Y', 'OB\_Z'], default 'NONE'

**roughness\_1**

Amount of location dependent rough

**Type** float in [0, 100000], default 0.0

**roughness\_1\_size**

Size of location dependent rough

**Type** float in [0.01, 100000], default 0.0

**roughness\_2**

Amount of random rough

**Type** float in [0, 100000], default 0.0

**roughness\_2\_size**

Size of random rough

**Type** float in [0.01, 100000], default 0.0

**roughness\_2\_threshold**

Amount of particles left untouched by random rough

**Type** float in [0, 1], default 0.0

**roughness\_end\_shape**

Shape of end point rough

**Type** float in [0, 10], default 0.0

**roughness\_endpoint**

Amount of end point rough

**Type** float in [0, 100000], default 0.0

**show\_health**

Draw boid health

**Type** boolean, default False

**show\_number**  
Show particle number  
**Type** boolean, default False

**show\_size**  
Show particle size  
**Type** boolean, default False

**show\_unborn**  
Show particles before they are emitted  
**Type** boolean, default False

**show\_velocity**  
Show particle velocity  
**Type** boolean, default False

**simplify\_rate**  
Speed of simplification  
**Type** float in [0, 1], default 0.0

**simplify\_refsize**  
Reference size in pixels, after which simplification begins  
**Type** int in [1, 32768], default 0

**simplify\_transition**  
Transition period for fading out strands  
**Type** float in [0, 1], default 0.0

**simplify\_viewport**  
Speed of Simplification  
**Type** float in [0, 0.999], default 0.0

**size\_random**  
Give the particle size a random variation  
**Type** float in [0, 1], default 0.0

**subframes**  
Subframes to simulate for improved stability and finer granularity simulations  
**Type** int in [0, 1000], default 0

**tangent\_factor**  
Let the surface tangent give the particle a starting speed  
**Type** float in [-1000, 1000], default 0.0

**tangent\_phase**  
Rotate the surface tangent  
**Type** float in [-1, 1], default 0.0

**texture\_slots**  
Texture slots defining the mapping and influence of textures  
**Type** ParticleSettingsTextureSlots [bpy\\_prop\\_collection](#) of  
ParticleSettingsTextureSlot, (readonly)

**time\_tweak**  
A multiplier for physics timestep (1.0 means one frame = 1/25 seconds)

**Type** float in [0, 100], default 0.0

**timestep**  
The simulation timestep per frame (in seconds)

**Type** float in [0.0001, 100], default 0.0

**trail\_count**  
Number of trail particles

**Type** int in [1, 100000], default 0

**type**  
Particle Type

**Type** enum in ['EMITTER', 'HAIR'], default 'EMITTER'

**use\_absolute\_path\_time**  
Path timing is in absolute frames

**Type** boolean, default False

**use\_advanced\_hair**  
Use full physics calculations for growing hair

**Type** boolean, default False

**use\_dead**  
Show particles after they have died

**Type** boolean, default False

**use\_die\_on\_collision**  
Particles die when they collide with a deflector object

**Type** boolean, default False

**use\_dynamic\_rotation**  
Sets rotation to dynamic/constant

**Type** boolean, default False

**use\_emit\_random**  
Emit in random order of elements

**Type** boolean, default False

**use\_even\_distribution**  
Use even distribution from faces based on face areas or edge lengths

**Type** boolean, default False

**use\_global\_dupli**  
Use object's global coordinates for duplication

**Type** boolean, default False

**use\_group\_count**  
Use object multiple times in the same group

**Type** boolean, default False

**use\_group\_pick\_random**  
Pick objects from group randomly

**Type** boolean, default False

**use\_hair\_bspline**  
Interpolate hair using B-Splines

**Type** boolean, default False

**use\_multiply\_size\_mass**  
Multiply mass by particle size

**Type** boolean, default False

**use\_parent\_particles**  
Render parent particles

**Type** boolean, default False

**use\_react\_multiple**  
React multiple times

**Type** boolean, default False

**use\_react\_start\_end**  
Give birth to unreacted particles eventually

**Type** boolean, default False

**use\_render\_adaptive**  
Draw steps of the particle path

**Type** boolean, default False

**use\_render\_emitter**  
Render emitter Object also

**Type** boolean, default False

**use\_self\_effect**  
Particle effectors effect themselves

**Type** boolean, default False

**use\_simplify**  
Remove child strands as the object becomes smaller on the screen

**Type** boolean, default False

**use\_simplify\_viewport**

**Type** boolean, default False

**use\_size\_deflect**  
Use particle's size in deflection

**Type** boolean, default False

**use\_strand\_primitive**  
Use the strand primitive for rendering

**Type** boolean, default False

**use\_velocity\_length**  
Multiply line length by particle speed

**Type** boolean, default False

**use\_whole\_group**

Use whole group at once

**Type** boolean, default False

**userjit**

Emission locations / face (0 = automatic)

**Type** int in [0, 1000], default 0

**virtual\_parents**

Relative amount of virtual parents

**Type** float in [0, 1], default 0.0

## Inherited Properties

- bpy\_struct.id\_data
- ID.name
- ID.use\_fake\_user
- ID.library
- ID.tag
- ID.users

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- ID.copy
- ID.user\_clear
- ID.animation\_data\_create
- ID.animation\_data\_clear
- ID.update\_tag

## References

- BlendData.particles
- BlendDataParticles.new
- BlendDataParticles.remove
- ParticleSystem.settings

## 2.4.387 ParticleSettingsTextureSlot(TextureSlot)

base classes — `bpy_struct`, `TextureSlot`

**class bpy.types.ParticleSettingsTextureSlot (TextureSlot)**  
Texture slot for textures in a Particle Settings datablock

**clump\_factor**  
Amount texture affects child clump  
**Type** float in [-inf, inf], default 0.0

**damp\_factor**  
Amount texture affects particle damping  
**Type** float in [-inf, inf], default 0.0

**density\_factor**  
Amount texture affects particle density  
**Type** float in [-inf, inf], default 0.0

**field\_factor**  
Amount texture affects particle force fields  
**Type** float in [-inf, inf], default 0.0

**gravity\_factor**  
Amount texture affects particle gravity  
**Type** float in [-inf, inf], default 0.0

**kink\_factor**  
Amount texture affects child kink  
**Type** float in [-inf, inf], default 0.0

**length\_factor**  
Amount texture affects child hair length  
**Type** float in [-inf, inf], default 0.0

**life\_factor**  
Amount texture affects particle life time  
**Type** float in [-inf, inf], default 0.0

**mapping**  
**Type** enum in ['FLAT', 'CUBE', 'TUBE', 'SPHERE'], default 'FLAT'

**mapping\_x**  
**Type** enum in ['NONE', 'X', 'Y', 'Z'], default 'NONE'

**mapping\_y**  
**Type** enum in ['NONE', 'X', 'Y', 'Z'], default 'NONE'

**mapping\_z**  
**Type** enum in ['NONE', 'X', 'Y', 'Z'], default 'NONE'

**object**  
Object to use for mapping with Object texture coordinates  
**Type** `Object`

**rough\_factor**

Amount texture affects child roughness

**Type** float in [-inf, inf], default 0.0

**size\_factor**

Amount texture affects physical particle size

**Type** float in [-inf, inf], default 0.0

**texture\_coords**

Texture coordinates used to map the texture onto the background

**Type** enum in ['GLOBAL', 'OBJECT', 'UV', 'ORCO', 'STRAND'], default 'GLOBAL'

**time\_factor**

Amount texture affects particle emission time

**Type** float in [-inf, inf], default 0.0

**use\_map\_clump**

Affect the child clumping

**Type** boolean, default False

**use\_map\_damp**

Affect the particle velocity damping

**Type** boolean, default False

**use\_map\_density**

Affect the density of the particles

**Type** boolean, default False

**use\_map\_field**

Affect the particle force fields

**Type** boolean, default False

**use\_map\_gravity**

Affect the particle gravity

**Type** boolean, default False

**use\_map\_kink**

Affect the child kink

**Type** boolean, default False

**use\_map\_length**

Affect the child hair length

**Type** boolean, default False

**use\_map\_life**

Affect the life time of the particles

**Type** boolean, default False

**use\_map\_rough**

Affect the child rough

**Type** boolean, default False

**use\_map\_size**

Affect the particle size

**Type** boolean, default False  
**use\_map\_time**  
Affect the emission time of the particles  
    **Type** boolean, default False  
**use\_map\_velocity**  
Affect the particle initial velocity  
    **Type** boolean, default False  
**uv\_layer**  
UV layer to use for mapping with UV texture coordinates  
    **Type** string, default ""  
**velocity\_factor**  
Amount texture affects particle initial velocity  
    **Type** float in [-inf, inf], default 0.0

## Inherited Properties

- bpy\_struct.id\_data
- TextureSlot.name
- TextureSlot.blend\_type
- TextureSlot.color
- TextureSlot.default\_value
- TextureSlot.invert
- TextureSlot.offset
- TextureSlot.output\_node
- TextureSlot.use\_rgb\_to\_intensity
- TextureSlot.scale
- TextureSlot.use\_stencil
- TextureSlot.texture

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- `ParticleSettings.texture_slots`
- `ParticleSettingsTextureSlots.add`
- `ParticleSettingsTextureSlots.create`

### 2.4.388 ParticleSettingsTextureSlots(bpy\_struct)

base class — `bpy_struct`

**class** `bpy.types.ParticleSettingsTextureSlots` (`bpy_struct`)  
Collection of texture slots

**classmethod** `add()`

add

**Returns** The newly initialized mtex.

**Return type** `ParticleSettingsTextureSlot`

**classmethod** `create(index)`

create

**Parameters** `index (int in [0, inf])` – Index, Slot index to initialize.

**Returns** The newly initialized mtex.

**Return type** `ParticleSettingsTextureSlot`

**classmethod** `clear(index)`

clear

**Parameters** `index (int in [0, inf])` – Index, Slot index to clear.

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `ParticleSettings.texture_slots`

### 2.4.389 ParticleSystem(bpy\_struct)

base class — `bpy_struct`

**class bpy.types.ParticleSystem(bpy\_struct)**

Particle system in an object

**active\_particle\_target**

**Type** `ParticleTarget`, (readonly)

**active\_particle\_target\_index**

**Type** int in [0, inf], default 0

**billboard\_normal\_uv**

UV Layer to control billboard normals

**Type** string, default “”

**billboard\_split\_uv**

UV Layer to control billboard splitting

**Type** string, default “”

**billboard\_time\_index\_uv**

UV Layer to control billboard time index (X-Y)

**Type** string, default “”

**child\_particles**

Child particles generated by the particle system

**Type** `bpy_prop_collection` of `ChildParticle`, (readonly)

**child\_seed**

Offset in the random number table for child particles, to get a different randomized result

**Type** int in [0, inf], default 0

**cloth**

Cloth dynamics for hair

**Type** `ClothModifier`, (readonly, never None)

**has\_multiple\_caches**

Particle system has multiple point caches

**Type** boolean, default False, (readonly)

**invert\_vertex\_group\_clump**

Negate the effect of the clump vertex group

**Type** boolean, default False

**invert\_vertex\_group\_density**

Negate the effect of the density vertex group

**Type** boolean, default False

**invert\_vertex\_group\_field**

Negate the effect of the field vertex group

**Type** boolean, default False

**invert\_vertex\_group\_kink**

Negate the effect of the kink vertex group

**Type** boolean, default False

**invert\_vertex\_group\_length**

Negate the effect of the length vertex group

**Type** boolean, default False

**invert\_vertex\_group\_rotation**

Negate the effect of the rotation vertex group

**Type** boolean, default False

**invert\_vertex\_group\_roughness\_1**

Negate the effect of the roughness 1 vertex group

**Type** boolean, default False

**invert\_vertex\_group\_roughness\_2**

Negate the effect of the roughness 2 vertex group

**Type** boolean, default False

**invert\_vertex\_group\_roughness\_end**

Negate the effect of the roughness end vertex group

**Type** boolean, default False

**invert\_vertex\_group\_size**

Negate the effect of the size vertex group

**Type** boolean, default False

**invert\_vertex\_group\_tangent**

Negate the effect of the tangent vertex group

**Type** boolean, default False

**invert\_vertex\_group\_velocity**

Negate the effect of the velocity vertex group

**Type** boolean, default False

**is\_editable**

Particle system can be edited in particle mode

**Type** boolean, default False, (readonly)

**is\_edited**

Particle system has been edited in particle mode

**Type** boolean, default False, (readonly)

**is\_global\_hair**

Hair keys are in global coordinate space

**Type** boolean, default False, (readonly)

**name**

Particle system name

**Type** string, default “”

**parent**  
Use this object’s coordinate system instead of global coordinate system

**Type** `Object`

**particles**  
Particles generated by the particle system

**Type** `bpy_prop_collection of Particle`, (readonly)

**point\_cache**

**Type** `PointCache`, (readonly, never None)

**reactor\_target\_object**  
For reactor systems, the object that has the target particle system (empty if same object)

**Type** `Object`

**reactor\_target\_particle\_system**  
For reactor systems, index of particle system on the target object

**Type** int in [1, 32767], default 0

**seed**  
Offset in the random number table, to get a different randomized result

**Type** int in [0, inf], default 0

**settings**  
Particle system settings

**Type** `ParticleSettings`, (never None)

**targets**  
Target particle systems

**Type** `bpy_prop_collection of ParticleTarget`, (readonly)

**use\_hair\_dynamics**  
Enable hair dynamics using cloth simulation

**Type** boolean, default False

**use\_keyed\_timing**  
Use key times

**Type** boolean, default False

**vertex\_group\_clump**  
Vertex group to control clump

**Type** string, default “”

**vertex\_group\_density**  
Vertex group to control density

**Type** string, default “”

**vertex\_group\_field**  
Vertex group to control field

**Type** string, default “”

**vertex\_group\_kink**  
Vertex group to control kink  
**Type** string, default “”

**vertex\_group\_length**  
Vertex group to control length  
**Type** string, default “”

**vertex\_group\_rotation**  
Vertex group to control rotation  
**Type** string, default “”

**vertex\_group\_roughness\_1**  
Vertex group to control roughness 1  
**Type** string, default “”

**vertex\_group\_roughness\_2**  
Vertex group to control roughness 2  
**Type** string, default “”

**vertex\_group\_roughness\_end**  
Vertex group to control roughness end  
**Type** string, default “”

**vertex\_group\_size**  
Vertex group to control size  
**Type** string, default “”

**vertex\_group\_tangent**  
Vertex group to control tangent  
**Type** string, default “”

**vertex\_group\_velocity**  
Vertex group to control velocity  
**Type** string, default “”

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`

- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `Object.particle_systems`
- `ParticleSystemModifier.particle_system`
- `ParticleSystems.active`
- `PointDensity.particle_system`
- `SmokeFlowSettings.particle_system`

## 2.4.390 ParticleSystemModifier(Modifier)

base classes — `bpy_struct, Modifier`

**class bpy.types.ParticleSystemModifier(*Modifier*)**

Particle system simulation modifier

**particle\_system**

Particle System that this modifier controls

**Type** `ParticleSystem`, (readonly, never None)

## Inherited Properties

- `bpy_struct.id_data`
- `Modifier.name`
- `Modifier.use_apply_on_spline`
- `Modifier.show_in_editmode`
- `Modifier.show_expanded`
- `Modifier.show_on_cage`
- `Modifier.show_viewport`
- `Modifier.show_render`
- `Modifier.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`

- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.391 ParticleSystems(`bpy_struct`)

base class — `bpy_struct`

`class bpy.types.ParticleSystems (bpy_struct)`

Collection of particle systems

### `active`

Active particle system being displayed

**Type** `ParticleSystem`, (readonly)

### `active_index`

Index of active particle system slot

**Type** int in [0, inf], default 0

### Inherited Properties

- `bpy_struct.id_data`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

### References

- `Object.particle_systems`

## 2.4.392 ParticleTarget(bpy\_struct)

base class — [bpy\\_struct](#)

**class bpy.types.ParticleTarget (bpy\_struct)**

Target particle system

### **alliance**

**Type** enum in ['FRIEND', 'NEUTRAL', 'ENEMY'], default 'NEUTRAL'

### **duration**

**Type** float in [0, 30000], default 0.0

### **is\_valid**

Keyed particles target is valid

**Type** boolean, default False

### **name**

Particle target name

**Type** string, default "", (readonly)

### **object**

The object that has the target particle system (empty if same object)

**Type** [Object](#)

### **system**

The index of particle system on the target object

**Type** int in [1, inf], default 0

### **time**

**Type** float in [0, 30000], default 0.0

## Inherited Properties

- [bpy\\_struct.id\\_data](#)

## Inherited Functions

- [bpy\\_struct.as\\_pointer](#)
- [bpy\\_struct.callback\\_add](#)
- [bpy\\_struct.callback\\_remove](#)
- [bpy\\_struct.driver\\_add](#)
- [bpy\\_struct.driver\\_remove](#)
- [bpy\\_struct.get](#)
- [bpy\\_struct.is\\_property\\_hidden](#)
- [bpy\\_struct.is\\_property\\_set](#)
- [bpy\\_struct.items](#)
- [bpy\\_struct.keyframe\\_delete](#)
- [bpy\\_struct.keyframe\\_insert](#)
- [bpy\\_struct.keys](#)
- [bpy\\_struct.path\\_from\\_id](#)
- [bpy\\_struct.path\\_resolve](#)
- [bpy\\_struct.type\\_recast](#)

- bpy\_struct.values

## References

- ParticleSystem.active\_particle\_target
- ParticleSystem.targets

### 2.4.393 PivotConstraint(Constraint)

base classes — bpy\_struct, Constraint

**class** bpy.types.PivotConstraint(Constraint)

    Rotate around a different point

**head\_tail**

    Target along length of bone: Head=0, Tail=1

**Type** float in [0, 1], default 0.0

**offset**

    Offset of pivot from target (when set), or from owner's location (when Fixed Position is off), or the absolute pivot point

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**rotation\_range**

    Rotation range on which pivoting should occur

**Type** enum in ['ALWAYS\_ACTIVE', 'NX', 'NY', 'NZ', 'X', 'Y', 'Z'], default 'NX'

**subtarget**

**Type** string, default ""

**target**

    Target Object, defining the position of the pivot when defined

**Type** Object

**use\_relative\_location**

    Offset will be an absolute point in space instead of relative to the target

**Type** boolean, default False

## Inherited Properties

- bpy\_struct.id\_data
- Constraint.name
- Constraint.active
- Constraint.mute
- Constraint.show\_expanded
- Constraint.influence
- Constraint.error\_location
- Constraint.owner\_space
- Constraint.is\_proxy\_local
- Constraint.error\_rotation
- Constraint.target\_space
- Constraint.type

- Constraint.is\_valid

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.394 PluginSequence(EffectSequence)

base classes — bpy\_struct, Sequence, EffectSequence

**class bpy.types.PluginSequence (EffectSequence)**  
Sequence strip applying an effect, loaded from an external plugin  
**filename**  
**Type** string, default "", (readonly)

### Inherited Properties

- bpy\_struct.id\_data
- Sequence.name
- Sequence.blend\_type
- Sequence.blend\_alpha
- Sequence.channel
- Sequence.effect\_fader
- Sequence.frame\_final\_end
- Sequence.frame\_offset\_end
- Sequence.frame\_still\_end
- Sequence.input\_1
- Sequence.input\_2
- Sequence.input\_3
- Sequence.select\_left\_handle
- Sequence.frame\_final\_duration
- Sequence.frame\_duration
- Sequence.lock
- Sequence.mute
- Sequence.select\_right\_handle
- Sequence.select

- Sequence.speed\_factor
- Sequence.frame\_start
- Sequence.frame\_final\_start
- Sequence.frame\_offset\_start
- Sequence.frame\_still\_start
- Sequence.type
- Sequence.use\_default\_fade
- Sequence.input\_count
- EffectSequence.color\_balance
- EffectSequence.use\_float
- EffectSequence.crop
- EffectSequence.use\_deinterlace
- EffectSequence.use\_reverse\_frames
- EffectSequence.use\_flip\_x
- EffectSequence.use\_flip\_y
- EffectSequence.color\_multiply
- EffectSequence.use\_premultiply
- EffectSequence.proxy
- EffectSequence.use\_proxy\_custom\_directory
- EffectSequence.use\_proxy\_custom\_file
- EffectSequence.color\_saturation
- EffectSequence.strobe
- EffectSequence.transform
- EffectSequence.use\_color\_balance
- EffectSequence.use\_crop
- EffectSequence.use\_proxy
- EffectSequence.use\_translation

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- Sequence.getStripElem
- Sequence.swap

## 2.4.395 PluginTexture(Texture)

base classes — bpy\_struct, ID, Texture

```
class bpy.types.PluginTexture (Texture)
    External plugin texture

    users_material
        Materials that use this texture (readonly)

    users_object_modifier
        Object modifiers that use this texture (readonly)
```

## Inherited Properties

- `bpy_struct.id_data`
- `ID.name`
- `ID.use_fake_user`
- `ID.library`
- `ID.tag`
- `ID.users`
- `Texture.animation_data`
- `Texture.intensity`
- `Texture.color_ramp`
- `Texture.contrast`
- `Texture.factor_blue`
- `Texture.factor_green`
- `Texture.factor_red`
- `Texture.node_tree`
- `Texture.saturation`
- `Texture.use_preview_alpha`
- `Texture.type`
- `Texture.use_color_ramp`
- `Texture.use_nodes`
- `Texture.users_material`
- `Texture.users_object_modifier`
- `Texture.users_material`
- `Texture.users_object_modifier`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

- `ID.copy`
- `ID.user_clear`
- `ID.animation_data_create`
- `ID.animation_data_clear`
- `ID.update_tag`

## 2.4.396 PointCache(bpy\_struct)

base class — `bpy_struct`

**class bpy.types.PointCache (bpy\_struct)**

Point cache for physics simulations

**compression**

Compression method to be used

**Type** enum in ['NO', 'LIGHT', 'HEAVY'], default 'NO'

**filepath**

Cache file path

**Type** string, default ""

**frame\_end**

Frame on which the simulation stops

**Type** int in [1, 300000], default 0

**frame\_start**

Frame on which the simulation starts

**Type** int in [1, 300000], default 0

**frame\_step**

Number of frames between cached frames

**Type** int in [1, 20], default 0

**frames\_skipped**

**Type** boolean, default False, (readonly)

**index**

Index number of cache files

**Type** int in [-1, 100], default 0

**info**

Info on current cache status

**Type** string, default "", (readonly)

**is\_baked**

**Type** boolean, default False, (readonly)

**is\_baking**

**Type** boolean, default False, (readonly)

**is\_outdated**

**Type** boolean, default False, (readonly)

**name**  
Cache name  
**Type** string, default “”

**point\_caches**  
Point cache list  
**Type** PointCaches bpy\_prop\_collection of PointCache, (readonly)

**use\_disk\_cache**  
Save cache files to disk (.blend file must be saved first)  
**Type** boolean, default False

**use\_external**  
Read cache from an external location  
**Type** boolean, default False

**use\_library\_path**  
Use this files path when library linked into another file.  
**Type** boolean, default False

**use\_quick\_cache**  
Update simulation with cache steps  
**Type** boolean, default False

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- ClothModifier.point\_cache
- ParticleSystem.point\_cache

- `PointCache.point_caches`
- `SmokeDomainSettings.point_cache`
- `SoftBodyModifier.point_cache`

## 2.4.397 PointCaches(bpy\_struct)

base class — `bpy_struct`

**class** `bpy.types.PointCaches(bpy_struct)`

Collection of point caches

**active\_index**

**Type** int in [0, inf], default 0

### Inherited Properties

- `bpy_struct.id_data`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

### References

- `PointCache.point_caches`

## 2.4.398 PointDensity(bpy\_struct)

base class — `bpy_struct`

**class** `bpy.types.PointDensity(bpy_struct)`

Point density settings

**color\_ramp**

**Type** `ColorRamp`, (readonly)

**color\_source**

Data to derive color results from

**Type** enum in ['CONSTANT', 'PARTICLE\_AGE', 'PARTICLE\_SPEED', 'PARTICLE\_VELOCITY'], default 'CONSTANT'

**falloff**

Method of attenuating density by distance from the point

**Type** enum in ['STANDARD', 'SMOOTH', 'SOFT', 'CONSTANT', 'ROOT', 'PARTICLE\_AGE', 'PARTICLE\_VELOCITY'], default 'STANDARD'

**falloff\_curve**

**Type** [CurveMapping](#), (readonly)

**falloff\_soft**

Softness of the 'soft' falloff option

**Type** float in [0.01, inf], default 0.0

**falloff\_speed\_scale**

Multiplier to bring particle speed within an acceptable range

**Type** float in [0.001, 100], default 0.0

**noise\_basis**

Noise formula used for turbulence

**Type** enum in ['BLENDER\_ORIGINAL', 'ORIGINAL\_PERLIN', 'IMPROVED\_PERLIN', 'VORONOI\_F1', 'VORONOI\_F2', 'VORONOI\_F3', 'VORONOI\_F4', 'VORONOI\_F2\_F1', 'VORONOI\_CRACKLE', 'CELL\_NOISE'], default 'BLENDER\_ORIGINAL'

**object**

Object to take point data from

**Type** [Object](#)

**particle\_cache\_space**

Co-ordinate system to cache particles in

**Type** enum in ['OBJECT\_LOCATION', 'OBJECT\_SPACE', 'WORLD\_SPACE'], default 'OBJECT\_LOCATION'

**particle\_system**

Particle System to render as points

**Type** [ParticleSystem](#)

**point\_source**

Point data to use as renderable point density

**Type** enum in ['PARTICLE\_SYSTEM', 'OBJECT'], default 'PARTICLE\_SYSTEM'

**radius**

Radius from the shaded sample to look for points within

**Type** float in [0.001, inf], default 0.0

**speed\_scale**

Multiplier to bring particle speed within an acceptable range

**Type** float in [0.001, 100], default 0.0

**turbulence\_depth**

Level of detail in the added turbulent noise

**Type** int in [0, 30], default 0

**turbulence\_influence**

Method for driving added turbulent noise

**Type** enum in ['STATIC', 'PARTICLE\_VELOCITY', 'PARTICLE\_AGE', 'GLOBAL\_TIME'], default 'STATIC'

**turbulence\_scale**

Scale of the added turbulent noise

**Type** float in [0.01, inf], default 0.0

**turbulence\_strength**

**Type** float in [0.01, inf], default 0.0

**use\_falloff\_curve**

Use a custom falloff curve

**Type** boolean, default False

**use\_turbulence**

Add directed noise to the density at render-time

**Type** boolean, default False

**vertex\_cache\_space**

Co-ordinate system to cache vertices in

**Type** enum in ['OBJECT\_LOCATION', 'OBJECT\_SPACE', 'WORLD\_SPACE'], default 'OBJECT\_LOCATION'

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- `PointDensityTexture.point_density`

### 2.4.399 PointDensityTexture(Texture)

base classes — `bpy_struct, ID, Texture`

**class bpy.types.PointDensityTexture (Texture)**

Settings for the Point Density texture

**point\_density**

The point density settings associated with this texture

**Type** `PointDensity`, (readonly)

**users\_material**

Materials that use this texture (readonly)

**users\_object\_modifier**

Object modifiers that use this texture (readonly)

## Inherited Properties

- `bpy_struct.id_data`
- `ID.name`
- `ID.use_fake_user`
- `ID.library`
- `ID.tag`
- `ID.users`
- `Texture.animation_data`
- `Texture.intensity`
- `Texture.color_ramp`
- `Texture.contrast`
- `Texture.factor_blue`
- `Texture.factor_green`
- `Texture.factor_red`
- `Texture.node_tree`
- `Texture.saturation`
- `Texture.use_preview_alpha`
- `Texture.type`
- `Texture.use_color_ramp`
- `Texture.use_nodes`
- `Texture.users_material`
- `Texture.users_object_modifier`
- `Texture.users_material`
- `Texture.users_object_modifier`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`

- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- ID.copy
- ID.user\_clear
- ID.animation\_data\_create
- ID.animation\_data\_clear
- ID.update\_tag

## 2.4.400 PointLamp(Lamp)

base classes — `bpy_struct, ID, Lamp`

**class bpy.types.PointLamp (Lamp)**  
Omnidirectional point lamp

**falloff\_curve**

Custom Lamp Falloff Curve

**Type** `CurveMapping`, (readonly)

**falloff\_type**

Intensity Decay with distance

**Type** enum in ['CONSTANT', 'INVERSE\_LINEAR', 'INVERSE\_SQUARE', 'CUSTOM\_CURVE', 'LINEAR\_QUADRATIC\_WEIGHTED'], default 'CONSTANT'

**linear\_attenuation**

Linear distance attenuation

**Type** float in [0, 1], default 0.0

**quadratic\_attenuation**

Quadratic distance attenuation

**Type** float in [0, 1], default 0.0

**shadow\_adaptive\_threshold**

Threshold for Adaptive Sampling (Raytraced shadows)

**Type** float in [0, 1], default 0.0

**shadow\_color**

Color of shadows cast by the lamp

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**shadow\_method**

Method to compute lamp shadow with

**Type** enum in ['NOSHADOW', 'RAY\_SHADOW'], default 'NOSHADOW'

**shadow\_ray\_sample\_method**

Method for generating shadow samples: Adaptive QMC is fastest, Constant QMC is less noisy but slower

**Type** enum in ['ADAPTIVE\_QMC', 'CONSTANT\_QMC'], default 'ADAPTIVE\_QMC'

**shadow\_ray\_samples**

Amount of samples taken extra (samples x samples)

**Type** int in [1, 64], default 0

**shadow\_soft\_size**

Light size for ray shadow sampling (Raytraced shadows)

**Type** float in [-inf, inf], default 0.0

**use\_only\_shadow**

Causes light to cast shadows only without illuminating objects

**Type** boolean, default False

**use\_shadow\_layer**

Causes only objects on the same layer to cast shadows

**Type** boolean, default False

**use\_sphere**

Sets light intensity to zero beyond lamp distance

**Type** boolean, default False

**Inherited Properties**

- bpy\_struct.id\_data
- ID.name
- ID.use\_fake\_user
- ID.library
- ID.tag
- ID.users
- Lamp.active\_texture
- Lamp.active\_texture\_index
- Lamp.animation\_data
- Lamp.color
- Lamp.use\_diffuse
- Lamp.distance
- Lamp.energy
- Lamp.use\_own\_layer
- Lamp.use\_negative
- Lamp.use\_specular
- Lamp.texture\_slots
- Lamp.type

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove

- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`
- `ID.copy`
- `ID.user_clear`
- `ID.animation_data_create`
- `ID.animation_data_clear`
- `ID.update_tag`

## 2.4.401 PointerProperty(Property)

base classes — `bpy_struct, Property`

**class bpy.types.PointerProperty(*Property*)**

RNA pointer property to point to another RNA struct

**fixed\_type**

Fixed pointer type, empty if variable type

**Type** `Struct`, (readonly)

### Inherited Properties

- `bpy_struct.id_data`
- `Property.name`
- `Property.srna`
- `Property.description`
- `Property.is_enum_flag`
- `Property.is_hidden`
- `Property.identifier`
- `Property.is_never_none`
- `Property.is_readonly`
- `Property.is_registered`
- `Property.is_registered_optional`
- `Property.is_required`
- `Property.is_output`
- `Property.is_runtime`
- `Property.is_skip_save`
- `Property.subtype`
- `Property.type`
- `Property.unit`

### Inherited Functions

- `bpy_struct.as_pointer`

- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.402 Pose(bpy\_struct)

base class — `bpy_struct`

**class** `bpy.types.Pose` (`bpy_struct`)

A collection of pose channels, including settings for animating bones

**animation\_visualisation**

Animation data for this datablock

**Type** `AnimViz`, (readonly, never None)

**bone\_groups**

Groups of the bones

**Type** `BoneGroups bpy_prop_collection of BoneGroup`, (readonly)

**bones**

Individual pose bones for the armature

**Type** `bpy_prop_collection of PoseBone`, (readonly)

**ik\_param**

Parameters for IK solver

**Type** `IKParam`, (readonly)

**ik\_solver**

Selection of IK solver for IK chain, current choice is 0 for Legacy, 1 for iTASC

**Type** enum in ['LEGACY', 'ITASC'], default 'LEGACY'

### Inherited Properties

- `bpy_struct.id_data`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`

- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `Object.pose`

### 2.4.403 PoseBone(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.PoseBone` (`bpy_struct`)

Channel defining pose data for a bone in a Pose

#### **bone**

Bone associated with this PoseBone

**Type** `Bone`, (readonly, never None)

#### **bone\_group**

Bone Group this pose channel belongs to

**Type** `BoneGroup`

#### **bone\_group\_index**

Bone Group this pose channel belongs to (0=no group)

**Type** int in [-32768, 32767], default 0

#### **child**

Child of this pose bone

**Type** `PoseBone`, (readonly)

#### **constraints**

Constraints that act on this PoseChannel

**Type** `PoseBoneConstraints` `bpy_prop_collection` of `Constraint`, (readonly)

#### **custom\_shape**

Object that defines custom draw type for this bone

**Type** `Object`

#### **custom\_shape\_transform**

Bone that defines the display transform of this custom shape

**Type** `PoseBone`

**head**

Location of head of the channel's bone

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0), (readonly)

**ik\_linear\_weight**

Weight of scale constraint for IK

**Type** float in [0, 1], default 0.0

**ik\_max\_x**

Maximum angles for IK Limit

**Type** float in [0, 3.14159], default 0.0

**ik\_max\_y**

Maximum angles for IK Limit

**Type** float in [0, 3.14159], default 0.0

**ik\_max\_z**

Maximum angles for IK Limit

**Type** float in [0, 3.14159], default 0.0

**ik\_min\_x**

Minimum angles for IK Limit

**Type** float in [-3.14159, 0], default 0.0

**ik\_min\_y**

Minimum angles for IK Limit

**Type** float in [-3.14159, 0], default 0.0

**ik\_min\_z**

Minimum angles for IK Limit

**Type** float in [-3.14159, 0], default 0.0

**ik\_rotation\_weight**

Weight of rotation constraint for IK

**Type** float in [0, 1], default 0.0

**ik\_stiffness\_x**

IK stiffness around the X axis

**Type** float in [0, 0.99], default 0.0

**ik\_stiffness\_y**

IK stiffness around the Y axis

**Type** float in [0, 0.99], default 0.0

**ik\_stiffness\_z**

IK stiffness around the Z axis

**Type** float in [0, 0.99], default 0.0

**ik\_stretch**

Allow scaling of the bone for IK

**Type** float in [0, 1], default 0.0

**is\_in\_ik\_chain**

Is part of an IK chain

**Type** boolean, default False, (readonly)

**location**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**lock\_ik\_x**

Disallow movement around the X axis

**Type** boolean, default False

**lock\_ik\_y**

Disallow movement around the Y axis

**Type** boolean, default False

**lock\_ik\_z**

Disallow movement around the Z axis

**Type** boolean, default False

**lock\_location**

Lock editing of location in the interface

**Type** boolean array of 3 items, default (False, False, False)

**lock\_rotation**

Lock editing of rotation in the interface

**Type** boolean array of 3 items, default (False, False, False)

**lock\_rotation\_w**

Lock editing of 'angle' component of four-component rotations in the interface

**Type** boolean, default False

**lock\_rotations\_4d**

Lock editing of four component rotations by components (instead of as Eulers)

**Type** boolean, default False

**lock\_scale**

Lock editing of scale in the interface

**Type** boolean array of 3 items, default (False, False, False)

**matrix**

Final 4x4 matrix after constraints and drivers are applied (object space)

**Type** float array of 16 items in [-inf, inf], default (0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0)

**matrix\_basis**

Provides an alternative access to loc/scale/rotation relative to the parent and own rest bone.

**Type** float array of 16 items in [-inf, inf], default (0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0)

**matrix\_channel**

4x4 matrix, before constraints

**Type** float array of 16 items in [-inf, inf], default (0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0), (readonly)

**motion\_path**

Motion Path for this element

**Type** `MotionPath`, (readonly)

**name**  
**Type** string, default “”

**parent**  
Parent of this pose bone  
**Type** `PoseBone`, (readonly)

**rotation\_axis\_angle**  
Angle of Rotation for Axis-Angle rotation representation  
**Type** float array of 4 items in [-inf, inf], default (0.0, 0.0, 1.0, 0.0)

**rotation\_euler**  
Rotation in Eulers  
**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**rotation\_mode**  
**Type** enum in ['QUATERNION', 'XYZ', 'XZY', 'YXZ', 'YZX', 'ZXY', 'ZYX', 'AXIS\_ANGLE'], default 'QUATERNION'

**rotation\_quaternion**  
Rotation in Quaternions  
**Type** float array of 4 items in [-inf, inf], default (1.0, 0.0, 0.0, 0.0)

**scale**  
**Type** float array of 3 items in [-inf, inf], default (1.0, 1.0, 1.0)

**tail**  
Location of tail of the channel's bone  
**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0), (readonly)

**use\_ik\_limit\_x**  
Limit movement around the X axis  
**Type** boolean, default False

**use\_ik\_limit\_y**  
Limit movement around the Y axis  
**Type** boolean, default False

**use\_ik\_limit\_z**  
Limit movement around the Z axis  
**Type** boolean, default False

**use\_ik\_linear\_control**  
Apply channel size as IK constraint if stretching is enabled  
**Type** boolean, default False

**use\_ik\_rotation\_control**  
Apply channel rotation as IK constraint  
**Type** boolean, default False

**basename**  
The name of this bone before any ‘.’ character (readonly)

**center**

The midpoint between the head and the tail. (readonly)

**children**

A list of all the bones children. (readonly)

**children\_recursive**

a list of all children from this bone. (readonly)

**children\_recursive\_basename**

Returns a chain of children with the same base name as this bone Only direct chains are supported, forks caused by multiple children with matching basenames will terminate the function and not be returned. (readonly)

**length**

The distance from head to tail, when set the head is moved to fit the length.

**parent\_recursive**

A list of parents, starting with the immediate parent (readonly)

**vector**

The direction this bone is pointing. Utility function for (tail - head) (readonly)

**x\_axis**

Vector pointing down the x-axis of the bone. (readonly)

**y\_axis**

Vector pointing down the x-axis of the bone. (readonly)

**z\_axis**

Vector pointing down the x-axis of the bone. (readonly)

**evaluate\_envelope (point)**

Calculate bone envelope at given point.

**Parameters** **point** (*float array of 3 items in [-inf, inf]*) – Point, Position in 3d space to evaluate

**Returns** Factor, Envelope factor

**Return type** float in [-inf, inf]

**parent\_index (parent\_test)**

The same as ‘bone in other\_bone.parent\_recursive’ but saved generating a list.

**translate (vec)**

Utility function to add *vec* to the head and tail of this bone.

**Inherited Properties**

- `bpy_struct.id_data`

**Inherited Functions**

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`

- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- Pose.bones
- PoseBone.child
- PoseBone.custom\_shape\_transform
- PoseBone.parent

### 2.4.404 PoseBoneConstraints(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.PoseBoneConstraints (*bpy\_struct*)

Collection of pose bone constraints

**active**

Active PoseChannel constraint

**Type** Constraint

**new** (*type*)

Add a constraint to this object

**Parameters** **type** (enum in ['COPY\_LOCATION', 'COPY\_ROTATION', 'COPY\_SCALE', 'COPY\_TRANSFORMS', 'LIMIT\_DISTANCE', 'LIMIT\_LOCATION', 'LIMIT\_ROTATION', 'LIMIT\_SCALE', 'MAINTAIN\_VOLUME', 'TRANSFORM', 'CLAMP\_TO', 'DAMPED\_TRACK', 'IK', 'LOCKED\_TRACK', 'SPLINE\_IK', 'STRETCH\_TO', 'TRACK\_TO', 'ACTION', 'CHILD\_OF', 'FLOOR', 'FOLLOW\_PATH', 'PIVOT', 'RIGID\_BODY\_JOINT', 'SCRIPT', 'SHRINKWRAP']) – Constraint type to add.

**Returns** New constraint.

**Return type** Constraint

**remove** (*constraint*)

Remove a constraint from this object.

**Parameters** **constraint** (Constraint, (never None)) – Removed constraint.

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer

- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- PoseBone.constraints

### 2.4.405 Property(bpy\_struct)

base class — bpy\_struct  
subclasses — PointerProperty, EnumProperty, IntProperty, CollectionProperty, BooleanProperty, FloatProperty, StringProperty

**class bpy.types.Property(bpy\_struct)**  
RNA property definition

**description**  
Description of the property for tooltips  
**Type** string, default "", (readonly)

**identifier**  
Unique name used in the code and scripting  
**Type** string, default "", (readonly)

**is\_enum\_flag**  
True when multiple enums  
**Type** boolean, default False, (readonly)

**is\_hidden**  
True when the property is hidden  
**Type** boolean, default False, (readonly)

**is\_never\_none**  
True when this value can't be set to None  
**Type** boolean, default False, (readonly)

**is\_output**  
True when this property is an output value from an RNA function  
**Type** boolean, default False, (readonly)

**is\_readonly**

Property is editable through RNA

**Type** boolean, default False, (readonly)

**is\_registered**

Property is registered as part of type registration

**Type** boolean, default False, (readonly)

**is\_registered\_optional**

Property is optionally registered as part of type registration

**Type** boolean, default False, (readonly)

**is\_required**

False when this property is an optional argument in an RNA function

**Type** boolean, default False, (readonly)

**is\_runtime**

Property has been dynamically created at runtime

**Type** boolean, default False, (readonly)

**is\_skip\_save**

True when the property is not saved in presets

**Type** boolean, default False, (readonly)

**name**

Human readable name

**Type** string, default "", (readonly)

**srna**

Struct definition used for properties assigned to this item

**Type** Struct, (readonly)

**subtype**

Semantic interpretation of the property

**Type** enum in ['NONE', 'FILE\_PATH', 'DIRECTORY\_PATH', 'UNSIGNED', 'PERCENTAGE', 'FACTOR', 'ANGLE', 'TIME', 'DISTANCE', 'COLOR', 'TRANSLATION', 'DIRECTION', 'MATRIX', 'EULER', 'QUATERNION', 'XYZ', 'COLOR\_GAMMA', 'COORDINATES', 'LAYER', 'LAYER\_MEMBERSHIP'], default 'NONE', (readonly)

**type**

Data type of the property

**Type** enum in ['BOOLEAN', 'INT', 'FLOAT', 'STRING', 'ENUM', 'POINTER', 'COLLECTION'], default 'BOOLEAN', (readonly)

**unit**

Type of units for this property

**Type** enum in ['NONE', 'LENGTH', 'AREA', 'VOLUME', 'ROTATION', 'TIME', 'VELOCITY', 'ACCELERATION'], default 'NONE', (readonly)

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `Function.parameters`
- `Struct.properties`

### 2.4.406 PropertyActuator(Actuator)

base classes — `bpy_struct, Actuator`

**class bpy.types.PropertyActuator(Actuator)**  
Actuator to handle properties

**mode**

**Type** enum in ['ASSIGN', 'ADD', 'COPY', 'TOGGLE'], default 'ASSIGN'

**object**

Copy from this Object

**Type** `Object`

**object\_property**

Copy this property

**Type** string, default ""

**property**

The name of the property

**Type** string, default ""

**value**

The name of the property or the value to use (use "" around strings)

**Type** string, default ""

## Inherited Properties

- `bpy_struct.id_data`
- `Actuator.name`
- `Actuator.show_expanded`
- `Actuator.pin`
- `Actuator.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`
- `Actuator.link`
- `Actuator.unlink`

## 2.4.407 PropertyGroup(bpy\_struct)

### Custom Properties

PropertyGroups are the base class for dynamically defined sets of properties.

They can be used to extend existing blender data with your own types which can be animated, accessed from the user interface and from python.

---

**Note:** The values assigned to blender data are saved to disk but the class definitions are not, this means whenever you load blender the class needs to be registered too.

This is best done by creating an addon which loads on startup and registers your properties.

---

---

**Note:** PropertyGroups must be registered before assigning them to blender data.

---

### See Also:

Property types used in class declarations are all in `bpy.props`

```
import bpy
```

```
class MyPropertyGroup(bpy.types.PropertyGroup):
    custom_1 = bpy.props.FloatProperty(name="My Float")
    custom_2 = bpy.props.IntProperty(name="My Int")

bpy.utils.register_class(MyPropertyGroup)

bpy.types.Object.my_prop_grp = bpy.props.PointerProperty(type=MyPropertyGroup)

# test this worked
bpy.data.objects[0].my_prop_grp.custom_1 = 22.0

base class — bpy_struct
subclasses — OperatorFileListElement, OperatorMousePath, OperatorStrokeElement
class bpy.types.PropertyGroup(bpy_struct)
    Group of ID properties

    name
        Unique name used in the code and scripting
        Type string, default ""


```

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- PropertyGroupItem.collection
- PropertyGroupItem.group
- PropertyGroupItem.idp\_array

## 2.4.408 PropertyGroupItem(bpy\_struct)

base class — `bpy_struct`

**class** `bpy.types.PropertyGroupItem(bpy_struct)`  
Property that stores arbitrary, user defined properties

**collection**

**Type** `bpy_prop_collection` of `PropertyGroup`, (readonly)

**double**

**Type** float in [-inf, inf], default 0.0

**double\_array**

**Type** float array of 1 items in [-inf, inf], default (0.0)

**float**

**Type** float in [-inf, inf], default 0.0

**float\_array**

**Type** float array of 1 items in [-inf, inf], default (0.0)

**group**

**Type** `PropertyGroup`, (readonly)

**idp\_array**

**Type** `bpy_prop_collection` of `PropertyGroup`, (readonly)

**int**

**Type** int in [-inf, inf], default 0

**int\_array**

**Type** int array of 1 items in [-inf, inf], default (0,)

**string**

**Type** string, default “”

### Inherited Properties

- `bpy_struct.id_data`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`

- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.409 PropertySensor(Sensor)

base classes — bpy\_struct, Sensor

**class bpy.types.PropertySensor (Sensor)**

Sensor to detect values and changes in values of properties

**evaluation\_type**

Type of property evaluation

**Type** enum in ['PROPEQUAL', 'PROPNEQUAL', 'PROPINTERVAL', 'PROPCHANGED'],  
default 'PROPEQUAL'

**property**

**Type** string, default “”

**value**

Check for this value in types in Equal or Not Equal types

**Type** string, default “”

**value\_max**

Specify maximum value in Interval type

**Type** string, default “”

**value\_min**

Specify minimum value in Interval type

**Type** string, default “”

### Inherited Properties

- bpy\_struct.id\_data
- Sensor.name
- Sensor.show\_expanded
- Sensor.frequency
- Sensor.invert
- Sensor.use\_level
- Sensor.pin
- Sensor.use\_pulse\_false\_level
- Sensor.use\_pulse\_true\_level
- Sensor.use\_tap
- Sensor.type

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add

- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- Sensor.link
- Sensor.unlink

## 2.4.410 PythonConstraint(Constraint)

base classes — bpy\_struct, Constraint

**class** bpy.types.PythonConstraint (*Constraint*)  
Uses Python script for constraint evaluation

**has\_script\_error**  
The linked Python script has thrown an error

**Type** boolean, default False, (readonly)

**target\_count**  
Usually only 1-3 are needed

**Type** int in [-inf, inf], default 0

**targets**  
Target Objects

**Type** bpy\_prop\_collection of ConstraintTarget, (readonly)

**text**  
The text object that contains the Python script

**Type** Text

**use\_targets**  
Use the targets indicated in the constraint panel

**Type** boolean, default False

### Inherited Properties

- bpy\_struct.id\_data
- Constraint.name
- Constraint.active
- Constraint.mute
- Constraint.show\_expanded
- Constraint.influence
- Constraint.error\_location

- Constraint.owner\_space
- Constraint.is\_proxy\_local
- Constraint.error\_rotation
- Constraint.target\_space
- Constraint.type
- Constraint.is\_valid

#### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

### 2.4.411 PythonController(Controller)

base classes — bpy\_struct, Controller

**class** bpy.types.PythonController(*Controller*)

Controller executing a python script

**mode**

Python script type (textblock or module - faster)

**Type** enum in ['SCRIPT', 'MODULE'], default 'SCRIPT'

**module**

Module name and function to run e.g. "someModule.main". Internal texts and external python files can be used

**Type** string, default ""

**text**

Text datablock with the python script

**Type** Text

**use\_debug**

Continuously reload the module from disk for editing external modules without restarting

**Type** boolean, default False

## Inherited Properties

- `bpy_struct.id_data`
- `Controller.name`
- `Controller.states`
- `Controller.show_expanded`
- `Controller.use_priority`
- `Controller.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`
- `Controller.link`
- `Controller.unlink`

## 2.4.412 RGBANodeSocket(NodeSocket)

base classes — `bpy_struct, NodeSocket`

**class** `bpy.types.RGBANodeSocket` (`NodeSocket`)  
Input or output socket of a node

**default\_value**  
Default value of the socket when no link is attached

**Type** float array of 4 items in [-inf, inf], default (0.0, 0.0, 0.0, 0.0)

## Inherited Properties

- `bpy_struct.id_data`
- `NodeSocket.name`
- `NodeSocket.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`

- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.413 RadarSensor(Sensor)

base classes — bpy\_struct, Sensor

**class** bpy.types.RadarSensor (*Sensor*)

Sensor to detect objects in a cone shaped radar emanating from the current object

**angle**

Opening angle of the radar cone (in degrees)

**Type** float in [0, 179.9], default 0.0

**axis**

Specify along which axis the radar cone is cast

**Type** enum in ['XAXIS', 'YAXIS', 'ZAXIS', 'NEGXAXIS', 'NEYAXIS', 'NEGZAXIS'],  
default 'XAXIS'

**distance**

Depth of the radar cone

**Type** float in [0, 10000], default 0.0

**property**

Only look for Objects with this property (blank = all objects)

**Type** string, default “”

### Inherited Properties

- bpy\_struct.id\_data
- Sensor.name
- Sensor.show\_expanded
- Sensor.frequency
- Sensor.invert
- Sensor.use\_level
- Sensor.pin
- Sensor.use\_pulse\_false\_level
- Sensor.use\_pulse\_true\_level
- Sensor.use\_tap
- Sensor.type

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`
- `Sensor.link`
- `Sensor.unlink`

### 2.4.414 RandomActuator(Actuator)

base classes — `bpy_struct, Actuator`

**class bpy.types.RandomActuator (Actuator)**  
Actuator to ..

**chance**

Pick a number between 0 and 1. Success if you stay below this value

**Type** float in [0, 1], default 0.0

**distribution**

Choose the type of distribution

**Type** enum in ['BOOL\_CONSTANT', 'BOOL\_UNIFORM', 'BOOL\_BERNOULLI', 'INT\_CONSTANT', 'INT\_UNIFORM', 'INT\_POISSON', 'FLOAT\_CONSTANT', 'FLOAT\_UNIFORM', 'FLOAT\_NORMAL', 'FLOAT\_NEGATIVE\_EXPONENTIAL'], default 'BOOL\_CONSTANT'

**float\_max**

Choose a number from a range. Upper boundary of the range

**Type** float in [-1000, 1000], default 0.0

**float\_mean**

A normal distribution. Mean of the distribution

**Type** float in [-1000, 1000], default 0.0

**float\_min**

Choose a number from a range. Lower boundary of the range

**Type** float in [-1000, 1000], default 0.0

**float\_value**

Always return this number

**Type** float in [0, 1], default 0.0

**half\_life\_time**  
Negative exponential dropoff

**Type** float in [-1000, 1000], default 0.0

**int\_max**  
Choose a number from a range. Upper boundary of the range

**Type** int in [-1000, 1000], default 0

**int\_mean**  
Expected mean value of the distribution

**Type** float in [0.01, 100], default 0.0

**int\_min**  
Choose a number from a range. Lower boundary of the range

**Type** int in [-1000, 1000], default 0

**int\_value**  
Always return this number

**Type** int in [-inf, inf], default 0

**property**  
Assign the random value to this property

**Type** string, default “”

**seed**  
Initial seed of the random generator. Use Python for more freedom (choose 0 for not random)

**Type** int in [0, 300000], default 0

**standard\_derivation**  
A normal distribution. Standard deviation of the distribution

**Type** float in [-1000, 1000], default 0.0

**use\_always\_true**  
Always false or always true

**Type** boolean, default False

## Inherited Properties

- `bpy_struct.id_data`
- `Actuator.name`
- `Actuator.show_expanded`
- `Actuator.pin`
- `Actuator.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`

- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- Actuator.link
- Actuator.unlink

## 2.4.415 RandomSensor(Sensor)

base classes — bpy\_struct, Sensor

**class** bpy.types.RandomSensor (*Sensor*)

Sensor to send random events

**seed**

Initial seed of the generator. (Choose 0 for not random)

**Type** int in [0, 1000], default 0

### Inherited Properties

- bpy\_struct.id\_data
- Sensor.name
- Sensor.show\_expanded
- Sensor.frequency
- Sensor.invert
- Sensor.use\_level
- Sensor.pin
- Sensor.use\_pulse\_false\_level
- Sensor.use\_pulse\_true\_level
- Sensor.use\_tap
- Sensor.type

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete

- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- Sensor.link
- Sensor.unlink

## 2.4.416 RaySensor(Sensor)

base classes — bpy\_struct, Sensor

**class bpy.types.RaySensor (Sensor)**

Sensor to detect intersections with a ray emanating from the current object

**axis**

Specify along which axis the ray is cast

**Type** enum in ['XAXIS', 'YAXIS', 'ZAXIS', 'NEGXAXIS', 'NEYYAXIS', 'NEGZAXIS'],  
default 'YAXIS'

**material**

Only look for Objects with this material (blank = all objects)

**Type** string, default “”

**property**

Only look for Objects with this property (blank = all objects)

**Type** string, default “”

**range**

Sense objects no farther than this distance

**Type** float in [0.01, 10000], default 0.0

**ray\_type**

Toggle collision on material or property

**Type** enum in ['PROPERTY', 'MATERIAL'], default 'PROPERTY'

**use\_x\_ray**

Toggle X-Ray option (see through objects that don't have the property)

**Type** boolean, default False

### Inherited Properties

- bpy\_struct.id\_data
- Sensor.name
- Sensor.show\_expanded
- Sensor.frequency
- Sensor.invert
- Sensor.use\_level
- Sensor.pin
- Sensor.use\_pulse\_false\_level
- Sensor.use\_pulse\_true\_level
- Sensor.use\_tap

- Sensor.type

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- Sensor.link
- Sensor.unlink

## 2.4.417 Region(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.Region (bpy\_struct)

Region in a subdivided screen area

**height**

Region height

**Type** int in [0, 32767], default 0, (readonly)

**id**

Unique ID for this region

**Type** int in [-32768, 32767], default 0, (readonly)

**type**

Type of this region

**Type** enum in ['WINDOW', 'HEADER', 'CHANNELS', 'TEMPORARY', 'UI', 'TOOLS', 'TOOL\_PROPS', 'PREVIEW'], default 'WINDOW', (readonly)

**width**

Region width

**Type** int in [0, 32767], default 0, (readonly)

**tag\_redraw()**

tag\_redraw

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `Area.regions`
- `Context.region`

### 2.4.418 RegionView3D(`bpy_struct`)

base class — `bpy_struct`

```
class bpy.types.RegionView3D(bpy_struct)
    3D View region data

    is_perspective
        Type boolean, default False

    lock_rotation
        Lock view rotation in side views
        Type boolean, default False

    perspective_matrix
        Current perspective matrix of the 3D region
        Type float array of 16 items in [-inf, inf], default (0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0), (readonly)

    show_sync_view
        Sync view position between side views
        Type boolean, default False
```

**use\_box\_clip**

Clip objects based on what's visible in other side views

**Type** boolean, default False

**view\_distance**

Distance to the view location

**Type** float in [0, inf], default 0.0

**view\_location**

View pivot location

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**view\_matrix**

Current view matrix of the 3D region

**Type** float array of 16 items in [-inf, inf], default (0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0)

**view\_perspective**

View Perspective

**Type** enum in ['PERSP', 'ORTHO', 'CAMERA'], default 'ORTHO'

**view\_rotation**

Rotation in quaternions (keep normalized)

**Type** float array of 4 items in [-inf, inf], default (0.0, 0.0, 0.0, 0.0)

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- Context.region\_data

- SpaceView3D.region\_3d
- SpaceView3D.region\_quadview

## 2.4.419 RenderEngine(bpy\_struct)

### Simple Render Engine

```
import bpy

class CustomRenderEngine(bpy.types.RenderEngine):
    # These three members are used by blender to set up the
    # RenderEngine; define its internal name, visible name and capabilities.
    bl_idname = 'custom_renderer'
    bl_label = 'Flat Color Renderer'
    bl_use_preview = True

    # This is the only method called by blender, in this example
    # we use it to detect preview rendering and call the implementation
    # in another method.
    def render(self, scene):
        scale = scene.render.resolution_percentage / 100.0
        self.size_x = int(scene.render.resolution_x * scale)
        self.size_y = int(scene.render.resolution_y * scale)

        if scene.name == 'preview':
            self.render_preview(scene)
        else:
            self.render_scene(scene)

    # In this example, we fill the preview renders with a flat green color.
    def render_preview(self, scene):
        pixel_count = self.size_x * self.size_y

        # The framebuffer is defined as a list of pixels, each pixel
        # itself being a list of R,G,B,A values
        green_rect = [[0.0, 1.0, 0.0, 1.0]] * pixel_count

        # Here we write the pixel values to the RenderResult
        result = self.begin_result(0, 0, self.size_x, self.size_y)
        layer = result.layers[0]
        layer.rect = green_rect
        self.end_result(result)

    # In this example, we fill the full renders with a flat blue color.
    def render_scene(self, scene):
        pixel_count = self.size_x * self.size_y

        # The framebuffer is defined as a list of pixels, each pixel
        # itself being a list of R,G,B,A values
        blue_rect = [[0.0, 0.0, 1.0, 1.0]] * pixel_count

        # Here we write the pixel values to the RenderResult
        result = self.begin_result(0, 0, self.size_x, self.size_y)
        layer = result.layers[0]
        layer.rect = blue_rect
        self.end_result(result)
```

```
# Register the RenderEngine
bpy.utils.register_class(CustomRenderEngine)

# RenderEngines also need to tell UI Panels that they are compatible
# Otherwise most of the UI will be empty when the engine is selected.
# In this example, we need to see the main render image button and
# the material preview panel.
from bl_ui import properties_render
properties_render.RENDER_PT_render.COMPAT_ENGINES.add('custom_renderer')
del properties_render

from bl_ui import properties_material
properties_material.MATERIAL_PT_preview.COMPAT_ENGINES.add('custom_renderer')
del properties_material

base class — bpy_struct

class bpy.types.RenderEngine(bpy_struct)
    Render engine

    bl_idname
        Type string, default ""

    bl_label
        Type string, default ""

    bl_use_postprocess
        Type boolean, default False

    bl_use_preview
        Type boolean, default False

    render(scene=None)
        Render scene into an image.

    begin_result(x, y, w, h)
        begin_result

    Parameters
        • x (int in [0, inf]) – X
        • y (int in [0, inf]) – Y
        • w (int in [0, inf]) – Width
        • h (int in [0, inf]) – Height

    Returns Result

    Return type RenderResult

    update_result(result)
        update_result

    Parameters result(RenderResult) – Result

    end_result(result)
        end_result
```

**Parameters** `result` (`RenderResult`) – Result

**test\_break()**  
test\_break

**Returns** Break

**Return type** boolean

**update\_stats** (`stats`, `info`)  
update\_stats

**Parameters**

- **stats** (`string`) – Stats
- **info** (`string`) – Info

**report** (`type`, `message`)  
report

**Parameters**

- **type** (`enum set in {‘DEBUG’, ‘INFO’, ‘OPERATOR’, ‘WARNING’, ‘ERROR’, ‘ERROR_INVALID_INPUT’, ‘ERROR_INVALID_CONTEXT’, ‘ERROR_OUT_OF_MEMORY’}`) – Type
- **message** (`string`) – Report Message

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.420 RenderLayer(`bpy_struct`)

base class — `bpy_struct`

```
class bpy.types.RenderLayer(bpy_struct)

exclude_ambient_occlusion
    Exclude AO pass from combined
    Type boolean, default False, (readonly)

exclude_emit
    Exclude emission pass from combined
    Type boolean, default False, (readonly)

exclude_environment
    Exclude environment pass from combined
    Type boolean, default False, (readonly)

exclude_indirect
    Exclude indirect pass from combined
    Type boolean, default False, (readonly)

exclude_reflection
    Exclude raytraced reflection pass from combined
    Type boolean, default False, (readonly)

exclude_refraction
    Exclude raytraced refraction pass from combined
    Type boolean, default False, (readonly)

exclude_shadow
    Exclude shadow pass from combined
    Type boolean, default False, (readonly)

exclude_specular
    Exclude specular pass from combined
    Type boolean, default False, (readonly)

invert_zmask
    For Zmask, only render what is behind solid z values instead of in front
    Type boolean, default False, (readonly)

layers
    Scene layers included in this render layer
    Type boolean array of 20 items, default (False, False, False, False, False, False, False, False,
        False, False, False, False, False, False, False, False, False, False, False, False), (readonly)

layers_zmask
    Zmask scene layers for solid faces
    Type boolean array of 20 items, default (False, False, False, False, False, False, False, False,
        False, False, False, False, False, False, False, False, False, False, False, False, False), (readonly)

light_override
    Group to override all other lights in this render layer
    Type Group, (readonly)
```

**material\_override**

Material to override all other materials in this render layer

**Type** Material, (readonly)

**name**

Render layer name

**Type** string, default "", (readonly)

**passes**

**Type** bpy\_prop\_collection of RenderPass, (readonly)

**rect**

**Type** float in [-inf, inf], default 0.0

**use**

Disable or enable the render layer

**Type** boolean, default False, (readonly)

**use\_all\_z**

Fill in Z values for solid faces in invisible layers, for masking

**Type** boolean, default False, (readonly)

**use\_edge\_enhance**

Render Edge-enhance in this Layer (only works for Solid faces)

**Type** boolean, default False, (readonly)

**use\_halo**

Render Halos in this Layer (on top of Solid)

**Type** boolean, default False, (readonly)

**use\_pass\_ambient\_occlusion**

Deliver AO pass

**Type** boolean, default False, (readonly)

**use\_pass\_color**

Deliver shade-less color pass

**Type** boolean, default False, (readonly)

**use\_pass\_combined**

Deliver full combined RGBA buffer

**Type** boolean, default False, (readonly)

**use\_pass\_diffuse**

Deliver diffuse pass

**Type** boolean, default False, (readonly)

**use\_pass\_emit**

Deliver emission pass

**Type** boolean, default False, (readonly)

**use\_pass\_environment**

Deliver environment lighting pass

**Type** boolean, default False, (readonly)

**use\_pass\_indirect**  
Deliver indirect lighting pass  
**Type** boolean, default False, (readonly)

**use\_pass\_material\_index**  
Deliver material index pass  
**Type** boolean, default False, (readonly)

**use\_pass\_mist**  
Deliver mist factor pass (0.0-1.0)  
**Type** boolean, default False, (readonly)

**use\_pass\_normal**  
Deliver normal pass  
**Type** boolean, default False, (readonly)

**use\_pass\_object\_index**  
Deliver object index pass  
**Type** boolean, default False, (readonly)

**use\_pass\_reflection**  
Deliver raytraced reflection pass  
**Type** boolean, default False, (readonly)

**use\_pass\_refraction**  
Deliver raytraced refraction pass  
**Type** boolean, default False, (readonly)

**use\_pass\_shadow**  
Deliver shadow pass  
**Type** boolean, default False, (readonly)

**use\_pass\_specular**  
Deliver specular pass  
**Type** boolean, default False, (readonly)

**use\_pass\_uv**  
Deliver texture UV pass  
**Type** boolean, default False, (readonly)

**use\_pass\_vector**  
Deliver speed vector pass  
**Type** boolean, default False, (readonly)

**use\_pass\_z**  
Deliver Z values pass  
**Type** boolean, default False, (readonly)

**use\_sky**  
Render Sky in this Layer  
**Type** boolean, default False, (readonly)

**use\_solid**  
Render Solid faces in this Layer

**Type** boolean, default False, (readonly)

**use\_strand**

Render Strands in this Layer

**Type** boolean, default False, (readonly)

**use\_zmask**

Only render what's in front of the solid z values

**Type** boolean, default False, (readonly)

**use\_ztransp**

Render Z-Transparent faces in this Layer (On top of Solid and Halos)

**Type** boolean, default False, (readonly)

**load\_from\_file (filename, x=0, y=0)**

Copies the pixels of this renderlayer from an image file.

**Parameters**

- **filename (string)** – Filename, Filename to load into this render tile, must be no smaller than the renderlayer
- **x (int in [0, inf], (optional))** – Offset X, Offset the position to copy from if the image is larger than the render layer
- **y (int in [0, inf], (optional))** – Offset Y, Offset the position to copy from if the image is larger than the render layer

**Inherited Properties**

- bpy\_struct.id\_data

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

**References**

- RenderResult.layers

## 2.4.421 RenderLayers(bpy\_struct)

base class — `bpy_struct`

**class bpy.types.RenderLayers (bpy\_struct)**  
Collection of render layers

**active**  
Active Render Layer  
**Type** `SceneRenderLayer`, (never None)

**active\_index**  
Active index in render layer array  
**Type** int in [-32768, 32767], default 0

### Inherited Properties

- `bpy_struct.id_data`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

### References

- `RenderSettings.layers`

## 2.4.422 RenderPass(bpy\_struct)

base class — `bpy_struct`

**class bpy.types.RenderPass (bpy\_struct)**

**channel\_id**  
**Type** string, default "", (readonly)

**channels**

**Type** int in [-inf, inf], default 0, (readonly)

**name**

**Type** string, default "", (readonly)

**rect**

**Type** float in [-inf, inf], default 0.0

**type**

**Type** enum in ['COMBINED', 'Z', 'COLOR', 'DIFFUSE', 'SPECULAR', 'SHADOW', 'AO', 'REFLECTION', 'NORMAL', 'VECTOR', 'REFRACTION', 'OBJECT\_INDEX', 'UV', 'MIST', 'EMIT', 'ENVIRONMENT', 'MATERIAL\_INDEX'], default 'COMBINED', (readonly)

**Inherited Properties**

- `bpy_struct.id_data`

**Inherited Functions**

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

**References**

- `RenderLayer.passes`

## 2.4.423 RenderResult(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.RenderResult` (`bpy_struct`)

Result of rendering, including all layers and passes

**layers**

**Type** bpy\_prop\_collection of RenderLayer, (readonly)

**resolution\_x**

**Type** int in [-inf, inf], default 0, (readonly)

**resolution\_y**

**Type** int in [-inf, inf], default 0, (readonly)

**load\_from\_file** (*filename*)  
Copies the pixels of this render result from an image file.

**Parameters** **filename** (*string*) – File Name, Filename to load into this render tile, must be no smaller than the render result

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- RenderEngine.begin\_result
- RenderEngine.end\_result
- RenderEngine.update\_result

## 2.4.424 RenderSettings(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.RenderSettings (*bpy\_struct*)  
Rendering settings for a Scene datablock

**alpha\_mode**  
Representation of alpha information in the RGBA pixels

**Type** enum in ['SKY', 'PREMUL', 'STRAIGHT'], default 'SKY'

**antialiasing\_samples**  
Amount of anti-aliasing samples per pixel

**Type** enum in ['5', '8', '11', '16'], default '5'

**bake\_aa\_mode**

**Type** enum in ['5', '8', '11', '16'], default '5'

**bake\_bias**  
Bias towards faces further away from the object (in blender units)

**Type** float in [0, 1000], default 0.0

**bake\_distance**  
Maximum distance from active object to other object (in blender units)

**Type** float in [0, 1000], default 0.0

**bake\_margin**  
Amount of pixels to extend the baked result with, as post process filter

**Type** int in [0, 64], default 0

**bake\_normal\_space**  
Choose normal space for baking

**Type** enum in ['CAMERA', 'WORLD', 'OBJECT', 'TANGENT'], default 'CAMERA'

**bake\_quad\_split**  
Choose the method used to split a quad into 2 triangles for baking

**Type** enum in ['AUTO', 'FIXED', 'FIXED\_ALT'], default 'AUTO'

**bake\_type**  
Choose shading information to bake into the image

**Type** enum in ['FULL', 'AO', 'SHADOW', 'NORMALS', 'TEXTURE', 'DISPLACEMENT', 'EMIT', 'ALPHA', 'MIRROR\_INTENSITY', 'MIRROR\_COLOR', 'SPEC\_INTENSITY', 'SPEC\_COLOR'], default 'FULL'

**border\_max\_x**  
Sets maximum X value for the render border

**Type** float in [0, 1], default 0.0

**border\_max\_y**  
Sets maximum Y value for the render border

**Type** float in [0, 1], default 0.0

**border\_min\_x**  
Sets minimum X value to for the render border

**Type** float in [0, 1], default 0.0

**border\_min\_y**  
Sets minimum Y value for the render border

**Type** float in [0, 1], default 0.0

**cineon\_black**  
Log conversion reference blackpoint

**Type** int in [0, 1024], default 0

**cineon\_gamma**

Log conversion gamma

**Type** float in [0, 10], default 0.0

**cineon\_white**

Log conversion reference whitepoint

**Type** int in [0, 1024], default 0

**color\_mode**

Choose BW for saving greyscale images, RGB for saving red, green and blue channels, AND RGBA for saving red, green, blue + alpha channels

**Type** enum in ['BW', 'RGB', 'RGBA'], default 'BW'

**display\_mode**

Select where rendered images will be displayed

**Type** enum in ['SCREEN', 'AREA', 'WINDOW', 'NONE'], default 'SCREEN'

**dither\_intensity**

Amount of dithering noise added to the rendered image to break up banding

**Type** float in [0, 2], default 0.0

**edge\_color**

Edge color

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**edge\_threshold**

Threshold for drawing outlines on geometry edges

**Type** int in [0, 255], default 0

**engine**

Engine to use for rendering

**Type** enum in ['BLENDER\_RENDER'], default 'BLENDER\_RENDER'

**field\_order**

Order of video fields. Select which lines get rendered first, to create smooth motion for TV output

**Type** enum in ['EVEN\_FIRST', 'ODD\_FIRST'], default 'EVEN\_FIRST'

**file\_extension**

The file extension used for saving renders

**Type** string, default "", (readonly)

**file\_format**

File format to save the rendered images as

**Type** enum in ['BMP', 'IRIS', 'PNG', 'JPEG', 'TARGA', 'TARGA\_RAW', 'AVI\_JPEG', 'AVI\_RAW'], default 'TARGA'

**file\_quality**

Quality of JPEG images, AVI Jpeg and SGI movies, Compression for PNG's

**Type** int in [0, 100], default 0

**filepath**

Directory/name to save animations, # characters defines the position and length of frame numbers

**Type** string, default ""

**filter\_size**

Pixel width over which the reconstruction filter combines samples

**Type** float in [0.5, 1.5], default 0.0

**fps**

Framerate, expressed in frames per second

**Type** int in [1, 120], default 0

**fps\_base**

Framerate base

**Type** float in [0.1, 120], default 0.0

**frame\_map\_new**

Specify how many frames the Map Old will last

**Type** int in [1, 900], default 0

**frame\_map\_old**

Specify old mapping value in frames

**Type** int in [1, 900], default 0

**has\_multiple\_engines**

More than one rendering engine is available

**Type** boolean, default False, (readonly)

**is\_movie\_format**

When true the format is a movie

**Type** boolean, default False, (readonly)

**layers**

**Type** RenderLayers bpy\_prop\_collection of SceneRenderLayer, (readonly)

**motion\_blur\_samples**

Number of scene samples to take with motion blur

**Type** int in [1, 32], default 0

**motion\_blur\_shutter**

Time taken in frames between shutter open and close

**Type** float in [0.01, 10], default 0.0

**octree\_resolution**

Resolution of raytrace accelerator. Use higher resolutions for larger scenes

**Type** enum in ['64', '128', '256', '512'], default '64'

**parts\_x**

Number of horizontal tiles to use while rendering

**Type** int in [1, 512], default 0

**parts\_y**

Number of vertical tiles to use while rendering

**Type** int in [1, 512], default 0

**pixel\_aspect\_x**

Horizontal aspect ratio - for anamorphic or non-square pixel output

**Type** float in [1, 200], default 0.0

**pixel\_aspect\_y**  
Vertical aspect ratio - for anamorphic or non-square pixel output

**Type** float in [1, 200], default 0.0

**pixel\_filter\_type**  
Reconstruction filter used for combining anti-aliasing samples

**Type** enum in ['BOX', 'TENT', 'QUADRATIC', 'CUBIC', 'CATMULLROM', 'GAUSSIAN', 'MITCHELL'], default 'BOX'

**raytrace\_method**  
Type of raytrace accelerator structure

**Type** enum in ['AUTO', 'OCTREE', 'BLIBVH', 'VBVH', 'SIMD\_SVBVH', 'SIMD\_QBVH'], default 'AUTO'

**resolution\_percentage**  
Percentage scale for render resolution

**Type** int in [1, 32767], default 0

**resolution\_x**  
Number of horizontal pixels in the rendered image

**Type** int in [4, 10000], default 0

**resolution\_y**  
Number of vertical pixels in the rendered image

**Type** int in [4, 10000], default 0

**sequencer\_gl\_preview**  
Method to draw in the sequencer view

**Type** enum in ['BOUNDBOX', 'WIREFRAME', 'SOLID', 'TEXTURED'], default 'BOUNDBOX'

**sequencer\_gl\_render**  
Method to draw in the sequencer view

**Type** enum in ['BOUNDBOX', 'WIREFRAME', 'SOLID', 'TEXTURED'], default 'BOUNDBOX'

**simplify\_ao\_sss**  
Global approximate AA and SSS quality factor

**Type** float in [0, 1], default 0.0

**simplify\_child\_particles**  
Global child particles percentage

**Type** float in [0, 1], default 0.0

**simplify\_shadow\_samples**  
Global maximum shadow samples

**Type** int in [0, 32767], default 0

**simplify\_subdivision**  
Global maximum subdivision level

**Type** int in [0, 32767], default 0

**stamp\_background**

Color to use behind stamp text

**Type** float array of 4 items in [0, 1], default (0.0, 0.0, 0.0, 0.0)

**stamp\_font\_size**

Size of the font used when rendering stamp text

**Type** int in [8, 64], default 0

**stamp\_foreground**

Color to use for stamp text

**Type** float array of 4 items in [0, 1], default (0.0, 0.0, 0.0, 0.0)

**stamp\_note\_text**

Custom text to appear in the stamp note

**Type** string, default “”

**threads**

Number of CPU threads to use simultaneously while rendering (for multi-core/CPU systems)

**Type** int in [1, 64], default 0

**threads\_mode**

Determine the amount of render threads used

**Type** enum in ['AUTO', 'FIXED'], default 'AUTO'

**use\_antialiasing**

Render and combine multiple samples per pixel to prevent jagged edges

**Type** boolean, default False

**use\_bake\_antialiasing**

Enables Anti-aliasing

**Type** boolean, default False

**use\_bake\_clear**

Clear Images before baking

**Type** boolean, default False

**use\_bake\_lores\_mesh**

Calculate heights against unsubdivided low resolution mesh

**Type** boolean, default False

**use\_bake\_multires**

Bake directly from multires object

**Type** boolean, default False

**use\_bake\_normalize**

With displacement normalize to the distance, with ambient occlusion normalize without using material settings

**Type** boolean, default False

**use\_bake\_selected\_to\_active**

Bake shading on the surface of selected objects to the active object

**Type** boolean, default False

**use\_border**

Render a user-defined border region, within the frame size. Note, this disables save\_buffers and full\_sample

**Type** boolean, default False

**use\_cineon\_log**

Convert to logarithmic color space

**Type** boolean, default False

**use\_color\_management**

Use linear workflow - gamma corrected imaging pipeline

**Type** boolean, default False

**use\_compositing**

Process the render result through the compositing pipeline, if compositing nodes are enabled

**Type** boolean, default False

**use\_crop\_to\_border**

Crop the rendered frame to the defined border size

**Type** boolean, default False

**use\_edge\_enhance**

Create a toon outline around the edges of geometry

**Type** boolean, default False

**use\_envmaps**

Calculate environment maps while rendering

**Type** boolean, default False

**use\_fields**

Render image to two fields per frame, for interlaced TV output

**Type** boolean, default False

**use\_fields\_still**

Disable the time difference between fields

**Type** boolean, default False

**use\_file\_extension**

Add the file format extensions to the rendered file name (eg: filename + .jpg)

**Type** boolean, default False

**use\_free\_image\_textures**

Free all image texture from memory after render, to save memory before compositing

**Type** boolean, default False

**use\_free\_unused\_nodes**

Free Nodes that are not used while compositing, to save memory

**Type** boolean, default False

**use\_full\_sample**

Save for every anti-aliasing sample the entire RenderLayer results. This solves anti-aliasing issues with compositing

**Type** boolean, default False

**use\_game\_engine**

Current rendering engine is a game engine

**Type** boolean, default False, (readonly)

**use\_instances**

Instance support leads to effective memory reduction when using duplicates

**Type** boolean, default False

**use\_local\_coords**

Vertex coordinates are stored locally on each primitive. Increases memory usage, but may have impact on speed

**Type** boolean, default False

**use\_motion\_blur**

Use multi-sampled 3D scene motion blur

**Type** boolean, default False

**use\_overwrite**

Overwrite existing files while rendering

**Type** boolean, default False

**use\_placeholder**

Create empty placeholder files while rendering frames (similar to Unix ‘touch’)

**Type** boolean, default False

**use\_radiosity**

Calculate radiosity in a pre-process before rendering

**Type** boolean, default False

**use\_raytrace**

Pre-calculate the raytrace accelerator and render raytracing effects

**Type** boolean, default False

**use\_save\_buffers**

Save tiles for all RenderLayers and SceneNodes to files in the temp directory (saves memory, required for Full Sample)

**Type** boolean, default False

**use\_sequencer**

Process the render (and composited) result through the video sequence editor pipeline, if sequencer strips exist

**Type** boolean, default False

**use\_sequencer\_gl\_preview**

**Type** boolean, default False

**use\_sequencer\_gl\_render**

**Type** boolean, default False

**use\_shadows**

Calculate shadows while rendering

**Type** boolean, default False

**use\_simplify**

Enable simplification of scene for quicker preview renders

**Type** boolean, default False

**use\_simplify\_triangulate**

Disables non-planer quads being triangulated

**Type** boolean, default False

**use\_single\_layer**

Only render the active layer

**Type** boolean, default False

**use\_sss**

Calculate sub-surface scattering in materials rendering

**Type** boolean, default False

**use\_stamp**

Render the stamp info text in the rendered image

**Type** boolean, default False

**use\_stamp\_camera**

Include the name of the active camera in image metadata

**Type** boolean, default False

**use\_stamp\_date**

Include the current date in image metadata

**Type** boolean, default False

**use\_stamp\_filename**

Include the filename of the .blend file in image metadata

**Type** boolean, default False

**use\_stamp\_frame**

Include the frame number in image metadata

**Type** boolean, default False

**use\_stamp\_lens**

Include the name of the active cameras lens in image metadata

**Type** boolean, default False

**use\_stamp\_marker**

Include the name of the last marker in image metadata

**Type** boolean, default False

**use\_stamp\_note**

Include a custom note in image metadata

**Type** boolean, default False

**use\_stamp\_render\_time**

Include the render time in the stamp image

**Type** boolean, default False

**use\_stamp\_scene**

Include the name of the active scene in image metadata

**Type** boolean, default False

**use\_stamp\_sequencer\_strip**

Include the name of the foreground sequence strip in image metadata

**Type** boolean, default False

**use\_stamp\_time**

Include the render frame as HH:MM:SS.FF in image metadata

**Type** boolean, default False

**use\_textures**

Use textures to affect material properties

**Type** boolean, default False

**use\_tiff\_16bit**

Save TIFF with 16 bits per channel

**Type** boolean, default False

**frame\_path (frame=-2147483648)**

Return the absolute path to the filename to be written for a given frame.

**Parameters** **frame** (*int in [-inf, inf], (optional)*) – Frame number to use, if unset the current frame will be used.

**Returns** File Path, the resulting filepath from the scenes render settings.

**Return type** string

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `Scene.render`

### 2.4.425 RigidBodyJointConstraint(Constraint)

base classes — `bpy_struct, Constraint`

`class bpy.types.RigidBodyJointConstraint (Constraint)`

For use with the Game Engine

**`axis_x`**

Rotate pivot on X axis in degrees

**Type** float in [-6.28319, 6.28319], default 0.0

**`axis_y`**

Rotate pivot on Y axis in degrees

**Type** float in [-6.28319, 6.28319], default 0.0

**`axis_z`**

Rotate pivot on Z axis in degrees

**Type** float in [-6.28319, 6.28319], default 0.0

**`child`**

Child object

**Type** `Object`

**`limit_angle_max_x`**

**Type** float in [-6.28319, 6.28319], default 0.0

**`limit_angle_max_y`**

**Type** float in [-6.28319, 6.28319], default 0.0

**`limit_angle_max_z`**

**Type** float in [-6.28319, 6.28319], default 0.0

**`limit_angle_min_x`**

**Type** float in [-6.28319, 6.28319], default 0.0

**`limit_angle_min_y`**

**Type** float in [-6.28319, 6.28319], default 0.0

**`limit_angle_min_z`**

**Type** float in [-6.28319, 6.28319], default 0.0

**`limit_max_x`**

**Type** float in [-inf, inf], default 0.0

**`limit_max_y`**

**Type** float in [-inf, inf], default 0.0

**`limit_max_z`**

**Type** float in [-inf, inf], default 0.0

**limit\_min\_x**

**Type** float in [-inf, inf], default 0.0

**limit\_min\_y**

**Type** float in [-inf, inf], default 0.0

**limit\_min\_z**

**Type** float in [-inf, inf], default 0.0

**pivot\_type**

**Type** enum in ['BALL', 'HINGE', 'CONE\_TWIST', 'GENERIC\_6\_DOF'], default 'BALL'

**pivot\_x**

Offset pivot on X

**Type** float in [-1000, 1000], default 0.0

**pivot\_y**

Offset pivot on Y

**Type** float in [-1000, 1000], default 0.0

**pivot\_z**

Offset pivot on Z

**Type** float in [-1000, 1000], default 0.0

**show\_pivot**

Display the pivot point and rotation in 3D view

**Type** boolean, default False

**target**

Target Object

**Type** [Object](#)

**use\_angular\_limit\_x**

Use minimum/maximum x angular limit

**Type** boolean, default False

**use\_angular\_limit\_y**

Use minimum/maximum y angular limit

**Type** boolean, default False

**use\_angular\_limit\_z**

Use minimum/maximum z angular limit

**Type** boolean, default False

**use\_limit\_x**

Use minimum/maximum x limit

**Type** boolean, default False

**use\_limit\_y**

Use minimum/maximum y limit

**Type** boolean, default False

**use\_limit\_z**

Use minimum/maximum z limit

**Type** boolean, default False  
**use\_linked\_collision**  
Disable collision between linked bodies  
**Type** boolean, default False

### Inherited Properties

- bpy\_struct.id\_data
- Constraint.name
- Constraint.active
- Constraint.mute
- Constraint.show\_expanded
- Constraint.influence
- Constraint.error\_location
- Constraint.owner\_space
- Constraint.is\_proxy\_local
- Constraint.error\_rotation
- Constraint.target\_space
- Constraint.type
- Constraint.is\_valid

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.426 SPHFluidSettings(bpy\_struct)

base class — bpy\_struct  
**class** bpy.types.SPHFluidSettings (*bpy\_struct*)  
Settings for particle fluids physics  
**buoyancy**  
Artificial buoyancy force in negative gravity direction based on pressure differences inside the fluid  
**Type** float in [0, 10], default 0.0

**factor\_density**

Density is calculated as a factor of default density (depends on particle size)

**Type** boolean, default False

**factor\_radius**

Interaction radius is a factor of 4 \* particle size

**Type** boolean, default False

**factor\_repulsion**

Repulsion is a factor of stiffness

**Type** boolean, default False

**factor\_rest\_length**

Spring rest length is a factor of 2 \* particle size

**Type** boolean, default False

**factor\_stiff\_viscosity**

Stiff viscosity is a factor of normal viscosity

**Type** boolean, default False

**fluid\_radius**

Fluid interaction radius

**Type** float in [0, 20], default 0.0

**linear\_viscosity**

Linear viscosity

**Type** float in [0, 100], default 0.0

**plasticity**

How much the spring rest length can change after the elastic limit is crossed

**Type** float in [0, 100], default 0.0

**repulsion**

How strongly the fluid tries to keep from clustering (factor of stiffness)

**Type** float in [0, 100], default 0.0

**rest\_density**

Fluid rest density

**Type** float in [0, 100], default 0.0

**rest\_length**

Spring rest length (factor of particle radius)

**Type** float in [0, 2], default 0.0

**spring\_force**

Spring force

**Type** float in [0, 100], default 0.0

**spring\_frames**

Create springs for this number of frames since particles birth (0 is always)

**Type** int in [0, 100], default 0

**stiff\_viscosity**

Creates viscosity for expanding fluid)

**Type** float in [0, 100], default 0.0

**stiffness**

How incompressible the fluid is

**Type** float in [0, 100], default 0.0

**use\_initial\_rest\_length**

Use the initial length as spring rest length instead of 2 \* particle size

**Type** boolean, default False

**use\_viscoelastic\_springs**

Use viscoelastic springs instead of Hooke's springs

**Type** boolean, default False

**yield\_ratio**

How much the spring has to be stretched/compressed in order to change it's rest length

**Type** float in [0, 1], default 0.0

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- ParticleSettings.fluid

## 2.4.427 Scene(*ID*)

base classes — bpy\_struct, ID

**class bpy.types.Scene (*ID*)**

Scene consisting objects and defining time and render related settings

**animation\_data**

Animation data for this datablock

**Type** [AnimData](#), (readonly)

**audio\_distance\_model**

Distance model for distance attenuation calculation

**Type** enum in ['NONE', 'INVERSE', 'INVERSE\_CLAMPED', 'LINEAR', 'LINEAR\_CLAMPED', 'EXPONENT', 'EXPONENT\_CLAMPED'], default 'NONE'

**audio\_doppler\_factor**

Pitch factor for Doppler effect calculation

**Type** float in [0, inf], default 0.0

**audio\_doppler\_speed**

Speed of sound for Doppler effect calculation

**Type** float in [0.01, inf], default 0.0

**background\_set**

Background set scene

**Type** [Scene](#)

**camera**

Active camera used for rendering the scene

**Type** [Object](#)

**cursor\_location**

3D cursor location

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**frame\_current**

Current Frame, to update animation data from python frame\_set() instead

**Type** int in [-300000, 300000], default 0

**frame\_end**

Final frame of the playback/rendering range

**Type** int in [0, 300000], default 0

**frame\_preview\_end**

Alternative end frame for UI playback

**Type** int in [-inf, inf], default 0

**frame\_preview\_start**

Alternative start frame for UI playback

**Type** int in [-inf, inf], default 0

**frame\_start**

First frame of the playback/rendering range

**Type** int in [0, 300000], default 0

**frame\_step**

Number of frames to skip forward while rendering/playing back each frame

**Type** int in [0, 300000], default 0

**frame\_subframe**

**Type** float in [-inf, inf], default 0.0, (readonly)

**game\_settings**

**Type** SceneGameData, (readonly, never None)

**gravity**

Constant acceleration in a given direction

**Type** float array of 3 items in [-200, 200], default (0.0, 0.0, 0.0)

**grease\_pencil**

Grease Pencil datablock

**Type** GreasePencil

**is\_nla\_tweakmode**

Indicates whether there is any action referenced by NLA being edited. Strictly read-only

**Type** boolean, default False, (readonly)

**keying\_sets**

Absolute Keying Sets for this Scene

**Type** KeyingSets bpy\_prop\_collection of KeyingSet, (readonly)

**keying\_sets\_all**

All Keying Sets available for use (Builtins and Absolute Keying Sets for this Scene)

**Type** KeyingSetsAll bpy\_prop\_collection of KeyingSet, (readonly)

**layers**

Layers visible when rendering the scene

**Type** boolean array of 20 items, default (False, False, False)

**node\_tree**

Compositing node tree

**Type** NodeTree, (readonly)

**object\_bases**

**Type** SceneBases bpy\_prop\_collection of ObjectBase, (readonly)

**objects**

**Type** SceneObjects bpy\_prop\_collection of Object, (readonly)

**orientations**

**Type** bpy\_prop\_collection of TransformOrientation, (readonly)

**render**

**Type** RenderSettings, (readonly, never None)

**sequence\_editor**

**Type** SequenceEditor, (readonly)

**sync\_mode**

How to sync playback

**Type** enum in ['NONE', 'FRAME\_DROP', 'AUDIO\_SYNC'], default 'NONE'

**timeline\_markers**

Markers used in all timelines for the current scene

**Type** `TimelineMarkers bpy_prop_collection` of `TimelineMarker`, (readonly)

**tool\_settings**

**Type** `ToolSettings`, (readonly, never None)

**unit\_settings**

Unit editing settings

**Type** `UnitSettings`, (readonly, never None)

**use\_audio**

Play back of audio from Sequence Editor will be muted

**Type** boolean, default False

**use\_audio\_scrub**

Play audio from Sequence Editor while scrubbing

**Type** boolean, default False

**use\_audio\_sync**

Play back and sync with audio clock, dropping frames if frame display is too slow

**Type** boolean, default False

**use\_frame\_drop**

Play back dropping frames if frame display is too slow

**Type** boolean, default False

**use\_gravity**

Use global gravity for all dynamics

**Type** boolean, default False

**use\_nodes**

Enable the compositing node tree

**Type** boolean, default False

**use\_preview\_range**

Use an alternative start/end frame for UI playback, rather than the scene start/end frame

**Type** boolean, default False

**use\_stamp\_note**

User define note for the render stamping

**Type** string, default “”

**world**

World used for rendering the scene

**Type** `World`

**statistics()**

statistics

**Returns** Statistics

**Return type** string

**frame\_set** (*frame, subframe=0.0*)

Set scene frame updating all objects immediately.

**Parameters**

- **frame** (*int in [-300000, 300000]*) – Frame number to set.
- **subframe** (*float in [0, 1], (optional)*) – Sub-frame time, between 0.0 and 1.0

**update()**

Update data tagged to be updated from previous access to data or operators.

**Inherited Properties**

- bpy\_struct.id\_data
- ID.name
- ID.use\_fake\_user
- ID.library
- ID.tag
- ID.users

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- ID.copy
- ID.user\_clear
- ID.animation\_data\_create
- ID.animation\_data\_clear
- ID.update\_tag

**References**

- BlendData.scenes
- BlendDataScenes.new
- BlendDataScenes.remove
- CompositorNodeRLayers.scene
- Context.scene
- Image.save\_render

- `Object.dupli_list_create`
- `Object.is_modified`
- `Object.is_visible`
- `Object.to_mesh`
- `RenderEngine.render`
- `Scene.background_set`
- `SceneActuator.scene`
- `SceneSequence.scene`
- `Screen.scene`

## 2.4.428 SceneActuator(Actuator)

base classes — `bpy_struct, Actuator`

**class bpy.types.SceneActuator(Actuator)**

Actuator to ..

**camera**

Set this Camera. Leave empty to refer to self object

**Type** `Object`

**mode**

**Type** enum in ['RESTART', 'SET', 'CAMERA', 'ADDFRONT', 'ADDBACK', 'REMOVE', 'SUSPEND', 'RESUME'], default 'RESTART'

**scene**

Set the Scene to be added/removed/paused/resumed

**Type** `Scene`

### Inherited Properties

- `bpy_struct.id_data`
- `Actuator.name`
- `Actuator.show_expanded`
- `Actuator.pin`
- `Actuator.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`

- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`
- `Actuator.link`
- `Actuator.unlink`

## 2.4.429 SceneBases(bpy\_struct)

base class — `bpy_struct`

**class bpy.types.SceneBases (bpy\_struct)**

Collection of scene bases

**active**

Active object base in the scene

**Type** `ObjectBase`

### Inherited Properties

- `bpy_struct.id_data`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

### References

- `Scene.object_bases`

## 2.4.430 SceneGameData(bpy\_struct)

base class — `bpy_struct`

**class bpy.types.SceneGameData (bpy\_struct)**

Game data for a Scene datablock

**activity\_culling\_box\_radius**

Radius of the activity bubble, in Manhattan length. Objects outside the box are activity-culled

**Type** float in [0, 1000], default 0.0

**depth**

Displays bit depth of full screen display

**Type** int in [8, 32], default 0

**dome\_angle**

Field of View of the Dome - it only works in mode Fisheye and Truncated

**Type** int in [-32768, 32767], default 0

**dome\_buffer\_resolution**

Buffer Resolution - decrease it to increase speed

**Type** float in [-inf, inf], default 0.0

**dome\_mode**

Dome physical configurations

**Type** enum in ['FISHEYE', 'TRUNCATED\_FRONT', 'TRUNCATED\_REAR', 'ENVMAP', 'PANORAM\_SPH'], default 'FISHEYE'

**dome\_tesselation**

Tessellation level - check the generated mesh in wireframe mode

**Type** int in [-32768, 32767], default 0

**dome\_text**

Custom Warp Mesh data file

**Type** Text

**dome\_tilt**

Camera rotation in horizontal axis

**Type** int in [-32768, 32767], default 0

**fps**

The nominal number of game frames per second. Physics fixed timestep = 1/fps, independently of actual frame rate

**Type** int in [1, 250], default 0

**frame\_color**

Set color of the bars

**Type** float array of 3 items in [0, 1], default (0.0, 0.0, 0.0)

**frame\_type**

Select the type of Framing you want

**Type** enum in ['LETTERBOX', 'EXTEND', 'SCALE'], default 'LETTERBOX'

**frequency**

Displays clock frequency of fullscreen display

**Type** int in [4, 2000], default 0

**logic\_step\_max**

Sets the maximum number of logic frame per game frame if graphics slows down the game, higher value allows better synchronization with physics

**Type** int in [1, 5], default 0

**material\_mode**  
Material mode to use for rendering

**Type** enum in ['TEXTURE\_FACE', 'MULTITEXTURE', 'GLSL'], default 'TEXTURE\_FACE'

**occlusion\_culling\_resolution**  
The size of the occlusion buffer in pixel, use higher value for better precision (slower)

**Type** int in [128, 1024], default 0

**physics\_engine**  
Physics engine used for physics simulation in the game engine

**Type** enum in ['NONE', 'BULLET'], default 'NONE'

**physics\_gravity**  
Gravitational constant used for physics simulation in the game engine

**Type** float in [0, 10000], default 0.0

**physics\_step\_max**  
Sets the maximum number of physics step per game frame if graphics slows down the game, higher value allows physics to keep up with realtime

**Type** int in [1, 5], default 0

**physics\_step\_sub**  
Sets the number of simulation substep per physic timestep, higher value give better physics precision

**Type** int in [1, 5], default 0

**resolution\_x**  
Number of horizontal pixels in the screen

**Type** int in [4, 10000], default 0

**resolution\_y**  
Number of vertical pixels in the screen

**Type** int in [4, 10000], default 0

**show\_debug\_properties**  
Show properties marked for debugging while the game runs

**Type** boolean, default False

**show\_framerate\_profile**  
Show framerate and profiling information while the game runs

**Type** boolean, default False

**show\_fullscreen**  
Starts player in a new fullscreen display

**Type** boolean, default False

**show\_mouse**  
Start player with a visible mouse cursor

**Type** boolean, default False

**show\_physics\_visualization**  
Show a visualization of physics bounds and interactions

**Type** boolean, default False

**stereo**

**Type** enum in ['NONE', 'STEREO', 'DOME'], default 'NONE'

**stereo\_eye\_separation**

Set the distance between the eyes - the camera focal length/30 should be fine

**Type** float in [0.01, 5], default 0.0

**stereo\_mode**

Stereographic techniques

**Type** enum in ['QUADBUFFERED', 'ABOVEBELOW', 'INTERLACED', 'ANAGLYPH', 'SIDEBYSIDE', 'VINTERLACE'], default 'QUADBUFFERED'

**use\_activity\_culling**

Activity culling is enabled

**Type** boolean, default False

**use\_animation\_record**

Record animation to fcurves

**Type** boolean, default False

**use\_auto\_start**

Automatically start game at load time

**Type** boolean, default False

**use\_deprecation\_warnings**

Print warnings when using deprecated features in the python API

**Type** boolean, default False

**use\_display\_lists**

Use display lists to speed up rendering by keeping geometry on the GPU

**Type** boolean, default False

**use\_frame\_rate**

Respect the frame rate rather than rendering as many frames as possible

**Type** boolean, default False

**use\_gsls\_color\_management**

Use color management for GLSL rendering

**Type** boolean, default False

**use\_gsls\_extra\_textures**

Use extra textures like normal or specular maps for GLSL rendering

**Type** boolean, default False

**use\_gsls\_lights**

Use lights for GLSL rendering

**Type** boolean, default False

**use\_gsls\_nodes**

Use nodes for GLSL rendering

**Type** boolean, default False

**use\_gsls\_ramps**  
Use ramps for GLSL rendering

**Type** boolean, default False

**use\_gsls\_shaders**  
Use shaders for GLSL rendering

**Type** boolean, default False

**use\_gsls\_shadows**  
Use shadows for GLSL rendering

**Type** boolean, default False

**use\_occlusion\_culling**  
Use optimized Bullet DBVT tree for view frustum and occlusion culling

**Type** boolean, default False

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `Scene.game_settings`

## 2.4.431 SceneObjects(`bpy_struct`)

base class — `bpy_struct`

**class bpy.types.SceneObjects (`bpy_struct`)**  
Collection of scene objects

**active**

Active object for this scene

**Type** [Object](#)

**link**(*object*)

Link object to scene, run `scene.update()` after.

**Parameters** **object** ([Object](#), (never None)) – Object to add to scene.

**Returns** The newly created base.

**Return type** [ObjectBase](#)

**unlink**(*object*)

Unlink object from scene.

**Parameters** **object** ([Object](#), (never None)) – Object to remove from scene.

## Inherited Properties

- [bpy\\_struct.id\\_data](#)

## Inherited Functions

- [bpy\\_struct.as\\_pointer](#)
- [bpy\\_struct.callback\\_add](#)
- [bpy\\_struct.callback\\_remove](#)
- [bpy\\_struct.driver\\_add](#)
- [bpy\\_struct.driver\\_remove](#)
- [bpy\\_struct.get](#)
- [bpy\\_struct.is\\_property\\_hidden](#)
- [bpy\\_struct.is\\_property\\_set](#)
- [bpy\\_struct.items](#)
- [bpy\\_struct.keyframe\\_delete](#)
- [bpy\\_struct.keyframe\\_insert](#)
- [bpy\\_struct.keys](#)
- [bpy\\_struct.path\\_from\\_id](#)
- [bpy\\_struct.path\\_resolve](#)
- [bpy\\_struct.type\\_recast](#)
- [bpy\\_struct.values](#)

## References

- [Scene.objects](#)

## 2.4.432 SceneRenderLayer([bpy\\_struct](#))

base class — [bpy\\_struct](#)

**class** [bpy.types.SceneRenderLayer](#)(*bpy\_struct*)  
    Render layer

**exclude\_ambient\_occlusion**

Exclude AO pass from combined

**Type** boolean, default False

**exclude\_emit**  
Exclude emission pass from combined

**Type** boolean, default False

**exclude\_environment**  
Exclude environment pass from combined

**Type** boolean, default False

**exclude\_indirect**  
Exclude indirect pass from combined

**Type** boolean, default False

**exclude\_reflection**  
Exclude raytraced reflection pass from combined

**Type** boolean, default False

**exclude\_refraction**  
Exclude raytraced refraction pass from combined

**Type** boolean, default False

**exclude\_shadow**  
Exclude shadow pass from combined

**Type** boolean, default False

**exclude\_specular**  
Exclude specular pass from combined

**Type** boolean, default False

**invert\_zmask**  
For Zmask, only render what is behind solid z values instead of in front

**Type** boolean, default False

**layers**  
Scene layers included in this render layer

**Type** boolean array of 20 items, default (False, False, False)

**layers\_zmask**  
Zmask scene layers for solid faces

**Type** boolean array of 20 items, default (False, False, False)

**light\_override**  
Group to override all other lights in this render layer

**Type** [Group](#)

**material\_override**  
Material to override all other materials in this render layer

**Type** [Material](#)

**name**  
Render layer name

**Type** string, default “”

**use**  
Disable or enable the render layer  
**Type** boolean, default False

**use\_all\_z**  
Fill in Z values for solid faces in invisible layers, for masking  
**Type** boolean, default False

**use\_edge\_enhance**  
Render Edge-enhance in this Layer (only works for Solid faces)  
**Type** boolean, default False

**use\_halo**  
Render Halos in this Layer (on top of Solid)  
**Type** boolean, default False

**use\_pass\_ambient\_occlusion**  
Deliver AO pass  
**Type** boolean, default False

**use\_pass\_color**  
Deliver shade-less color pass  
**Type** boolean, default False

**use\_pass\_combined**  
Deliver full combined RGBA buffer  
**Type** boolean, default False

**use\_pass\_diffuse**  
Deliver diffuse pass  
**Type** boolean, default False

**use\_pass\_emit**  
Deliver emission pass  
**Type** boolean, default False

**use\_pass\_environment**  
Deliver environment lighting pass  
**Type** boolean, default False

**use\_pass\_indirect**  
Deliver indirect lighting pass  
**Type** boolean, default False

**use\_pass\_material\_index**  
Deliver material index pass  
**Type** boolean, default False

**use\_pass\_mist**  
Deliver mist factor pass (0.0-1.0)  
**Type** boolean, default False

**use\_pass\_normal**

Deliver normal pass

**Type** boolean, default False

**use\_pass\_object\_index**

Deliver object index pass

**Type** boolean, default False

**use\_pass\_reflection**

Deliver raytraced reflection pass

**Type** boolean, default False

**use\_pass\_refraction**

Deliver raytraced refraction pass

**Type** boolean, default False

**use\_pass\_shadow**

Deliver shadow pass

**Type** boolean, default False

**use\_pass\_specular**

Deliver specular pass

**Type** boolean, default False

**use\_pass\_uv**

Deliver texture UV pass

**Type** boolean, default False

**use\_pass\_vector**

Deliver speed vector pass

**Type** boolean, default False

**use\_pass\_z**

Deliver Z values pass

**Type** boolean, default False

**use\_sky**

Render Sky in this Layer

**Type** boolean, default False

**use\_solid**

Render Solid faces in this Layer

**Type** boolean, default False

**use\_strand**

Render Strands in this Layer

**Type** boolean, default False

**use\_zmask**

Only render what's in front of the solid z values

**Type** boolean, default False

**use\_ztransp**

Render Z-Transparent faces in this Layer (On top of Solid and Halos)

**Type** boolean, default False

### Inherited Properties

- bpy\_struct.id\_data

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

### References

- RenderLayers.active
- RenderSettings.layers

## 2.4.433 SceneSequence(Sequence)

base classes — bpy\_struct, Sequence

**class** bpy.types.SceneSequence (*Sequence*)

Sequence strip to used the rendered image of a scene

**animation\_offset\_end**

Animation end offset (trim end)

**Type** int in [0, inf], default 0

**animation\_offset\_start**

Animation start offset (trim start)

**Type** int in [0, inf], default 0

**color\_balance**

**Type** SequenceColorBalance, (readonly)

**color\_multiply**

**Type** float in [0, 20], default 0.0

**color\_saturation**  
**Type** float in [0, 20], default 0.0

**crop**  
**Type** SequenceCrop, (readonly)

**proxy**  
**Type** SequenceProxy, (readonly)

**scene**  
Scene that this sequence uses  
**Type** Scene

**scene\_camera**  
Override the scenes active camera  
**Type** Object

**strobe**  
Only display every nth frame  
**Type** float in [1, 30], default 0.0

**transform**  
**Type** SequenceTransform, (readonly)

**use\_color\_balance**  
(3-Way color correction) on input  
**Type** boolean, default False

**use\_crop**  
Crop image before processing  
**Type** boolean, default False

**use\_deinterlace**  
For video movies to remove fields  
**Type** boolean, default False

**use\_flip\_x**  
Flip on the X axis  
**Type** boolean, default False

**use\_flip\_y**  
Flip on the Y axis  
**Type** boolean, default False

**use\_float**  
Convert input to float data  
**Type** boolean, default False

**use\_premultiply**  
Convert RGB from key alpha to premultiplied alpha  
**Type** boolean, default False

**use\_proxy**  
Use a preview proxy for this strip

**Type** boolean, default False

**use\_proxy\_custom\_directory**

Use a custom directory to store data

**Type** boolean, default False

**use\_proxy\_custom\_file**

Use a custom file to read proxy data from

**Type** boolean, default False

**use\_reverse\_frames**

Reverse frame order

**Type** boolean, default False

**use\_translation**

Translate image before processing

**Type** boolean, default False

## Inherited Properties

- bpy\_struct.id\_data
- Sequence.name
- Sequence.blend\_type
- Sequence.blend\_alpha
- Sequence.channel
- Sequence.effect\_fader
- Sequence.frame\_final\_end
- Sequence.frame\_offset\_end
- Sequence.frame\_still\_end
- Sequence.input\_1
- Sequence.input\_2
- Sequence.input\_3
- Sequence.select\_left\_handle
- Sequence.frame\_final\_duration
- Sequence.frame\_duration
- Sequence.lock
- Sequence.mute
- Sequence.select\_right\_handle
- Sequence.select
- Sequence.speed\_factor
- Sequence.frame\_start
- Sequence.frame\_final\_start
- Sequence.frame\_offset\_start
- Sequence.frame\_still\_start
- Sequence.type
- Sequence.use\_default\_fade
- Sequence.input\_count

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add

- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- Sequence.getStripElem
- Sequence.swap

## 2.4.434 Scopes(bpy\_struct)

base class — `bpy_struct`

**class** bpy.types.Scopes (*bpy\_struct*)

Scopes for statistical view of an image

**accuracy**

Proportion of original image source pixel lines to sample

**Type** float in [0, 100], default 0.0

**histogram**

Histogram for viewing image statistics

**Type** `Histogram`, (readonly)

**use\_full\_resolution**

Sample every pixel of the image

**Type** boolean, default False

**vectorscope\_alpha**

Opacity of the points

**Type** float in [0, 1], default 0.0

**waveform\_alpha**

Opacity of the points

**Type** float in [0, 1], default 0.0

**waveform\_mode**

**Type** enum in ['LUMA', 'RGB', 'YCBCR601', 'YCBCR709', 'YCBQRJPG'], default 'LUMA'

### Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `SpaceImageEditor.scopes`

### 2.4.435 Screen(ID)

base classes — `bpy_struct, ID`

**class bpy.types.Screen(ID)**

Screen datablock, defining the layout of areas in a window

#### **areas**

Areas the screen is subdivided into

**Type** `bpy_prop_collection of Area, (readonly)`

#### **is\_animation\_playing**

Animation playback is active

**Type** boolean, default False, (readonly)

#### **scene**

Active scene to be edited in the screen

**Type** `Scene, (never None)`

#### **showFullscreen**

An area is maximised, filling this screen

**Type** boolean, default False, (readonly)

#### **usePlay3dEditors**

**Type** boolean, default False

#### **usePlayAnimationEditors**

**Type** boolean, default False

#### **usePlayImageEditors**

**Type** boolean, default False  
**use\_play\_node\_editors**  
    **Type** boolean, default False  
**use\_play\_properties\_editors**  
    **Type** boolean, default False  
**use\_play\_sequence\_editors**  
    **Type** boolean, default False  
**use\_play\_top\_left\_3d\_editor**  
    **Type** boolean, default False

## Inherited Properties

- bpy\_struct.id\_data
- ID.name
- ID.use\_fake\_user
- ID.library
- ID.tag
- ID.users

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- ID.copy
- ID.user\_clear
- ID.animation\_data\_create
- ID.animation\_data\_clear
- ID.update\_tag

## References

- BlendData.screens
- Context.screen

- `Window.screen`

## 2.4.436 ScrewModifier(Modifier)

base classes — `bpy_struct, Modifier`

**class bpy.types.ScrewModifier (Modifier)**  
Revolve edges

**angle**  
Angle of revolution  
**Type** float in [-inf, inf], default 0.0

**axis**  
Screw axis  
**Type** enum in ['X', 'Y', 'Z'], default 'X'

**iterations**  
Number of times to apply the screw operation  
**Type** int in [1, 10000], default 0

**object**  
Object to define the screw axis  
**Type** `Object`

**render\_steps**  
Number of steps in the revolution  
**Type** int in [2, 10000], default 0

**screw\_offset**  
Offset the revolution along its axis  
**Type** float in [-inf, inf], default 0.0

**steps**  
Number of steps in the revolution  
**Type** int in [2, 10000], default 0

**use\_normal\_calculate**  
Calculate the order of edges (needed for meshes, but not curves)  
**Type** boolean, default False

**use\_normal\_flip**  
Flip normals of lathed faces  
**Type** boolean, default False

**use\_object\_screw\_offset**  
Use the distance between the objects to make a screw  
**Type** boolean, default False

### Inherited Properties

- `bpy_struct.id_data`
- `Modifier.name`

- Modifier.use\_apply\_on\_spline
- Modifier.show\_in\_editmode
- Modifier.show\_expanded
- Modifier.show\_on\_cage
- Modifier.show\_viewport
- Modifier.show\_render
- Modifier.type

#### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

### 2.4.437 Sculpt(Paint)

base classes — bpy\_struct, Paint

**class** bpy.types.Sculpt (*Paint*)

**lock\_x**

Disallow changes to the X axis of vertices

**Type** boolean, default False

**lock\_y**

Disallow changes to the Y axis of vertices

**Type** boolean, default False

**lock\_z**

Disallow changes to the Z axis of vertices

**Type** boolean, default False

**radial\_symmetry**

Number of times to copy strokes across the surface

**Type** int array of 3 items in [1, 64], default (1, 1, 1)

**use\_deform\_only**

Use only deformation modifiers (temporary disable all constructive modifiers except multi-resolution)

**Type** boolean, default False

**use\_symmetry\_feather**

Reduce the strength of the brush where it overlaps symmetrical daubs

**Type** boolean, default False

**use\_symmetry\_x**

Mirror brush across the X axis

**Type** boolean, default False

**use\_symmetry\_y**

Mirror brush across the Y axis

**Type** boolean, default False

**use\_symmetry\_z**

Mirror brush across the Z axis

**Type** boolean, default False

**use\_threaded**

Take advantage of multiple CPU cores to improve sculpting performance

**Type** boolean, default False

**Inherited Properties**

- `bpy_struct.id_data`
- `Paint.brush`
- `Paint.show_low_resolution`
- `Paint.show_brush`
- `Paint.show_brush_on_surface`

**Inherited Functions**

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

**References**

- `ToolSettings.sculpt`

## 2.4.438 Sensor([bpy\\_struct](#))

base class — [bpy\\_struct](#)  
subclasses — [RaySensor](#), [PropertySensor](#), [MessageSensor](#), [TouchSensor](#), [KeyboardSensor](#), [CollisionSensor](#), [RadarSensor](#), [DelaySensor](#), [RandomSensor](#), [AlwaysSensor](#), [ActuatorSensor](#), [JoystickSensor](#), [MouseSensor](#), [ArmatureSensor](#), [NearSensor](#)

**class bpy.types.Sensor(bpy\_struct)**  
Game engine logic brick to detect events

**frequency**  
Delay between repeated pulses(in logic tics, 0=no delay)  
**Type** int in [0, 10000], default 0

**invert**  
Invert the level(output) of this sensor  
**Type** boolean, default False

**name**  
Sensor name  
**Type** string, default ""

**pin**  
Display when not linked to a visible states controller  
**Type** boolean, default False

**show\_expanded**  
Set sensor expanded in the user interface  
**Type** boolean, default False

**type**  
**Type** enum in ['ACTUATOR', 'ALWAYS', 'ARMATURE', 'COLLISION', 'DELAY', 'JOYSTICK', 'KEYBOARD', 'MESSAGE', 'MOUSE', 'NEAR', 'PROPERTY', 'RADAR', 'RANDOM', 'RAY', 'TOUCH'], default 'ALWAYS'

**use\_level**  
Level detector, trigger controllers of new states(only applicable upon logic state transition)  
**Type** boolean, default False

**use\_pulse\_false\_level**  
Activate FALSE level triggering (pulse mode)  
**Type** boolean, default False

**use\_pulse\_true\_level**  
Activate TRUE level triggering (pulse mode)  
**Type** boolean, default False

**use\_tap**  
Trigger controllers only for an instant, even while the sensor remains true  
**Type** boolean, default False

**link(controller)**  
Link the sensor to a controller.  
**Parameters** **controller** ([Controller](#)) – Controller to link to.

**unlink(controller)**

Unlink the sensor from a controller.

**Parameters** `controller` ([Controller](#)) – Controller to unlink from.

**Inherited Properties**

- `bpy_struct.id_data`

**Inherited Functions**

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

**References**

- `Controller.link`
- `Controller.unlink`
- `GameObjectSettings.sensors`

## 2.4.439 Sequence([bpy\\_struct](#))

base class — `bpy_struct`

subclasses — `MulticamSequence`, `ImageSequence`, `SceneSequence`, `AdjustmentSequence`, `MetaSequence`, `SoundSequence`, `MovieSequence`, `EffectSequence`

**class** `bpy.types.Sequence(bpy_struct)`

Sequence strip in the sequence editor

**blend\_alpha**

**Type** float in [0, 1], default 0.0

**blend\_type**

**Type** enum in ['REPLACE', 'CROSS', 'ADD', 'SUBTRACT', 'ALPHA\_OVER', 'ALPHA\_UNDER', 'GAMMA\_CROSS', 'MULTIPLY', 'OVER\_DROP'], default 'REPLACE'

**channel**

Y position of the sequence strip

**Type** int in [0, 31], default 0

**effect\_fader**

**Type** float in [0, 1], default 0.0

**frame\_duration**

The length of the contents of this strip before the handles are applied

**Type** int in [1, 300000], default 0, (readonly)

**frame\_final\_duration**

The length of the contents of this strip before the handles are applied

**Type** int in [1, 300000], default 0

**frame\_final\_end**

End frame displayed in the sequence editor after offsets are applied

**Type** int in [-inf, inf], default 0

**frame\_final\_start**

Start frame displayed in the sequence editor after offsets are applied, setting this is equivalent to moving the handle, not the actual start frame

**Type** int in [-inf, inf], default 0

**frame\_offset\_end**

**Type** int in [-inf, inf], default 0, (readonly)

**frame\_offset\_start**

**Type** int in [-inf, inf], default 0, (readonly)

**frame\_start**

**Type** int in [-inf, inf], default 0

**frame\_still\_end**

**Type** int in [0, 300000], default 0, (readonly)

**frame\_still\_start**

**Type** int in [0, 300000], default 0, (readonly)

**input\_1**

First input for the effect strip

**Type** Sequence, (readonly)

**input\_2**

Second input for the effect strip

**Type** Sequence, (readonly)

**input\_3**

Third input for the effect strip

**Type** Sequence, (readonly)

**input\_count**

**Type** int in [0, inf], default 0, (readonly)

**lock**

Lock strip so that it can't be transformed

**Type** boolean, default False

**mute**

**Type** boolean, default False

**name**

**Type** string, default “”

**select**

**Type** boolean, default False

**select\_left\_handle**

**Type** boolean, default False

**select\_right\_handle**

**Type** boolean, default False

**speed\_factor**

Multiply the current speed of the sequence with this number or remap current frame to this frame

**Type** float in [-inf, inf], default 0.0

**type**

**Type** enum in ['IMAGE', 'META', 'SCENE', 'MOVIE', 'SOUND', 'CROSS', 'ADD', 'SUBTRACT', 'ALPHA\_OVER', 'ALPHA\_UNDER', 'GAMMA\_CROSS', 'MULTIPLY', 'OVER\_DROP', 'PLUGIN', 'WIPE', 'GLOW', 'TRANSFORM', 'COLOR', 'SPEED', 'MULTICAM', 'ADJUSTMENT'], default 'IMAGE', (readonly)

**use\_default\_fade**

Fade effect using the built-in default (usually make transition as long as effect strip)

**Type** boolean, default False

**getStripElem(frame)**

Return the strip element from a given frame or None.

**Parameters** **frame** (*int in [-300000, 300000]*) – Frame, The frame to get the strip element from

**Returns** strip element of the current frame

**Return type** SequenceElement

**swap(other)**

swap

**Parameters** **other** (Sequence, (never None)) – Other

**Inherited Properties**

- bpy\_struct.id\_data

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `MetaSequence.sequences`
- `Sequence.input_1`
- `Sequence.input_2`
- `Sequence.input_3`
- `Sequence.swap`
- `SequenceEditor.active_strip`
- `SequenceEditor.meta_stack`
- `SequenceEditor.sequences`
- `SequenceEditor.sequences_all`

## 2.4.440 SequenceColorBalance(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.SequenceColorBalance` (`bpy_struct`)  
Color balance parameters for a sequence strip

**gain**  
Color balance gain (highlights)  
**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**gamma**  
Color balance gamma (midtones)  
**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**invert\_gain**  
**Type** boolean, default False

**invert\_gamma**  
**Type** boolean, default False

**invert\_lift**

**Type** boolean, default False

**lift**

Color balance lift (shadows)

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

### Inherited Properties

- bpy\_struct.id\_data

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

### References

- AdjustmentSequence.color\_balance
- EffectSequence.color\_balance
- ImageSequence.color\_balance
- MetaSequence.color\_balance
- MovieSequence.color\_balance
- MulticamSequence.color\_balance
- SceneSequence.color\_balance

## 2.4.441 SequenceCrop(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.SequenceCrop (*bpy\_struct*)

Cropping parameters for a sequence strip

**max\_x**

**Type** int in [0, inf], default 0

**max\_y**

**Type** int in [0, inf], default 0

**min\_x**

**Type** int in [0, inf], default 0

**min\_y**

**Type** int in [0, inf], default 0

**Inherited Properties**

- bpy\_struct.id\_data

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

**References**

- AdjustmentSequence.crop
- EffectSequence.crop
- ImageSequence.crop
- MetaSequence.crop
- MovieSequence.crop
- MulticamSequence.crop
- SceneSequence.crop

## 2.4.442 SequenceEditor(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.SequenceEditor (bpy\_struct)  
Sequence editing data for a Scene datablock

**active\_strip**

**Type** Sequence

**meta\_stack**

Meta strip stack, last is currently edited meta strip

**Type** bpy\_prop\_collection of Sequence, (readonly)

**overlay\_frame**  
Sequencers active strip  
**Type** int in [-inf, inf], default 0

**overlay\_lock**  
**Type** boolean, default False

**sequences**  
**Type** bpy\_prop\_collection of Sequence, (readonly)

**sequences\_all**  
**Type** bpy\_prop\_collection of Sequence, (readonly)

**show\_overlay**  
Partial overlay on top of the sequencer  
**Type** boolean, default False

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- Scene.sequence\_editor

## 2.4.443 SequenceElement(bpy\_struct)

base class — bpy\_struct

```
class bpy.types.SequenceElement(bpy_struct)
    Sequence strip data for a single frame

    filename
        Type string, default ""

    orig_height
        Original image height
        Type int in [-inf, inf], default 0, (readonly)

    orig_width
        Original image width
        Type int in [-inf, inf], default 0, (readonly)
```

### Inherited Properties

- bpy\_struct.id\_data

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

### References

- ImageSequence.elements
- MovieSequence.elements
- Sequence.getStripElem

## 2.4.444 SequenceProxy(bpy\_struct)

base class — bpy\_struct

```
class bpy.types.SequenceProxy(bpy_struct)
    Proxy parameters for a sequence strip
```

**directory**

Location to store the proxy files

**Type** string, default “”

**filepath**

Location of custom proxy file

**Type** string, default “”

**Inherited Properties**

- `bpy_struct.id_data`

**Inherited Functions**

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

**References**

- `AdjustmentSequence.proxy`
- `EffectSequence.proxy`
- `ImageSequence.proxy`
- `MetaSequence.proxy`
- `MovieSequence.proxy`
- `MulticamSequence.proxy`
- `SceneSequence.proxy`

## 2.4.445 SequenceTransform(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.SequenceTransform(bpy_struct)`

Transform parameters for a sequence strip

**offset\_x**

**Type** int in [-inf, inf], default 0

**offset\_y**

Type int in [-inf, inf], default 0

**Inherited Properties**

- bpy\_struct.id\_data

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

**References**

- AdjustmentSequence.transform
- EffectSequence.transform
- ImageSequence.transform
- MetaSequence.transform
- MovieSequence.transform
- MulticamSequence.transform
- SceneSequence.transform

## 2.4.446 ShaderNode(Node)

base classes — bpy\_struct, Node

subclasses — ShaderNodeHueSaturation, ShaderNodeVectorMath, ShaderNodeRGB, ShaderNodeCameraData, ShaderNodeSeparateRGB, ShaderNodeMath, ShaderNodeRGBOBW, ShaderNodeRGBCurve, ShaderNodeInvert, ShaderNodeExtendedMaterial, ShaderNodeMaterial, ShaderNodeValue, ShaderNodeMixRGB, ShaderNodeVectorCurve, ShaderNodeCombineRGB, ShaderNodeOutput, ShaderNodeValToRGB, ShaderNodeGeometry, ShaderNodeTexture, ShaderNodeMapping, ShaderNodeSqueeze, ShaderNodeNormal

class bpy.types.ShaderNode(Node)

Material shader node

**type**

**Type** enum in [‘OUTPUT’, ‘MATERIAL’, ‘RGB’, ‘VALUE’, ‘MIX\_RGB’, ‘VALTORGB’, ‘RGBTOBW’, ‘TEXTURE’, ‘NORMAL’, ‘GEOMETRY’, ‘MAPPING’, ‘CURVE\_VEC’, ‘CURVE\_RGB’, ‘CAMERA’, ‘MATH’, ‘VECT\_MATH’, ‘SQUEEZE’, ‘MATERIAL\_EXT’, ‘INVERT’, ‘SEPRGB’, ‘COMBRGB’, ‘HUE\_SAT’, ‘SCRIPT’, ‘GROUP’], default ‘OUTPUT’, (readonly)

### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.447 ShaderNodeCameraData(ShaderNode)

base classes — `bpy_struct`, `Node`, `ShaderNode`

`class bpy.types.ShaderNodeCameraData (ShaderNode)`

### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `ShaderNode.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.448 ShaderNodeCombineRGB(ShaderNode)

base classes — `bpy_struct, Node, ShaderNode`

`class bpy.types.ShaderNodeCombineRGB (ShaderNode)`

## Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `ShaderNode.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`

- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.449 ShaderNodeExtendedMaterial(ShaderNode)

base classes — `bpy_struct, Node, ShaderNode`

`class bpy.types.ShaderNodeExtendedMaterial (ShaderNode)`

### `invert_normal`

Material Node uses inverted normal

**Type** boolean, default False

### `material`

**Type** Material

### `use_diffuse`

Material Node outputs Diffuse

**Type** boolean, default False

### `use_specular`

Material Node outputs Specular

**Type** boolean, default False

## Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `ShaderNode.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`

- `bpy_struct.values`

## 2.4.450 ShaderNodeGeometry(ShaderNode)

base classes — `bpy_struct, Node, ShaderNode`

`class bpy.types.ShaderNodeGeometry (ShaderNode)`

### `color_layer`

**Type** string, default “”

### `uv_layer`

**Type** string, default “”

## Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `ShaderNode.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.451 ShaderNodeHueSaturation(ShaderNode)

base classes — `bpy_struct, Node, ShaderNode`

`class bpy.types.ShaderNodeHueSaturation (ShaderNode)`

### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `ShaderNode.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.452 ShaderNodeInvert(ShaderNode)

base classes — `bpy_struct`, `Node`, `ShaderNode`

**class** `bpy.types.ShaderNodeInvert` (`ShaderNode`)

### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `ShaderNode.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`

- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.453 ShaderNodeMapping(ShaderNode)

base classes — `bpy_struct, Node, ShaderNode`

`class bpy.types.ShaderNodeMapping (ShaderNode)`

### `location`

Location offset for the input coordinate

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

### `max`

Maximum value to clamp coordinate to

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

### `min`

Minimum value to clamp coordinate to

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

### `rotation`

Rotation offset for the input coordinate

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

### `scale`

Scale adjustment for the input coordinate

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

### `use_max`

Clamp the output coordinate to a maximum value

**Type** boolean, default False

### `use_min`

Clamp the output coordinate to a minimum value

**Type** boolean, default False

## Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`

- `Node.label`
- `Node.location`
- `Node.outputs`
- `ShaderNode.type`

#### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

### 2.4.454 ShaderNodeMaterial(ShaderNode)

base classes — `bpy_struct`, `Node`, `ShaderNode`

`class bpy.types.ShaderNodeMaterial (ShaderNode)`

#### `invert_normal`

Material Node uses inverted normal

**Type** boolean, default False

#### `material`

**Type** Material

#### `use_diffuse`

Material Node outputs Diffuse

**Type** boolean, default False

#### `use_specular`

Material Node outputs Specular

**Type** boolean, default False

#### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`

- `Node.location`
- `Node.outputs`
- `ShaderNode.type`

#### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

### 2.4.455 ShaderNodeMath(ShaderNode)

base classes — `bpy_struct`, `Node`, `ShaderNode`

`class bpy.types.ShaderNodeMath (ShaderNode)`

#### `operation`

**Type** enum in ['ADD', 'SUBTRACT', 'MULTIPLY', 'DIVIDE', 'SINE', 'COSINE', 'TANGENT', 'ARCSINE', 'ARCCOSINE', 'ARCTANGENT', 'POWER', 'LOGARITHM', 'MINIMUM', 'MAXIMUM', 'ROUND', 'LESS\_THAN', 'GREATER\_THAN'], default 'ADD'

#### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `ShaderNode.type`

#### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`

- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.456 ShaderNodeMixRGB(ShaderNode)

base classes — bpy\_struct, Node, ShaderNode

**class** bpy.types.ShaderNodeMixRGB (*ShaderNode*)

### **blend\_type**

**Type** enum in ['MIX', 'ADD', 'MULTIPLY', 'SUBTRACT', 'SCREEN', 'DIVIDE', 'DIFFERENCE', 'DARKEN', 'LIGHTEN', 'OVERLAY', 'DODGE', 'BURN', 'HUE', 'SATURATION', 'VALUE', 'COLOR', 'SOFT\_LIGHT', 'LINEAR\_LIGHT'], default 'MIX'

### **use\_alpha**

Include alpha of second input in this operation

**Type** boolean, default False

### Inherited Properties

- bpy\_struct.id\_data
- Node.name
- Node.inputs
- Node.label
- Node.location
- Node.outputs
- ShaderNode.type

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete

- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.457 ShaderNodeNormal(ShaderNode)

base classes — bpy\_struct, Node, ShaderNode

**class** bpy.types.ShaderNodeNormal (*ShaderNode*)

### Inherited Properties

- bpy\_struct.id\_data
- Node.name
- Node.inputs
- Node.label
- Node.location
- Node.outputs
- ShaderNode.type

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.458 ShaderNodeOutput(ShaderNode)

base classes — bpy\_struct, Node, ShaderNode

**class** bpy.types.ShaderNodeOutput (*ShaderNode*)

### Inherited Properties

- bpy\_struct.id\_data

- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `ShaderNode.type`

#### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

### 2.4.459 **ShaderNodeRGB(ShaderNode)**

base classes — `bpy_struct, Node, ShaderNode`  
`class bpy.types.ShaderNodeRGB (ShaderNode)`

#### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `ShaderNode.type`

#### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`

- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.460 ShaderNodeRGBCurve(ShaderNode)

base classes — bpy\_struct, Node, ShaderNode

**class** bpy.types.ShaderNodeRGBCurve (*ShaderNode*)

### mapping

**Type** CurveMapping, (readonly)

### Inherited Properties

- bpy\_struct.id\_data
- Node.name
- Node.inputs
- Node.label
- Node.location
- Node.outputs
- ShaderNode.type

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.461 ShaderNodeRGBToBW(ShaderNode)

base classes — `bpy_struct`, `Node`, `ShaderNode`

`class bpy.types.ShaderNodeRGBToBW (ShaderNode)`

### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `ShaderNode.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.462 ShaderNodeSeparateRGB(ShaderNode)

base classes — `bpy_struct`, `Node`, `ShaderNode`

`class bpy.types.ShaderNodeSeparateRGB (ShaderNode)`

### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `ShaderNode.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.463 ShaderNodeSqueeze(ShaderNode)

base classes — `bpy_struct, Node, ShaderNode`

`class bpy.types.ShaderNodeSqueeze (ShaderNode)`

### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `ShaderNode.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`

- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.464 ShaderNodeTexture(ShaderNode)

base classes — `bpy_struct, Node, ShaderNode`

`class bpy.types.ShaderNodeTexture (ShaderNode)`

### `node_output`

For node-based textures, which output node to use

**Type** int in [-32768, 32767], default 0

### `texture`

**Type** Texture

### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `ShaderNode.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.465 ShaderNodeTree(NodeTree)

base classes — `bpy_struct, ID, NodeTree`

```
class bpy.types.ShaderNodeTree (NodeTree)
    Node tree consisting of linked nodes used for materials

    nodes
        Type: ShaderNodes bpy_prop_collection of Node, (readonly)
```

### Inherited Properties

- bpy\_struct.id\_data
- ID.name
- ID.use\_fake\_user
- ID.library
- ID.tag
- ID.users
- NodeTree.animation\_data
- NodeTree.grease\_pencil
- NodeTree.inputs
- NodeTree.links
- NodeTree.outputs
- NodeTree.type

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- ID.copy
- ID.user\_clear
- ID.animation\_data\_create
- ID.animation\_data\_clear
- ID.update\_tag

## 2.4.466 ShaderNodeValToRGB(ShaderNode)

base classes — bpy\_struct, Node, ShaderNode

```
class bpy.types.ShaderNodeValToRGB (ShaderNode)
```

**color\_ramp**

Type [ColorRamp](#), (readonly)

**Inherited Properties**

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `ShaderNode.type`

**Inherited Functions**

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.467 ShaderNodeValue(ShaderNode)

base classes — `bpy_struct, Node, ShaderNode`

**class** `bpy.types.ShaderNodeValue(ShaderNode)`

**Inherited Properties**

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `ShaderNode.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.468 ShaderNodeVectorCurve(ShaderNode)

base classes — `bpy_struct, Node, ShaderNode`

`class bpy.types.ShaderNodeVectorCurve (ShaderNode)`

### `mapping`

Type `CurveMapping, (readonly)`

## Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `ShaderNode.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`

- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.469 ShaderNodeVectorMath(ShaderNode)

base classes — bpy\_struct, Node, ShaderNode

class bpy.types.ShaderNodeVectorMath(*ShaderNode*)

### operation

Type enum in ['ADD', 'SUBTRACT', 'AVERAGE', 'DOT\_PRODUCT', 'CROSS\_PRODUCT', 'NORMALIZE'], default 'ADD'

### Inherited Properties

- bpy\_struct.id\_data
- Node.name
- Node.inputs
- Node.label
- Node.location
- Node.outputs
- ShaderNode.type

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.470 ShaderNodes(bpy\_struct)

base class — bpy\_struct

```
class bpy.types.ShaderNodes (bpy_struct)
```

Collection of Shader Nodes

```
new (type, group=None)
```

Add a node to this node tree.

#### Parameters

- **type** (*enum in ['OUTPUT', 'MATERIAL', 'RGB', 'VALUE', 'MIX\_RGB', 'VALTORGB', 'RGBTOBW', 'TEXTURE', 'NORMAL', 'GEOMETRY', 'MAPPING', 'CURVE\_VEC', 'CURVE\_RGB', 'CAMERA', 'MATH', 'VECT\_MATH', 'SQUEEZE', 'MATERIAL\_EXT', 'INVERT', 'SEPRGB', 'COMBRGB', 'HUE\_SAT', 'SCRIPT', 'GROUP']*) – Type, Type of node to add
- **group** ([NodeTree](#), (optional)) – The group tree

**Returns** New node.

**Return type** [Node](#)

```
remove (node)
```

remove a node from this node tree.

**Parameters** **node** ([Node](#)) – The node to remove.

### Inherited Properties

- [bpy\\_struct.id\\_data](#)

### Inherited Functions

- [bpy\\_struct.as\\_pointer](#)
- [bpy\\_struct.callback\\_add](#)
- [bpy\\_struct.callback\\_remove](#)
- [bpy\\_struct.driver\\_add](#)
- [bpy\\_struct.driver\\_remove](#)
- [bpy\\_struct.get](#)
- [bpy\\_struct.is\\_property\\_hidden](#)
- [bpy\\_struct.is\\_property\\_set](#)
- [bpy\\_struct.items](#)
- [bpy\\_struct.keyframe\\_delete](#)
- [bpy\\_struct.keyframe\\_insert](#)
- [bpy\\_struct.keys](#)
- [bpy\\_struct.path\\_from\\_id](#)
- [bpy\\_struct.path\\_resolve](#)
- [bpy\\_struct.type\\_recast](#)
- [bpy\\_struct.values](#)

### References

- [ShaderNodeTree.nodes](#)

## 2.4.471 ShapeActionActuator(Actuator)

base classes — `bpy_struct`, `Actuator`

**class bpy.types.ShapeActionActuator(Actuator)**  
Actuator to control shape key animations

**action**  
**Type** `Action`

**frame\_blend\_in**  
Number of frames of motion blending  
**Type** int in [0, 32767], default 0

**frame\_end**  
**Type** float in [-inf, inf], default 0.0

**frame\_property**  
Assign the action's current frame number to this property  
**Type** string, default “”

**frame\_start**  
**Type** float in [-inf, inf], default 0.0

**mode**  
Action playback type  
**Type** enum in ['PLAY', 'PINGPONG', 'FLIPPER', 'LOOPSTOP', 'LOOPEND', 'PROPERTY'], default 'PLAY'

**priority**  
Execution priority - lower numbers will override actions with higher numbers. With 2 or more actions at once, the overriding channels must be lower in the stack  
**Type** int in [0, 100], default 0

**property**  
Use this property to define the Action position  
**Type** string, default “”

**use\_continue\_last\_frame**  
Restore last frame when switching on/off, otherwise play from the start each time  
**Type** boolean, default False

### Inherited Properties

- `bpy_struct.id_data`
- `Actuator.name`
- `Actuator.show_expanded`
- `Actuator.pin`
- `Actuator.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`
- `Actuator.link`
- `Actuator.unlink`

## 2.4.472 ShapeKey(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.ShapeKey` (`bpy_struct`)

Shape key in a shape keys datablock

### **data**

**Type** `bpy_prop_collection` of `UnknownType`, (readonly)

### **frame**

Frame for absolute keys

**Type** float in [-inf, inf], default 0.0, (readonly)

### **interpolation**

Interpolation type

**Type** enum in ['KEY\_LINEAR', 'KEY\_CARDINAL', 'KEY\_BSPLINE'], default 'KEY\_LINEAR'

### **mute**

Mute this shape key

**Type** boolean, default False

### **name**

Name of Shape Key

**Type** string, default ""

### **relative\_key**

Shape used as a relative key

**Type** `ShapeKey`

### **slider\_max**

Maximum for slider

**Type** float in [-10, 10], default 1.0

**slider\_min**

Minimum for slider

**Type** float in [-10, 10], default 0.0

**value**

Value of shape key at the current frame

**Type** float in [0, 1], default 0.0

**vertex\_group**

Vertex weight group, to blend with basis shape

**Type** string, default “”

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- ClothSettings.rest\_shape\_key
- Key.key\_blocks
- Key.reference\_key
- Object.active\_shape\_key
- Object.shape\_key\_add
- ShapeKey.relative\_key

## 2.4.473 ShapeKeyBezierPoint(bpy\_struct)

base class — bpy\_struct

```
class bpy.types.ShapeKeyBezierPoint (bpy_struct)
    Point in a shape key for Bezier curves

    co
        Type float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

    handle_left
        Type float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

    handle_right
        Type float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)
```

### Inherited Properties

- bpy\_struct.id\_data

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.474 ShapeKeyCurvePoint(bpy\_struct)

base class — bpy\_struct

```
class bpy.types.ShapeKeyCurvePoint (bpy_struct)
    Point in a shape key for curves

    co
        Type float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

    tilt
        Type float in [-inf, inf], default 0.0
```

### Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.475 ShapeKeyPoint(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.ShapeKeyPoint` (`bpy_struct`)

Point in a shape key

**co**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.476 ShrinkwrapConstraint(Constraint)

base classes — `bpy_struct`, `Constraint`

`class bpy.types.ShrinkwrapConstraint (Constraint)`

Creates constraint-based shrinkwrap relationship

### `distance`

Distance to Target

**Type** float in [0, 100], default 0.0

### `shrinkwrap_type`

Selects type of shrinkwrap algorithm for target position

**Type** enum in ['NEAREST\_SURFACE', 'PROJECT', 'NEAREST\_VERTEX'], default 'NEAREST\_SURFACE'

### `target`

Target Object

**Type** `Object`

### `use_x`

Projection over X Axis

**Type** boolean, default False

### `use_y`

Projection over Y Axis

**Type** boolean, default False

### `use_z`

Projection over Z Axis

**Type** boolean, default False

## Inherited Properties

- `bpy_struct.id_data`
- `Constraint.name`
- `Constraint.active`
- `Constraint.mute`
- `Constraint.show_expanded`
- `Constraint.influence`
- `Constraint.error_location`
- `Constraint.owner_space`
- `Constraint.is_proxy_local`
- `Constraint.error_rotation`
- `Constraint.target_space`
- `Constraint.type`
- `Constraint.is_valid`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`

- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.477 ShrinkwrapModifier(Modifier)

base classes — bpy\_struct, Modifier

**class** bpy.types.**ShrinkwrapModifier** (*Modifier*)

Shrink wrapping modifier to shrink wrap and object to a target

**auxiliary\_target**

Additional mesh target to shrink to

**Type** Object

**cull\_face**

Stop vertices from projecting to a the face on the target when facing towards/away

**Type** enum in ['OFF', 'FRONT', 'BACK'], default 'OFF'

**offset**

Distance to keep from the target

**Type** float in [-inf, inf], default 0.0

**subsurf\_levels**

Number of subdivisions that must be performed before extracting vertices' positions and normals

**Type** int in [0, 6], default 0

**target**

Mesh target to shrink to

**Type** Object

**use\_keep\_above\_surface**

**Type** boolean, default False

**use\_negative\_direction**

Allow vertices to move in the negative direction of axis

**Type** boolean, default False

**use\_positive\_direction**

Allow vertices to move in the positive direction of axis

**Type** boolean, default False

**use\_project\_x**

**Type** boolean, default False

```
use_project_y
  Type boolean, default False
use_project_z
  Type boolean, default False
vertex_group
  Vertex group name
  Type string, default ""
wrap_method
  Type enum in ['NEAREST_SURFACEPOINT', 'PROJECT', 'NEAREST_VERTEX'], default
    'NEAREST_SURFACEPOINT'
```

### Inherited Properties

- bpy\_struct.id\_data
- Modifier.name
- Modifier.use\_apply\_on\_spline
- Modifier.show\_in\_editmode
- Modifier.show\_expanded
- Modifier.show\_on\_cage
- Modifier.show\_viewport
- Modifier.show\_render
- Modifier.type

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.478 SimpleDeformModifier(Modifier)

base classes — `bpy_struct, Modifier`

```
class bpy.types.SimpleDeformModifier(Modifier)
  Simple deformation modifier to apply effects such as twisting and bending
```

**deform\_method**

**Type** enum in ['TWIST', 'BEND', 'TAPER', 'STRETCH'], default 'TWIST'

**factor**

Amount to deform object

**Type** float in [-inf, inf], default 0.0

**limits**

Lower/Upper limits for deform

**Type** float array of 2 items in [0, 1], default (0.0, 0.0)

**lock\_x**

Do not allow tapering along the X axis

**Type** boolean, default False

**lock\_y**

Do not allow tapering along the Y axis

**Type** boolean, default False

**origin**

Origin of modifier space coordinates

**Type** Object

**use\_relative**

Sets the origin of deform space to be relative to the object

**Type** boolean, default False

**vertex\_group**

Vertex group name

**Type** string, default ""

## Inherited Properties

- bpy\_struct.id\_data
- Modifier.name
- Modifier.use\_apply\_on\_spline
- Modifier.show\_in\_editmode
- Modifier.show\_expanded
- Modifier.show\_on\_cage
- Modifier.show\_viewport
- Modifier.show\_render
- Modifier.type

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden

- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.479 SmokeCollSettings(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.SmokeCollSettings` (`bpy_struct`)  
Smoke collision settings

### Inherited Properties

- `bpy_struct.id_data`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

### References

- `SmokeModifier.coll_settings`

## 2.4.480 SmokeDomainSettings(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.SmokeDomainSettings` (`bpy_struct`)  
Smoke domain settings

**alpha**

How much density effects smoke motion, higher value results in faster rising smoke

**Type** float in [-5, 5], default 0.0

**amplify**

Enhance the resolution of smoke by this factor using noise

**Type** int in [1, 10], default 0

**beta**

How much heat effects smoke motion, higher value results in faster rising smoke

**Type** float in [-5, 5], default 0.0

**collision\_extents**

Selects which domain border will be treated as collision object.

**Type** enum in ['BORDEROPEN', 'BORDERVERTICAL', 'BORDERCLOSED'], default 'BORDEROPEN'

**collision\_group**

Limit collisions to this group

**Type** Group

**dissolve\_speed**

Dissolve Speed

**Type** int in [1, 10000], default 0

**effector\_group**

Limit effectors to this group

**Type** Group

**effector\_weights**

**Type** EffectorWeights, (readonly)

**fluid\_group**

Limit fluid objects to this group

**Type** Group

**noise\_type**

Noise method which is used for creating the high resolution

**Type** enum in ['NOISEWAVE'], default 'NOISEWAVE'

**point\_cache**

**Type** PointCache, (readonly, never None)

**point\_cache\_compress\_type**

Compression method to be used

**Type** enum in ['CACHELIGHT', 'CACHEHEAVY'], default 'CACHELIGHT'

**resolution\_max**

Maximal resolution used in the fluid domain

**Type** int in [24, 512], default 0

**show\_high\_resolution**

Show high resolution (using amplification)

**Type** boolean, default False  
**smooth\_emitter**  
Smoothens emitted smoke to avoid blockiness.  
**Type** boolean, default False  
**strength**  
Strength of noise  
**Type** float in [0, 10], default 0.0  
**time\_scale**  
Adjust simulation speed.  
**Type** float in [0.2, 1.5], default 0.0  
**use\_dissolve\_smoke**  
Enable smoke to disappear over time  
**Type** boolean, default False  
**use\_dissolve\_smoke\_log**  
Using 1/x  
**Type** boolean, default False  
**use\_high\_resolution**  
Enable high resolution (using amplification)  
**Type** boolean, default False  
**vorticity**  
Amount of turbulence/rotation in fluid.  
**Type** float in [0.01, 4], default 0.0

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `SmokeModifier.domain_settings`

### 2.4.481 `SmokeFlowSettings(bpy_struct)`

base class — `bpy_struct`

```
class bpy.types.SmokeFlowSettings(bpy_struct)
    Smoke flow settings

    density
        Type float in [0.001, 1], default 0.0

    initial_velocity
        Smoke inherits it's velocity from the emitter particle
        Type boolean, default False

    particle_system
        Particle systems emitted from the object
        Type ParticleSystem

    temperature
        Temperature difference to ambient temperature
        Type float in [-10, 10], default 0.0

    use_absolute
        Only allows given density value in emitter area.
        Type boolean, default False

    use_outflow
        Deletes smoke from simulation
        Type boolean, default False

    velocity_factor
        Multiplier to adjust velocity passed to smoke
        Type float in [-2, 2], default 0.0
```

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`

- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- SmokeModifier.flow\_settings

### 2.4.482 SmokeModifier(Modifier)

base classes — bpy\_struct, Modifier

```
class bpy.types.SmokeModifier(Modifier)
    Smoke simulation modifier

    coll_settings
        Type SmokeCollSettings, (readonly)

    domain_settings
        Type SmokeDomainSettings, (readonly)

    flow_settings
        Type SmokeFlowSettings, (readonly)

    smoke_type
        Type enum in ['NONE', 'DOMAIN', 'FLOW', 'COLLISION'], default 'NONE'
```

## Inherited Properties

- bpy\_struct.id\_data
- Modifier.name
- Modifier.use\_apply\_on\_spline
- Modifier.show\_in\_editmode
- Modifier.show\_expanded
- Modifier.show\_on\_cage
- Modifier.show\_viewport
- Modifier.show\_render
- Modifier.type

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add

- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.483 SmoothModifier(Modifier)

base classes — bpy\_struct, Modifier

**class bpy.types.SmoothModifier (Modifier)**  
Smoothing effect modifier

**factor**

Strength of modifier effect

**Type** float in [-inf, inf], default 0.0

**iterations**

**Type** int in [-32768, 32767], default 0

**use\_x**

Smooth object along X axis

**Type** boolean, default False

**use\_y**

Smooth object along Y axis

**Type** boolean, default False

**use\_z**

Smooth object along Z axis

**Type** boolean, default False

**vertex\_group**

Name of Vertex Group which determines influence of modifier per point

**Type** string, default “”

### Inherited Properties

- bpy\_struct.id\_data
- Modifier.name
- Modifier.use\_apply\_on\_spline
- Modifier.show\_in\_editmode
- Modifier.show\_expanded
- Modifier.show\_on\_cage
- Modifier.show\_viewport
- Modifier.show\_render

- `Modifier.type`

#### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

### 2.4.484 SoftBodyModifier(Modifier)

base classes — `bpy_struct, Modifier`

```
class bpy.types.SoftBodyModifier (Modifier)
    Soft body simulation modifier

    point_cache
        Type PointCache, (readonly, never None)

    settings
        Type SoftBodySettings, (readonly, never None)
```

#### Inherited Properties

- `bpy_struct.id_data`
- `Modifier.name`
- `Modifier.use_apply_on_spline`
- `Modifier.show_in_editmode`
- `Modifier.show_expanded`
- `Modifier.show_on_cage`
- `Modifier.show_viewport`
- `Modifier.show_render`
- `Modifier.type`

#### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`

- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.485 SoftBodySettings(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.SoftBodySettings (bpy_struct)`

Soft body simulation settings for an object

**aero**

Make edges ‘sail’

**Type** int in [0, 30000], default 0

**aerodynamics\_type**

Method of calculating aerodynamic interaction

**Type** enum in ['SIMPLE', 'LIFT\_FORCE'], default 'SIMPLE'

**ball\_damp**

Blending to inelastic collision

**Type** float in [0.001, 1], default 0.0

**ball\_size**

Absolute ball size or factor if not manual adjusted

**Type** float in [-10, 10], default 0.0

**ball\_stiff**

Ball inflating pressure

**Type** float in [0.001, 100], default 0.0

**bend**

Bending Stiffness

**Type** float in [0, 10], default 0.0

**choke**

‘Viscosity’ inside collision target

**Type** int in [0, 100], default 0

**collision\_type**

Choose Collision Type

**Type** enum in ['MANUAL', 'AVERAGE', 'MINIMAL', 'MAXIMAL', 'MINMAX'], default 'MANUAL'

**damping**

Edge spring friction

**Type** float in [0, 50], default 0.0

**effector\_weights**

**Type** `EffectorWeights`, (readonly)

**error\_threshold**

The Runge-Kutta ODE solver error limit, low value gives more precision, high values speed

**Type** float in [0.001, 10], default 0.0

**friction**

General media friction for point movements

**Type** float in [0, 50], default 0.0

**fuzzy**

Fuzziness while on collision, high values make collision handling faster but less stable

**Type** int in [1, 100], default 0

**goal\_default**

Default Goal (vertex target position) value, when no Vertex Group used

**Type** float in [0, 1], default 0.0

**goal\_friction**

Goal (vertex target position) friction

**Type** float in [0, 50], default 0.0

**goal\_max**

Goal maximum, vertex weights are scaled to match this range

**Type** float in [0, 1], default 0.0

**goal\_min**

Goal minimum, vertex weights are scaled to match this range

**Type** float in [0, 1], default 0.0

**goal\_spring**

Goal (vertex target position) spring stiffness

**Type** float in [0, 0.999], default 0.0

**gravity**

Apply gravitation to point movement

**Type** float in [-10, 10], default 0.0

**location\_mass\_center**

Location of Center of mass

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**mass**

General Mass value

**Type** float in [0, 50000], default 0.0

**plastic**

Permanent deform

**Type** int in [0, 100], default 0

**pull**  
Edge spring stiffness when longer than rest length

**Type** float in [0, 0.999], default 0.0

**push**  
Edge spring stiffness when shorter than rest length

**Type** float in [0, 0.999], default 0.0

**rotation\_estimate**  
Estimated rotation matrix

**Type** float array of 9 items in [-inf, inf], default (0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0)

**scale\_estimate**  
Estimated scale matrix

**Type** float array of 9 items in [-inf, inf], default (0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0)

**shear**  
Shear Stiffness

**Type** float in [0, 1], default 0.0

**speed**  
Tweak timing for physics to control frequency and speed

**Type** float in [0.01, 100], default 0.0

**spring\_length**  
Alter spring length to shrink/blow up (unit %) 0 to disable

**Type** int in [0, 200], default 0

**step\_max**  
Maximal # solver steps/frame

**Type** int in [0, 30000], default 0

**step\_min**  
Minimal # solver steps/frame

**Type** int in [0, 30000], default 0

**use\_auto\_step**  
Use velocities for automagic step sizes

**Type** boolean, default False

**use\_diagnose**  
Turn on SB diagnose console prints

**Type** boolean, default False

**use\_edge\_collision**  
Edges collide too

**Type** boolean, default False

**use\_edges**  
Use Edges as springs

**Type** boolean, default False

**use\_estimate\_matrix**  
estimate matrix .. split to COM , ROT ,SCALE  
**Type** boolean, default False

**use\_face\_collision**  
Faces collide too, can be very slow  
**Type** boolean, default False

**use\_goal**  
Define forces for vertices to stick to animated position  
**Type** boolean, default False

**use\_self\_collision**  
Enable naive vertex ball self collision  
**Type** boolean, default False

**use\_stiff\_quads**  
Adds diagonal springs on 4-gons  
**Type** boolean, default False

**vertex\_group\_goal**  
Control point weight values  
**Type** string, default “”

**vertex\_group\_mass**  
Control point mass values  
**Type** string, default “”

**vertex\_group\_spring**  
Control point spring strength values  
**Type** string, default “”

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`

- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `Object.soft_body`
- `SoftBodyModifier.settings`

### 2.4.486 SolidifyModifier(Modifier)

base classes — `bpy_struct, Modifier`

**class bpy.types.SolidifyModifier (Modifier)**

Create a solid skin by extruding, compensating for sharp angles

**edge\_creature\_inner**

Assign a crease to inner edges

**Type** float in [0, 1], default 0.0

**edge\_creature\_outer**

Assign a crease to outer edges

**Type** float in [0, 1], default 0.0

**edge\_creature\_rim**

Assign a crease to the edges making up the rim

**Type** float in [0, 1], default 0.0

**invert\_vertex\_group**

Invert the vertex group influence

**Type** boolean, default False

**material\_offset**

Offset material index of generated faces

**Type** int in [-32768, 32767], default 0

**material\_offset\_rim**

Offset material index of generated rim faces

**Type** int in [-32768, 32767], default 0

**offset**

Offset the thickness from the center

**Type** float in [-inf, inf], default 0.0

**thickness**

Thickness of the shell

**Type** float in [-inf, inf], default 0.0

**thickness\_vertex\_group**

Thickness factor to use for zero vertex group influence

**Type** float in [0, 1], default 0.0

**use\_even\_offset**

Maintain thickness by adjusting for sharp corners (slow, disable when not needed)

**Type** boolean, default False

**use\_quality\_normals**  
Calculate normals which result in more even thickness (slow, disable when not needed)

**Type** boolean, default False

**use\_rim**  
Create edge loops between the inner and outer surfaces on face edges (slow, disable when not needed)

**Type** boolean, default False

**vertex\_group**  
Vertex group name

**Type** string, default “”

### Inherited Properties

- bpy\_struct.id\_data
- Modifier.name
- Modifier.use\_apply\_on\_spline
- Modifier.show\_in\_editmode
- Modifier.show\_expanded
- Modifier.show\_on\_cage
- Modifier.show\_viewport
- Modifier.show\_render
- Modifier.type

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.487 Sound(ID)

base classes — bpy\_struct, ID

**class bpy.types.Sound(*ID*)**  
Sound datablock referencing an external or packed sound file

**filepath**

Sound sample file used by this Sound datablock

**Type** string, default “”

**packed\_file**

**Type** PackedFile, (readonly)

**use\_memory\_cache**

The sound file is decoded and loaded into RAM

**Type** boolean, default False

**Inherited Properties**

- bpy\_struct.id\_data
- ID.name
- ID.use\_fake\_user
- ID.library
- ID.tag
- ID.users

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- ID.copy
- ID.user\_clear
- ID.animation\_data\_create
- ID.animation\_data\_clear
- ID.update\_tag

**References**

- BlendData.sounds
- SoundActuator.sound
- SoundSequence.sound

## 2.4.488 SoundActuator(Actuator)

base classes — `bpy_struct`, `Actuator`

**class bpy.types.SoundActuator(Actuator)**  
Sound file

**cone\_inner\_angle\_3d**  
The angle of the inner cone  
**Type** float in [-inf, inf], default 0.0

**cone\_outer\_angle\_3d**  
The angle of the outer cone  
**Type** float in [-inf, inf], default 0.0

**cone\_outer\_gain\_3d**  
The gain outside the outer cone. The gain in the outer cone will be interpolated between this value and the normal gain in the inner cone  
**Type** float in [-inf, inf], default 0.0

**distance\_3d\_max**  
The maximum distance at which you can hear the sound  
**Type** float in [-inf, inf], default 0.0

**distance\_3d\_reference**  
The distance where the sound has a gain of 1.0  
**Type** float in [-inf, inf], default 0.0

**gain\_3d\_max**  
The maximum gain of the sound, no matter how near it is  
**Type** float in [-inf, inf], default 0.0

**gain\_3d\_min**  
The minimum gain of the sound, no matter how far it is away  
**Type** float in [-inf, inf], default 0.0

**mode**  
**Type** enum in ['PLAYSTOP', 'PLAYEND', 'LOOPSTOP', 'LOOPEND', 'LOOPBIDIRECTIONAL', 'LOOPBIDIRECTIONALSTOP'], default 'PLAYSTOP'

**pitch**  
Sets the pitch of the sound  
**Type** float in [-inf, inf], default 0.0

**rolloff\_factor\_3d**  
The influence factor on volume depending on distance  
**Type** float in [-inf, inf], default 0.0

**sound**  
**Type** Sound

**use\_sound\_3d**  
Enable/Disable 3D Sound  
**Type** boolean, default False

**volume**

Sets the initial volume of the sound

**Type** float in [0, 2], default 0.0

**Inherited Properties**

- bpy\_struct.id\_data
- Actuator.name
- Actuator.show\_expanded
- Actuator.pin
- Actuator.type

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- Actuator.link
- Actuator.unlink

## 2.4.489 SoundSequence(Sequence)

base classes — bpy\_struct, Sequence

**class bpy.types.SoundSequence(Sequence)**

Sequence strip defining a sound to be played over a period of time

**animation\_offset\_end**

Animation end offset (trim end)

**Type** int in [0, inf], default 0

**animation\_offset\_start**

Animation start offset (trim start)

**Type** int in [0, inf], default 0

**attenuation**

Attenuation in decibel

**Type** float in [-100, 40], default 0.0

**filepath**

**Type** string, default “”

**sound**

Sound datablock used by this sequence

**Type** Sound, (readonly)

**volume**

Playback volume of the sound

**Type** float in [0, 100], default 0.0

**Inherited Properties**

- bpy\_struct.id\_data
- Sequence.name
- Sequence.blend\_type
- Sequence.blend\_alpha
- Sequence.channel
- Sequence.effect\_fader
- Sequence.frame\_final\_end
- Sequence.frame\_offset\_end
- Sequence.frame\_still\_end
- Sequence.input\_1
- Sequence.input\_2
- Sequence.input\_3
- Sequence.select\_left\_handle
- Sequence.frame\_final\_duration
- Sequence.frame\_duration
- Sequence.lock
- Sequence.mute
- Sequence.select\_right\_handle
- Sequence.select
- Sequence.speed\_factor
- Sequence.frame\_start
- Sequence.frame\_final\_start
- Sequence.frame\_offset\_start
- Sequence.frame\_still\_start
- Sequence.type
- Sequence.use\_default\_fade
- Sequence.input\_count

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items

- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- Sequence.getStripElem
- Sequence.swap

## 2.4.490 Space(bpy\_struct)

base class — bpy\_struct

subclasses — SpaceUserPreferences, SpaceOutliner, SpaceImageEditor, SpaceSequenceEditor, SpaceProperties, SpaceGraphEditor, SpaceLogicEditor, SpaceInfo, SpaceConsole, SpaceNodeEditor, SpaceView3D, SpaceDopeSheetEditor, SpaceTextEditor, SpaceFileBrowser, SpaceNLA, SpaceTimeline

**class bpy.types.Space (bpy\_struct)**

Space data for a screen area

**type**

Space data type

Type enum in ['EMPTY', 'VIEW\_3D', 'GRAPH\_EDITOR', 'OUTLINER', 'PROPERTIES', 'FILE\_BROWSER', 'IMAGE\_EDITOR', 'INFO', 'SEQUENCE\_EDITOR', 'TEXT\_EDITOR', 'AUDIO\_WINDOW', 'DOPESHEET\_EDITOR', 'NLA\_EDITOR', 'SCRIPTS\_WINDOW', 'TIMELINE', 'NODE\_EDITOR', 'LOGIC\_EDITOR', 'CONSOLE', 'USER\_PREFERENCES'], default 'EMPTY', (readonly)

### Inherited Properties

- bpy\_struct.id\_data

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- `Area.spaces`
- `AreaSpaces.active`
- `Context.space_data`

### 2.4.491 SpaceConsole(Space)

base classes — `bpy_struct, Space`

**class bpy.types.SpaceConsole(Space)**  
Interactive python console

**font\_size**

Font size to use for displaying the text

**Type** int in [8, 32], default 0

**history**

Command history

**Type** `bpy_prop_collection` of `ConsoleLine`, (readonly)

**language**

Command line prompt language

**Type** string, default “”

**prompt**

Command line prompt

**Type** string, default “”

**scrollback**

Command output

**Type** `bpy_prop_collection` of `ConsoleLine`, (readonly)

**select\_end**

**Type** int in [0, inf], default 0

**select\_start**

**Type** int in [0, inf], default 0

## Inherited Properties

- `bpy_struct.id_data`
- `Space.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`

- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.492 SpaceDopeSheetEditor(Space)

base classes — `bpy_struct, Space`

**class bpy.types.SpaceDopeSheetEditor (Space)**  
DopeSheet space data

**action**

Action displayed and edited in this space

**Type** `Action`

**auto\_snap**

Automatic time snapping settings for transformations

**Type** `enum` in ['NONE', 'STEP', 'FRAME', 'MARKER'], default 'NONE'

**dopesheet**

Settings for filtering animation data

**Type** `DopeSheet`, (readonly)

**mode**

Editing context being displayed

**Type** `enum` in ['DOPESHEET', 'ACTION', 'SHAPEKEY', 'GPENCIL'], default 'ACTION'

**show\_frame\_indicator**

Show frame number beside the current frame indicator line

**Type** boolean, default False

**show\_pose\_markers**

Show markers belonging to the active action instead of Scene markers (Action and Shape Key Editors only)

**Type** boolean, default False

**show\_seconds**

Show timing in seconds not frames

**Type** boolean, default False, (readonly)

**show\_sliders**

Show sliders beside F-Curve channels

**Type** boolean, default False

**use\_auto\_merge\_keyframes**

Automatically merge nearby keyframes

**Type** boolean, default False  
**use\_marker\_sync**  
Sync Markers with keyframe edits  
**Type** boolean, default False  
**use\_realtime\_update**  
When transforming keyframes, changes to the animation data are flushed to other views  
**Type** boolean, default False

### Inherited Properties

- bpy\_struct.id\_data
- Space.type

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.493 SpaceFileBrowser(Space)

base classes — bpy\_struct, Space

**class** bpy.types.SpaceFileBrowser (Space)  
File browser space data

**operator**

**Type** Operator, (readonly)

**params**  
Parameters and Settings for the Filebrowser

**Type** FileSelectParams, (readonly)

### Inherited Properties

- bpy\_struct.id\_data

- `Space.type`

#### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

### 2.4.494 SpaceGraphEditor(Space)

base classes — `bpy_struct, Space`

**class bpy.types.SpaceGraphEditor (Space)**

Graph Editor space data

**auto\_snap**

Automatic time snapping settings for transformations

**Type** enum in ['NONE', 'STEP', 'FRAME', 'MARKER'], default 'NONE'

**cursor\_position\_y**

Graph Editor 2D-Value cursor - Y-Value component

**Type** float in [-inf, inf], default 0.0

**dopesheet**

Settings for filtering animation data

**Type** `DopeSheet`, (readonly)

**has\_ghost\_curves**

Graph Editor instance has some ghost curves stored

**Type** boolean, default False

**mode**

Editing context being displayed

**Type** enum in ['FCURVES', 'DRIVERS'], default 'FCURVES'

**pivot\_point**

Pivot center for rotation/scaling

**Type** enum in ['BOUNDING\_BOX\_CENTER', 'CURSOR', 'INDIVIDUAL\_ORIGINS'], default 'BOUNDING\_BOX\_CENTER'

**show\_cursor**  
Show 2D cursor  
**Type** boolean, default False

**show\_frame\_indicator**  
Show frame number beside the current frame indicator line  
**Type** boolean, default False

**show\_handles**  
Show handles of Bezier control points  
**Type** boolean, default False

**show\_seconds**  
Show timing in seconds not frames  
**Type** boolean, default False, (readonly)

**show\_sliders**  
Show sliders beside F-Curve channels  
**Type** boolean, default False

**use\_auto\_merge\_keyframes**  
Automatically merge nearby keyframes  
**Type** boolean, default False

**use\_fancy\_drawing**  
Draw F-Curves using Anti-Aliasing and other fancy effects. Disable for better performance  
**Type** boolean, default False

**use\_only\_selected\_curves\_handles**  
Only keyframes of selected F-Curves are visible and editable  
**Type** boolean, default False

**use\_only\_selected\_keyframe\_handles**  
Only show and edit handles of selected keyframes  
**Type** boolean, default False

**use\_realtime\_update**  
When transforming keyframes, changes to the animation data are flushed to other views  
**Type** boolean, default False

## Inherited Properties

- `bpy_struct.id_data`
- `Space.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`

- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.495 `SpaceImageEditor(Space)`

base classes — `bpy_struct, Space`

**class bpy.types.SpaceImageEditor (Space)**

    Image and UV editor space data

**curve**

    Color curve mapping to use for displaying the image

**Type** `CurveMapping`, (readonly)

**draw\_channels**

    Channels of the image to draw

**Type** enum in ['COLOR', 'COLOR\_ALPHA', 'ALPHA', 'Z\_BUFFER'], default 'COLOR'

**grease\_pencil**

    Grease pencil data for this space

**Type** `GreasePencil`

**image**

    Image displayed and edited in this space

**Type** `Image`

**image\_user**

    Parameters defining which layer, pass and frame of the image is displayed

**Type** `ImageUser`, (readonly, never None)

**sample\_histogram**

    Sampled colors along line

**Type** `Histogram`, (readonly)

**scopes**

    Scopes to visualize image statistics.

**Type** `Scopes`, (readonly)

**show\_paint**

    Show paint related properties

**Type** boolean, default False, (readonly)

**show\_render**

    Show render related properties

**Type** boolean, default False, (readonly)

**show\_repeat**

Draw the image repeated outside of the main view

**Type** boolean, default False

**show\_uvedit**

Show UV editing related properties

**Type** boolean, default False, (readonly)

**use\_grease\_pencil**

Display and edit the grease pencil freehand annotations overlay

**Type** boolean, default False

**use\_image\_paint**

Enable image painting mode

**Type** boolean, default False

**use\_image\_pin**

Display current image regardless of object selection

**Type** boolean, default False

**use\_realtime\_update**

Update other affected window spaces automatically to reflect changes during interactive operations such as transform

**Type** boolean, default False

**uv\_editor**

UV editor settings

**Type** SpaceUVEditor, (readonly, never None)

**zoom**

Zoom factor

**Type** float array of 2 items in [-inf, inf], default (0.0, 0.0), (readonly)

## Inherited Properties

- bpy\_struct.id\_data
- Space.type

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys

- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.496 SpaceInfo(Space)

base classes — `bpy_struct`, `Space`

```
class bpy.types.SpaceInfo(Space)
    Info space data

    show_report_debug
        Display debug reporting info
        Type boolean, default False

    show_report_error
        Display error text
        Type boolean, default False

    show_report_info
        Display general information
        Type boolean, default False

    show_report_operator
        Display the operator log
        Type boolean, default False

    show_report_warning
        Display warnings
        Type boolean, default False
```

### Inherited Properties

- `bpy_struct.id_data`
- `Space.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`

- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.497 SpaceLogicEditor(Space)

base classes — bpy\_struct, Space

**class bpy.types.SpaceLogicEditor(Space)**

Logic editor space data

**show\_actuators\_active\_object**

Show actuators of active object

**Type** boolean, default False

**show\_actuators\_active\_states**

Show only actuators connected to active states

**Type** boolean, default False

**show\_actuators\_linked\_controller**

Show linked objects to the actuator

**Type** boolean, default False

**show\_actuators\_selected\_objects**

Show actuators of all selected objects

**Type** boolean, default False

**show\_controllers\_active\_object**

Show controllers of active object

**Type** boolean, default False

**show\_controllers\_linked\_controller**

Show linked objects to sensor/actuator

**Type** boolean, default False

**show\_controllers\_selected\_objects**

Show controllers of all selected objects

**Type** boolean, default False

**show\_sensors\_active\_object**

Show sensors of active object

**Type** boolean, default False

**show\_sensors\_active\_states**

Show only sensors connected to active states

**Type** boolean, default False

**show\_sensors\_linked\_controller**

Show linked objects to the controller

**Type** boolean, default False

**show\_sensors\_selected\_objects**

Show sensors of all selected objects

**Type** boolean, default False

### Inherited Properties

- `bpy_struct.id_data`
- `Space.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.498 SpaceNLA(Space)

base classes — `bpy_struct, Space`

**class bpy.types.SpaceNLA(Space)**

NLA editor space data

**auto\_snap**

Automatic time snapping settings for transformations

**Type** enum in ['NONE', 'STEP', 'FRAME', 'MARKER'], default 'NONE'

**dopesheet**

Settings for filtering animation data

**Type** `DopeSheet`, (readonly)

**show\_frame\_indicator**

Show frame number beside the current frame indicator line

**Type** boolean, default False

**show\_seconds**

Show timing in seconds not frames

**Type** boolean, default False, (readonly)

**show\_strip\_curves**

Show influence curves on strips

**Type** boolean, default False

**use\_realtime\_update**

When transforming strips, changes to the animation data are flushed to other views

**Type** boolean, default False

#### Inherited Properties

- bpy\_struct.id\_data
- Space.type

#### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

### 2.4.499 SpaceNodeEditor(Space)

base classes — bpy\_struct, Space

**class** bpy.types.SpaceNodeEditor(Space)

Node editor space data

**backdrop\_channels**

Channels of the image to draw

**Type** enum in ['COLOR', 'COLOR\_ALPHA', 'ALPHA'], default 'COLOR'

**backdrop\_x**

Backdrop X offset

**Type** float in [-inf, inf], default 0.0

**backdrop\_y**

Backdrop Y offset

**Type** float in [-inf, inf], default 0.0

**backdrop\_zoom**

Backdrop zoom factor

**Type** float in [0.01, inf], default 1.0

**id**

Datablock whose nodes are being edited

**Type** ID, (readonly)

**id\_from**

Datablock from which the edited datablock is linked

**Type** `ID`, (readonly)

**node\_tree**

Node tree being displayed and edited

**Type** `NodeTree`, (readonly)

**show\_backdrop**

Use active Viewer Node output as backdrop for compositing nodes

**Type** boolean, default False

**texture\_type**

Type of data to take texture from

**Type** enum in ['OBJECT', 'WORLD', 'BRUSH'], default 'OBJECT'

**tree\_type**

Node tree type to display and edit

**Type** enum in ['MATERIAL', 'TEXTURE', 'COMPOSITING'], default 'MATERIAL'

**use\_auto\_render**

Re-render and composite changed layer on 3D edits

**Type** boolean, default False

## Inherited Properties

- `bpy_struct.id_data`
- `Space.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.500 SpaceOutliner(Space)

base classes — `bpy_struct`, `Space`

```
class bpy.types.SpaceOutliner (Space)
    Outliner space data

    display_mode
        Type enum in ['ALL_SCENES', 'CURRENT_SCENE', 'VISIBLE_LAYERS', 'SELECTED', 'ACTIVE', 'SAME_TYPES', 'GROUPS', 'LIBRARIES', 'SEQUENCE', 'DATABLOCKS', 'USER_PREFERENCES', 'KEYMAPS'], default 'ALL_SCENES'

    filter_text
        Live search filtering string
        Type string, default ""

    show_restrict_columns
        Show column
        Type boolean, default False

    use_filter_case_sensitive
        Only use case sensitive matches of search string
        Type boolean, default False

    use_filter_complete
        Only use complete matches of search string
        Type boolean, default False
```

## Inherited Properties

- [bpy\\_struct.id\\_data](#)
- [Space.type](#)

## Inherited Functions

- [bpy\\_struct.as\\_pointer](#)
- [bpy\\_struct.callback\\_add](#)
- [bpy\\_struct.callback\\_remove](#)
- [bpy\\_struct.driver\\_add](#)
- [bpy\\_struct.driver\\_remove](#)
- [bpy\\_struct.get](#)
- [bpy\\_struct.is\\_property\\_hidden](#)
- [bpy\\_struct.is\\_property\\_set](#)
- [bpy\\_struct.items](#)
- [bpy\\_struct.keyframe\\_delete](#)
- [bpy\\_struct.keyframe\\_insert](#)
- [bpy\\_struct.keys](#)
- [bpy\\_struct.path\\_from\\_id](#)
- [bpy\\_struct.path\\_resolve](#)
- [bpy\\_struct.type\\_recast](#)
- [bpy\\_struct.values](#)

## 2.4.501 SpaceProperties(Space)

base classes — `bpy_struct`, `Space`

**class bpy.types.SpaceProperties (Space)**

Properties space data

**align**

Arrangement of the panels

**Type** enum in ['HORIZONTAL', 'VERTICAL'], default 'HORIZONTAL'

**context**

Type of active data to display and edit

**Type** enum in ['SCENE', 'RENDER', 'WORLD', 'OBJECT', 'CONSTRAINT', 'MODIFIER', 'DATA', 'BONE', 'BONE\_CONSTRAINT', 'MATERIAL', 'TEXTURE', 'PARTICLES', 'PHYSICS'], default 'RENDER'

**pin\_id**

**Type** ID

**texture\_context**

Type of texture data to display and edit

**Type** enum in ['MATERIAL'], default 'MATERIAL'

**use\_pin\_id**

Use the pinned context

**Type** boolean, default False

### Inherited Properties

- `bpy_struct.id_data`
- `Space.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.502 SpaceSequenceEditor(Space)

base classes — `bpy_struct`, `Space`

**class bpy.types.SpaceSequenceEditor (Space)**  
Sequence editor space data

**display\_channel**  
The channel number shown in the image preview. 0 is the result of all strips combined  
**Type** int in [-5, 32], default 0

**display\_mode**  
The view mode to use for displaying sequencer output  
**Type** enum in ['IMAGE', 'WAVEFORM', 'VECTOR\_SCOPE', 'HISTOGRAM'], default 'IMAGE'

**draw\_overexposed**  
Show overexposed areas with zebra stripes  
**Type** int in [0, 110], default 0

**grease\_pencil**  
Grease pencil data for this space  
**Type** `UnknownType`, (readonly)

**offset\_x**  
Offsets image horizontally from the view center  
**Type** float in [-inf, inf], default 0.0

**offset\_y**  
Offsets image horizontally from the view center  
**Type** float in [-inf, inf], default 0.0

**proxy\_render\_size**  
Draw preview using full resolution or different proxy resolutions  
**Type** enum in ['NONE', 'SCENE', 'PROXY\_25', 'PROXY\_50', 'PROXY\_75', 'FULL'], default 'SCENE'

**show\_frame\_indicator**  
Show frame number beside the current frame indicator line  
**Type** boolean, default False

**show\_frames**  
Draw frames rather than seconds  
**Type** boolean, default False

**show\_safe\_margin**  
Draw title safe margins in preview  
**Type** boolean, default False

**show\_separate\_color**  
Separate color channels in preview  
**Type** boolean, default False

**use\_grease\_pencil**  
Display and edit the grease pencil freehand annotations overlay

**Type** boolean, default False

**use\_marker\_sync**

Transform markers as well as strips

**Type** boolean, default False

**view\_type**

The type of the Sequencer view (sequencer, preview or both)

**Type** enum in ['SEQUENCER', 'PREVIEW', 'SEQUENCER\_PREVIEW'], default 'SEQUENCER'

**zoom**

Display zoom level

**Type** float in [-inf, inf], default 0.0

## Inherited Properties

- `bpy_struct.id_data`
- `Space.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.503 SpaceTextEditor(Space)

base classes — `bpy_struct, Space`

**class bpy.types.SpaceTextEditor(Space)**

Text editor space data

**find\_text**

Text to search for with the find tool

**Type** string, default ""

**font\_size**

Font size to use for displaying the text

**Type** int in [8, 32], default 0

**margin\_column**  
Column number to show right margin at

**Type** int in [0, 1024], default 0

**replace\_text**  
Text to replace selected text with using the replace tool

**Type** string, default ""

**show\_line\_highlight**  
Highlight the current line

**Type** boolean, default False

**show\_line\_numbers**  
Show line numbers next to the text

**Type** boolean, default False

**show\_margin**  
Show right margin

**Type** boolean, default False

**show\_syntax\_highlight**  
Syntax highlight for scripting

**Type** boolean, default False

**show\_word\_wrap**  
Wrap words if there is not enough horizontal space

**Type** boolean, default False

**tab\_width**  
Number of spaces to display tabs with

**Type** int in [2, 8], default 0

**text**  
Text displayed and edited in this space

**Type** Text

**use\_find\_all**  
Search in all text datablocks, instead of only the active one

**Type** boolean, default False

**use\_find\_wrap**  
Search again from the start of the file when reaching the end

**Type** boolean, default False

**use\_live\_edit**  
Run python while editing

**Type** boolean, default False

**use\_match\_case**  
Search string is sensitive to uppercase and lowercase letters

**Type** boolean, default False

**use\_overwrite**

Overwrite characters when typing rather than inserting them

**Type** boolean, default False

**Inherited Properties**

- bpy\_struct.id\_data
- Space.type

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.504 SpaceTimeline(Space)

base classes — bpy\_struct, Space

**class** bpy.types.SpaceTimeline (*Space*)

Timeline editor space data

**cache\_cloth**

Show the active object's cloth point cache

**Type** boolean, default False

**cache\_particles**

Show the active object's particle point cache

**Type** boolean, default False

**cache\_smoke**

Show the active object's smoke cache

**Type** boolean, default False

**cache\_softbody**

Show the active object's softbody point cache

**Type** boolean, default False

**show\_cache**

Show the status of cached frames in the timeline

**Type** boolean, default False

**show\_frame\_indicator**

Show frame number beside the current frame indicator line

**Type** boolean, default False

**show\_only\_selected**

Show keyframes for active Object and/or its selected channels only

**Type** boolean, default False

**Inherited Properties**

- `bpy_struct.id_data`
- `Space.type`

**Inherited Functions**

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.505 SpaceUVEditor(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.SpaceUVEditor(bpy_struct)`

UV editor data for the image editor space

**cursor\_location**

2D cursor location for this view

**Type** float array of 2 items in [-inf, inf], default (0.0, 0.0)

**draw\_stretch\_type**

Type of stretch to draw

**Type** enum in ['ANGLE', 'AREA'], default 'ANGLE'

**edge\_draw\_type**

Draw type for drawing UV edges

**Type** enum in ['OUTLINE', 'DASH', 'BLACK', 'WHITE'], default 'OUTLINE'

**lock\_bounds**

Constraint to stay within the image bounds while editing

**Type** boolean, default False

**pivot\_point**

Rotation/Scaling Pivot

**Type** enum in ['CENTER', 'MEDIAN', 'CURSOR'], default 'CENTER'

**show\_faces**

Draw faces over the image

**Type** boolean, default False

**show\_modified\_edges**

Draw edges after modifiers are applied

**Type** boolean, default False

**show\_normalized\_coords**

Display UV coordinates from 0.0 to 1.0 rather than in pixels

**Type** boolean, default False

**show\_other\_objects**

Draw other selected objects that share the same image

**Type** boolean, default False

**show\_smooth\_edges**

Draw UV edges anti-aliased

**Type** boolean, default False

**show\_stretch**

Draw faces colored according to the difference in shape between UVs and their 3D coordinates (blue for low distortion, red for high distortion)

**Type** boolean, default False

**sticky\_select\_mode**

Automatically select also UVs sharing the same vertex as the ones being selected

**Type** enum in ['DISABLED', 'SHARED\_LOCATION', 'SHARED\_VERTEX'], default 'SHARED\_LOCATION'

**use\_live\_unwrap**

Continuously unwrap the selected UV island while transforming pinned vertices

**Type** boolean, default False

**use\_snap\_to\_pixels**

Snap UVs to pixel locations while editing

**Type** boolean, default False

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- SpaceImageEditor.uv\_editor

## 2.4.506 SpaceUserPreferences(Space)

base classes — bpy\_struct, Space

**class bpy.types.SpaceUserPreferences (Space)**  
User preferences space data

**filter\_text**  
Search term for filtering in the UI

**Type** string, default “”

## Inherited Properties

- bpy\_struct.id\_data
- Space.type

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove

- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.507 SpaceView3D(Space)

base classes — `bpy_struct`, `Space`

**class bpy.types.SpaceView3D (Space)**  
3D View space data

**background\_images**

List of background images

**Type** `bpy_prop_collection` of `BackgroundImage`, (readonly)

**camera**

Active camera used in this view (when unlocked from the scene's active camera)

**Type** `Object`

**clip\_end**

3D View far clipping distance

**Type** float in [1, inf], default 0.0

**clip\_start**

3D View near clipping distance

**Type** float in [0.001, inf], default 0.0

**current\_orientation**

Current Transformation orientation

**Type** `TransformOrientation`, (readonly)

**cursor\_location**

3D cursor location for this view (dependent on local view setting)

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**grid\_lines**

The number of grid lines to display in perspective view

**Type** int in [0, 1024], default 0

**grid\_scale**

The distance between 3D View grid lines

**Type** float in [0, inf], default 0.0

**grid\_subdivisions**

The number of subdivisions between grid lines

**Type** int in [1, 1024], default 0

**layers**

Layers visible in this 3D View

**Type** boolean array of 20 items, default (False, False, False)

**layers\_used**

Layers that contain something

**Type** boolean array of 20 items, default (False, False, False), (readonly)

**lens**

Lens angle (mm) in perspective view

**Type** float in [1, 250], default 0.0

**local\_view**

Display an isolated sub-set of objects, apart from the scene visibility

**Type** SpaceView3D, (readonly)

**lock\_bone**

3D View center is locked to this bone's position

**Type** string, default “”

**lock\_camera**

Enable view navigation within the camera view

**Type** boolean, default False

**lock\_camera\_and\_layers**

Use the scene's active camera and layers in this view, rather than local layers

**Type** boolean, default False

**lock\_cursor**

3D View center is locked to the cursor's position

**Type** boolean, default False

**lock\_object**

3D View center is locked to this object's position

**Type** Object

**pivot\_point**

Pivot center for rotation/scaling

**Type** enum in ['BOUNDING\_BOX\_CENTER', 'CURSOR', 'INDIVIDUAL\_ORIGINS', 'MEDIAN\_POINT', 'ACTIVE\_ELEMENT'], default 'BOUNDING\_BOX\_CENTER'

**region\_3d**

3D region in this space, in case of quad view the camera region

**Type** RegionView3D, (readonly)

**region\_quadview**

3D region that defines the quad view settings

**Type** RegionView3D, (readonly)

**show\_all\_objects\_origin**

Show the object origin center dot for all (selected and unselected) objects

**Type** boolean, default False

**show\_axis\_x**  
Show the X axis line in perspective view

**Type** boolean, default False

**show\_axis\_y**  
Show the Y axis line in perspective view

**Type** boolean, default False

**show\_axis\_z**  
Show the Z axis line in perspective view

**Type** boolean, default False

**show\_background\_images**  
Display reference images behind objects in the 3D View

**Type** boolean, default False

**show\_floor**  
Show the ground plane grid in perspective view

**Type** boolean, default False

**show\_manipulator**  
Use a 3D manipulator widget for controlling transforms

**Type** boolean, default False

**show\_only\_render**  
Display only objects which will be rendered

**Type** boolean, default False

**show\_outline\_selected**  
Show an outline highlight around selected objects in non-wireframe views

**Type** boolean, default False

**show\_relationship\_lines**  
Show dashed lines indicating parent or constraint relationships

**Type** boolean, default False

**show\_textured\_solid**  
Display face-assigned textures in solid view

**Type** boolean, default False

**transform\_orientation**  
Transformation orientation

**Type** enum in ['GLOBAL', 'LOCAL', 'GIMBAL', 'NORMAL', 'VIEW', 'CUSTOM'], default 'GLOBAL'

**use\_manipulator\_rotate**  
Use the manipulator for rotation transformations

**Type** boolean, default False

**use\_manipulator\_scale**  
Use the manipulator for scale transformations

**Type** boolean, default False

**use\_manipulator\_translate**

Use the manipulator for movement transformations

**Type** boolean, default False

**use\_occlude\_geometry**

Limit selection to visible (clipped with depth buffer)

**Type** boolean, default False

**use\_pivot\_point\_align**

Manipulate object centers only

**Type** boolean, default False

**viewport\_shade**

Method to display/shade objects in the 3D View

**Type** enum in ['BOUNDBOX', 'WIREFRAME', 'SOLID', 'TEXTURED'], default 'BOUNDBOX'

## Inherited Properties

- `bpy_struct.id_data`
- `Space.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `ObjectBase.layers_from_view`
- `SpaceView3D.local_view`

## 2.4.508 SpeedControlSequence(EffectSequence)

base classes — `bpy_struct`, `Sequence`, `EffectSequence`

```
class bpy.types.SpeedControlSequence(EffectSequence)
    Sequence strip to control the speed of other strips

    multiply_speed
        Multiply the resulting speed after the speed factor
            Type float in [0, inf], default 0.0

    scale_to_length
        Scale values from 0.0 to 1.0 to target sequence length
            Type boolean, default False

    use_as_speed
        Interpret the value as speed instead of a frame number
            Type boolean, default False

    use_frame_blend
        Blend two frames into the target for a smoother result
            Type boolean, default False
```

### Inherited Properties

- bpy\_struct.id\_data
- Sequence.name
- Sequence.blend\_type
- Sequence.blend\_alpha
- Sequence.channel
- Sequence.effect\_fader
- Sequence.frame\_final\_end
- Sequence.frame\_offset\_end
- Sequence.frame\_still\_end
- Sequence.input\_1
- Sequence.input\_2
- Sequence.input\_3
- Sequence.select\_left\_handle
- Sequence.frame\_final\_duration
- Sequence.frame\_duration
- Sequence.lock
- Sequence.mute
- Sequence.select\_right\_handle
- Sequence.select
- Sequence.speed\_factor
- Sequence.frame\_start
- Sequence.frame\_final\_start
- Sequence.frame\_offset\_start
- Sequence.frame\_still\_start
- Sequence.type
- Sequence.use\_default\_fade
- Sequence.input\_count
- EffectSequence.color\_balance
- EffectSequence.use\_float
- EffectSequence.crop
- EffectSequence.use\_deinterlace
- EffectSequence.use\_reverse\_frames

- EffectSequence.use\_flip\_x
- EffectSequence.use\_flip\_y
- EffectSequence.color\_multiply
- EffectSequence.use\_premultiply
- EffectSequence.proxy
- EffectSequence.use\_proxy\_custom\_directory
- EffectSequence.use\_proxy\_custom\_file
- EffectSequence.color\_saturation
- EffectSequence.strobe
- EffectSequence.transform
- EffectSequence.use\_color\_balance
- EffectSequence.use\_crop
- EffectSequence.use\_proxy
- EffectSequence.use\_translation

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- Sequence.getStripElem
- Sequence.swap

## 2.4.509 Spline(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.Spline (*bpy\_struct*)

Element of a curve, either Nurbs, Bezier or Polyline or a character with text objects

**bezier\_points**

Collection of points for Bezier curves only

**Type** SplineBezierPoints bpy\_prop\_collection of BezierSplinePoint,  
(readonly)

**character\_index**

Location of this character in the text data (only for text curves)

**Type** int in [0, inf], default 0, (readonly)

**hide**  
Hide this curve in editmode  
**Type** boolean, default False

**material\_index**  
**Type** int in [0, 32767], default 0

**order\_u**  
Nurbs order in the U direction (For splines and surfaces), Higher values let points influence a greater area  
**Type** int in [2, 6], default 0

**order\_v**  
Nurbs order in the V direction (For surfaces only), Higher values let points influence a greater area  
**Type** int in [2, 6], default 0

**point\_count\_u**  
Total number points for the curve or surface in the U direction  
**Type** int in [0, 32767], default 0, (readonly)

**point\_count\_v**  
Total number points for the surface on the V direction  
**Type** int in [0, 32767], default 0, (readonly)

**points**  
Collection of points that make up this poly or nurbs spline  
**Type** SplinePoints bpy\_prop\_collection of SplinePoint, (readonly)

**radius\_interpolation**  
The type of radius interpolation for Bezier curves  
**Type** enum in ['LINEAR', 'CARDINAL', 'BSPLINE', 'EASE'], default 'LINEAR'

**resolution\_u**  
Curve or Surface subdivisions per segment  
**Type** int in [1, 32767], default 0

**resolution\_v**  
Surface subdivisions per segment  
**Type** int in [1, 32767], default 0

**tilt\_interpolation**  
The type of tilt interpolation for 3D, Bezier curves  
**Type** enum in ['LINEAR', 'CARDINAL', 'BSPLINE', 'EASE'], default 'LINEAR'

**type**  
The interpolation type for this curve element  
**Type** enum in ['POLY', 'BEZIER', 'BSPLINE', 'CARDINAL', 'NURBS'], default 'POLY'

**use\_bezier\_u**  
Make this nurbs curve or surface act like a Bezier spline in the U direction (Order U must be 3 or 4, Cyclic U must be disabled)  
**Type** boolean, default False

**use\_bezier\_v**

Make this nurbs surface act like a Bezier spline in the V direction (Order V must be 3 or 4, Cyclic V must be disabled)

**Type** boolean, default False

**use\_cyclic\_u**

Make this curve or surface a closed loop in the U direction

**Type** boolean, default False

**use\_cyclic\_v**

Make this surface a closed loop in the V direction

**Type** boolean, default False

**use\_endpoint\_u**

Make this nurbs curve or surface meet the endpoints in the U direction (Cyclic U must be disabled)

**Type** boolean, default False

**use\_endpoint\_v**

Make this nurbs surface meet the endpoints in the V direction (Cyclic V must be disabled)

**Type** boolean, default False

**use\_smooth**

Smooth the normals of the surface or beveled curve

**Type** boolean, default False

**Inherited Properties**

- bpy\_struct.id\_data

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

**References**

- Curve.splines

- `CurveSplines.new`
- `CurveSplines.remove`

## 2.4.510 SplineBezierPoints(bpy\_struct)

base class — `bpy_struct`

**class** `bpy.types.SplineBezierPoints` (*bpy\_struct*)

Collection of spline bezirt points

**add** (*count=1*)

Add a number of points to this spline.

**Parameters** `count` (*int in [-inf, inf], (optional)*) – Number, Number of points to add to the spline

### Inherited Properties

- `bpy_struct.id_data`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

### References

- `Spline.bezier_points`

## 2.4.511 SplineIKConstraint(Constraint)

base classes — `bpy_struct, Constraint`

**class** `bpy.types.SplineIKConstraint` (*Constraint*)

Align ‘n’ bones along a curve

**chain\_count**

How many bones are included in the chain

**Type** int in [1, 255], default 0

**joint\_bindings**  
(EXPERIENCED USERS ONLY) The relative positions of the joints along the chain as percentages

**Type** float array of 32 items in [0, 1], default (0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0)

**target**  
Curve that controls this relationship

**Type** Object

**use\_chain\_offset**  
Offset the entire chain relative to the root joint

**Type** boolean, default False

**use\_curve\_radius**  
Average radius of the endpoints is used to tweak the X and Z Scaling of the bones, on top of XZ Scale mode

**Type** boolean, default False

**use\_even\_divisions**  
Ignore the relative lengths of the bones when fitting to the curve

**Type** boolean, default False

**use\_y\_stretch**  
Stretch the Y axis of the bones to fit the curve

**Type** boolean, default False

**xz\_scale\_mode**  
Method used for determining the scaling of the X and Z axes of the bones

**Type** enum in ['NONE', 'BONE\_ORIGINAL', 'VOLUME\_PRESERVE'], default 'NONE'

## Inherited Properties

- bpy\_struct.id\_data
- Constraint.name
- Constraint.active
- Constraint.mute
- Constraint.show\_expanded
- Constraint.influence
- Constraint.error\_location
- Constraint.owner\_space
- Constraint.is\_proxy\_local
- Constraint.error\_rotation
- Constraint.target\_space
- Constraint.type
- Constraint.is\_valid

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add

- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.512 SplinePoint(bpy\_struct)

base class — `bpy_struct`

**class** `bpy.types.SplinePoint` (`bpy_struct`)  
Spline point without handles

**co**  
Point coordinates  
**Type** float array of 4 items in [-inf, inf], default (0.0, 0.0, 0.0, 0.0)

**hide**  
Visibility status  
**Type** boolean, default False

**radius**  
Radius for bevelling  
**Type** float in [0, inf], default 0.0

**select**  
Selection status  
**Type** boolean, default False

**tilt**  
Tilt in 3D View  
**Type** float in [-inf, inf], default 0.0

**weight**  
Nurbs weight  
**Type** float in [-inf, inf], default 0.0

**weight\_softbody**  
Softbody goal weight  
**Type** float in [0.01, 100], default 0.0

### Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `Spline.points`

### 2.4.513 SplinePoints(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.SplinePoints(bpy_struct)`

Collection of spline points

**add(count=1)**

Add a number of points to this spline.

**Parameters** `count (int in [1, inf], (optional))` – Number, Number of points to add to the spline

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`

- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- Spline.points

### 2.4.514 SpotLamp(Lamp)

base classes — bpy\_struct, ID, Lamp

**class bpy.types.SpotLamp (Lamp)**

Directional cone lamp

**compression\_threshold**

Deep shadow map compression threshold

**Type** float in [0, 1], default 0.0

**falloff\_curve**

Custom Lamp Falloff Curve

**Type** CurveMapping, (readonly)

**falloff\_type**

Intensity Decay with distance

**Type** enum in ['CONSTANT', 'INVERSE\_LINEAR', 'INVERSE\_SQUARE', 'CUSTOM\_CURVE', 'LINEAR\_QUADRATIC\_WEIGHTED'], default 'CONSTANT'

**halo\_intensity**

Brightness of the spotlight's halo cone

**Type** float in [-inf, inf], default 0.0

**halo\_step**

Volumetric halo sampling frequency

**Type** int in [0, 12], default 0

**linear\_attenuation**

Linear distance attenuation

**Type** float in [0, 1], default 0.0

**quadratic\_attenuation**

Quadratic distance attenuation

**Type** float in [0, 1], default 0.0

**shadow\_adaptive\_threshold**

Threshold for Adaptive Sampling (Raytraced shadows)

**Type** float in [0, 1], default 0.0

**shadow\_buffer\_bias**

Shadow buffer sampling bias

**Type** float in [0.001, 5], default 0.0

**shadow\_buffer\_clip\_end**

Shadow map clip end beyond which objects will not generate shadows

**Type** float in [0, 9999], default 0.0

**shadow\_buffer\_clip\_start**

Shadow map clip start: objects closer will not generate shadows

**Type** float in [0, 9999], default 0.0

**shadow\_buffer\_samples**

Number of shadow buffer samples

**Type** int in [1, 16], default 0

**shadow\_buffer\_size**

Resolution of the shadow buffer, higher values give crisper shadows but use more memory

**Type** int in [512, 10240], default 0

**shadow\_buffer\_soft**

Size of shadow buffer sampling area

**Type** float in [0, 100], default 0.0

**shadow\_buffer\_type**

Type of shadow buffer

**Type** enum in ['REGULAR', 'HALFWAY', 'IRREGULAR', 'DEEP'], default 'REGULAR'

**shadow\_color**

Color of shadows cast by the lamp

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**shadow\_filter\_type**

Type of shadow filter (Buffer Shadows)

**Type** enum in ['BOX', 'TENT', 'GAUSS'], default 'BOX'

**shadow\_method**

Method to compute lamp shadow with

**Type** enum in ['NOSHADOW', 'BUFFER\_SHADOW', 'RAY\_SHADOW'], default 'NOSHADOW'

**shadow\_ray\_sample\_method**

Method for generating shadow samples: Adaptive QMC is fastest, Constant QMC is less noisy but slower

**Type** enum in ['ADAPTIVE\_QMC', 'CONSTANT\_QMC'], default 'ADAPTIVE\_QMC'

**shadow\_ray\_samples**

Amount of samples taken extra (samples x samples)

**Type** int in [1, 64], default 0

**shadow\_sample\_buffers**

Number of shadow buffers to render for better AA, this increases memory usage

**Type** enum in ['BUFFERS\_1', 'BUFFERS\_4', 'BUFFERS\_9'], default 'BUFFERS\_1'

**shadow\_soft\_size**

Light size for ray shadow sampling (Raytraced shadows)

**Type** float in [-inf, inf], default 0.0

**show\_cone**

Draw transparent cone in 3D view to visualize which objects are contained in it

**Type** boolean, default False

**spot\_blend**

The softness of the spotlight edge

**Type** float in [0, 1], default 0.0

**spot\_size**

Angle of the spotlight beam in degrees

**Type** float in [0.0174533, 3.14159], default 0.0

**use\_auto\_clip\_end**

Automatic calculation of clipping-end, based on visible vertices

**Type** boolean, default False

**use\_auto\_clip\_start**

Automatic calculation of clipping-start, based on visible vertices

**Type** boolean, default False

**use\_halo**

Renders spotlight with a volumetric halo

**Type** boolean, default False

**use\_only\_shadow**

Causes light to cast shadows only without illuminating objects

**Type** boolean, default False

**use\_shadow\_layer**

Causes only objects on the same layer to cast shadows

**Type** boolean, default False

**use\_sphere**

Sets light intensity to zero beyond lamp distance

**Type** boolean, default False

**use\_square**

Casts a square spot light shape

**Type** boolean, default False

**Inherited Properties**

- bpy\_struct.id\_data
- ID.name
- ID.use\_fake\_user
- ID.library
- ID.tag
- ID.users
- Lamp.active\_texture
- Lamp.active\_texture\_index
- Lamp.animation\_data
- Lamp.color

- Lamp.use\_diffuse
- Lamp.distance
- Lamp.energy
- Lamp.use\_own\_layer
- Lamp.use\_negative
- Lamp.use\_specular
- Lamp.texture\_slots
- Lamp.type

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- ID.copy
- ID.user\_clear
- ID.animation\_data\_create
- ID.animation\_data\_clear
- ID.update\_tag

## 2.4.515 StateActuator(Actuator)

base classes — bpy\_struct, Actuator

**class** bpy.types.StateActuator(Actuator)

Actuator to handle states

**operation**

Select the bit operation on object state mask

**Type** enum in ['SET', 'ADD', 'REMOVE', 'CHANGE'], default 'SET'

**states**

**Type** boolean array of 30 items, default (False, False, False)

### Inherited Properties

- bpy\_struct.id\_data

- `Actuator.name`
- `Actuator.show_expanded`
- `Actuator.pin`
- `Actuator.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`
- `Actuator.link`
- `Actuator.unlink`

## 2.4.516 StretchToConstraint(Constraint)

base classes — `bpy_struct, Constraint`

**class** `bpy.types.StretchToConstraint (Constraint)`

Stretches to meet the target object

**bulge**

Factor between volume variation and stretching

**Type** float in [0, 100], default 0.0

**head\_tail**

Target along length of bone: Head=0, Tail=1

**Type** float in [0, 1], default 0.0

**keep\_axis**

Axis to maintain during stretch

**Type** enum in ['PLANE\_X', 'PLANE\_Z'], default 'PLANE\_X'

**rest\_length**

Length at rest position

**Type** float in [0, 100], default 0.0

**subtarget**

**Type** string, default ""

**target**

Target Object

**Type** Object**volume**

Maintain the object's volume as it stretches

**Type** enum in ['VOLUME\_XZX', 'VOLUME\_X', 'VOLUME\_Z', 'NO\_VOLUME'], default 'VOLUME\_XZX'**Inherited Properties**

- bpy\_struct.id\_data
- Constraint.name
- Constraint.active
- Constraint.mute
- Constraint.show\_expanded
- Constraint.influence
- Constraint.error\_location
- Constraint.owner\_space
- Constraint.is\_proxy\_local
- Constraint.error\_rotation
- Constraint.target\_space
- Constraint.type
- Constraint.is\_valid

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.517 StringProperty(Property)

base classes — bpy\_struct, Property

**class** bpy.types.StringProperty(*Property*)  
RNA text string property definition

**default**

string default value

**Type** string, default "", (readonly)

**length\_max**

Maximum length of the string, 0 means unlimited

**Type** int in [0, inf], default 0, (readonly)

## Inherited Properties

- `bpy_struct.id_data`
- `Property.name`
- `Property.srna`
- `Property.description`
- `Property.is_enum_flag`
- `Property.is_hidden`
- `Property.identifier`
- `Property.is_never_none`
- `Property.is_readonly`
- `Property.is_registered`
- `Property.is_registered_optional`
- `Property.is_required`
- `Property.is_output`
- `Property.is_runtime`
- `Property.is_skip_save`
- `Property.subtype`
- `Property.type`
- `Property.unit`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `Struct.name_property`

## 2.4.518 Struct(bpy\_struct)

base class — `bpy_struct`

**class** `bpy.types.Struct` (`bpy_struct`)

RNA structure definition

### **base**

Struct definition this is derived from

**Type** `Struct`, (readonly)

### **description**

Description of the Struct's purpose

**Type** `string`, default "", (readonly)

### **functions**

**Type** `bpy_prop_collection` of `Function`, (readonly)

### **identifier**

Unique name used in the code and scripting

**Type** `string`, default "", (readonly)

### **name**

Human readable name

**Type** `string`, default "", (readonly)

### **name\_property**

Property that gives the name of the struct

**Type** `StringProperty`, (readonly)

### **nested**

Struct in which this struct is always nested, and to which it logically belongs

**Type** `Struct`, (readonly)

### **properties**

Properties in the struct

**Type** `bpy_prop_collection` of `Property`, (readonly)

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`

- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- BlenderRNA.structs
- CollectionProperty.fixed\_type
- PointerProperty.fixed\_type
- Property.srna
- Struct.base
- Struct.nested

## 2.4.519 StucciTexture(Texture)

base classes — bpy\_struct, ID, Texture

**class bpy.types.StucciTexture (Texture)**

Procedural noise texture

### **noise\_basis**

Sets the noise basis used for turbulence

**Type** enum in ['BLENDER\_ORIGINAL', 'ORIGINAL\_PERLIN', 'IMPROVED\_PERLIN',  
'VORONOI\_F1', 'VORONOI\_F2', 'VORONOI\_F3', 'VORONOI\_F4',  
'VORONOI\_F2\_F1', 'VORONOI\_CRACKLE', 'CELL\_NOISE'], default  
'BLENDER\_ORIGINAL'

### **noise\_scale**

Sets scaling for noise input

**Type** float in [0.0001, inf], default 0.0

### **noise\_type**

**Type** enum in ['SOFT\_NOISE', 'HARD\_NOISE'], default 'SOFT\_NOISE'

### **stucci\_type**

**Type** enum in ['PLASTIC', 'WALL\_IN', 'WALL\_OUT'], default 'PLASTIC'

### **turbulence**

Sets the turbulence of the bandnoise and ringnoise types

**Type** float in [0.0001, inf], default 0.0

### **users\_material**

Materials that use this texture (readonly)

### **users\_object\_modifier**

Object modifiers that use this texture (readonly)

## Inherited Properties

- `bpy_struct.id_data`
- `ID.name`
- `ID.use_fake_user`
- `ID.library`
- `ID.tag`
- `ID.users`
- `Texture.animation_data`
- `Texture.intensity`
- `Texture.color_ramp`
- `Texture.contrast`
- `Texture.factor_blue`
- `Texture.factor_green`
- `Texture.factor_red`
- `Texture.node_tree`
- `Texture.saturation`
- `Texture.use_preview_alpha`
- `Texture.type`
- `Texture.use_color_ramp`
- `Texture.use_nodes`
- `Texture.users_material`
- `Texture.users_object_modifier`
- `Texture.users_material`
- `Texture.users_object_modifier`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`
- `ID.copy`
- `ID.user_clear`
- `ID.animation_data_create`
- `ID.animation_data_clear`
- `ID.update_tag`

## 2.4.520 SubsurfModifier(Modifier)

base classes — `bpy_struct`, `Modifier`

**class bpy.types.SubsurfModifier(*Modifier*)**

Subdivision surface modifier

**levels**

Number of subdivisions to perform

**Type** int in [0, 32767], default 0

**render\_levels**

Number of subdivisions to perform when rendering

**Type** int in [0, 32767], default 0

**show\_only\_control\_edges**

Skip drawing/rendering of interior subdivided edges

**Type** boolean, default False

**subdivision\_type**

Selects type of subdivision algorithm

**Type** enum in ['CATMULL\_CLARK', 'SIMPLE'], default 'CATMULL\_CLARK'

**use\_subsurf\_uv**

Use subsurf to subdivide UVs

**Type** boolean, default False

### Inherited Properties

- `bpy_struct.id_data`
- `Modifier.name`
- `Modifier.use_apply_on_spline`
- `Modifier.show_in_editmode`
- `Modifier.show_expanded`
- `Modifier.show_on_cage`
- `Modifier.show_viewport`
- `Modifier.show_render`
- `Modifier.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`

- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.521 SunLamp(Lamp)

base classes — `bpy_struct`, `ID`, `Lamp`

**class bpy.types.SunLamp (Lamp)**

Constant direction parallel ray lamp

**shadow\_adaptive\_threshold**

Threshold for Adaptive Sampling (Raytraced shadows)

**Type** float in [0, 1], default 0.0

**shadow\_color**

Color of shadows cast by the lamp

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**shadow\_method**

Method to compute lamp shadow with

**Type** enum in ['NOSHADOW', 'RAY\_SHADOW'], default 'NOSHADOW'

**shadow\_ray\_sample\_method**

Method for generating shadow samples: Adaptive QMC is fastest, Constant QMC is less noisy but slower

**Type** enum in ['ADAPTIVE\_QMC', 'CONSTANT\_QMC'], default 'ADAPTIVE\_QMC'

**shadow\_ray\_samples**

Amount of samples taken extra (samples x samples)

**Type** int in [1, 64], default 0

**shadow\_soft\_size**

Light size for ray shadow sampling (Raytraced shadows)

**Type** float in [-inf, inf], default 0.0

**sky**

Sky related settings for sun lamps

**Type** `LampSkySettings`, (readonly, never None)

**use\_only\_shadow**

Causes light to cast shadows only without illuminating objects

**Type** boolean, default False

**use\_shadow\_layer**

Causes only objects on the same layer to cast shadows

**Type** boolean, default False

### Inherited Properties

- `bpy_struct.id_data`
- `ID.name`
- `ID.use_fake_user`

- `ID.library`
- `ID.tag`
- `ID.users`
- `Lamp.active_texture`
- `Lamp.active_texture_index`
- `Lamp.animation_data`
- `Lamp.color`
- `Lamp.use_diffuse`
- `Lamp.distance`
- `Lamp.energy`
- `Lamp.use_own_layer`
- `Lamp.use_negative`
- `Lamp.use_specular`
- `Lamp.texture_slots`
- `Lamp.type`

#### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`
- `ID.copy`
- `ID.user_clear`
- `ID.animation_data_create`
- `ID.animation_data_clear`
- `ID.update_tag`

### 2.4.522 SurfaceCurve(Curve)

base classes — `bpy_struct, ID, Curve`

**class** `bpy.types.SurfaceCurve (Curve)`  
Curve datablock used for storing surfaces

**use\_uv\_as\_generated**  
Uses the UV values as Generated textured coordinates

**Type** boolean, default False

## Inherited Properties

- bpy\_struct.id\_data
- ID.name
- ID.use\_fake\_user
- ID.library
- ID.tag
- ID.users
- Curve.animation\_data
- Curve.use\_auto\_texspace
- Curve.use\_fill\_back
- Curve.bevel\_depth
- Curve.bevel\_object
- Curve.bevel\_resolution
- Curve.use\_deform\_bounds
- Curve.dimensions
- Curve.show\_handles
- Curve.show\_normal\_face
- Curve.eval\_time
- Curve.extrude
- Curve.use\_fill\_deform
- Curve.use\_path\_follow
- Curve.use\_fill\_front
- Curve.materials
- Curve.offset
- Curve.use\_time\_offset
- Curve.use\_path
- Curve.path\_duration
- Curve.use\_radius
- Curve.render\_resolution\_u
- Curve.render\_resolution\_v
- Curve.resolution\_u
- Curve.resolution\_v
- Curve.shape\_keys
- Curve.splines
- Curve.use\_stretch
- Curve.taper\_object
- Curve.texspace\_location
- Curve.texspace\_size
- Curve.twist\_mode
- Curve.twist\_smooth
- Curve.use\_uv\_as\_generated

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set

- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- ID.copy
- ID.user\_clear
- ID.animation\_data\_create
- ID.animation\_data\_clear
- ID.update\_tag

## 2.4.523 SurfaceModifier(Modifier)

base classes — bpy\_struct, Modifier

**class bpy.types.SurfaceModifier(*Modifier*)**  
Surface modifier defining modifier stack position used for surface fields

### Inherited Properties

- bpy\_struct.id\_data
- Modifier.name
- Modifier.use\_apply\_on\_spline
- Modifier.show\_in\_editmode
- Modifier.show\_expanded
- Modifier.show\_on\_cage
- Modifier.show\_viewport
- Modifier.show\_render
- Modifier.type

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.524 TexMapping(bpy\_struct)

base class — [bpy\\_struct](#)

**class bpy.types.TexMapping (bpy\_struct)**  
Mapping settings

**location**  
**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**max**  
Maximum value for clipping  
**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**min**  
Minimum value for clipping  
**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**rotation**  
**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**scale**  
**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**use\_max**  
Whether to use maximum clipping value  
**Type** boolean, default False

**use\_min**  
Whether to use minimum clipping value  
**Type** boolean, default False

### Inherited Properties

- [bpy\\_struct.id\\_data](#)

### Inherited Functions

- [bpy\\_struct.as\\_pointer](#)
- [bpy\\_struct.callback\\_add](#)
- [bpy\\_struct.callback\\_remove](#)
- [bpy\\_struct.driver\\_add](#)
- [bpy\\_struct.driver\\_remove](#)
- [bpy\\_struct.get](#)
- [bpy\\_struct.is\\_property\\_hidden](#)
- [bpy\\_struct.is\\_property\\_set](#)
- [bpy\\_struct.items](#)
- [bpy\\_struct.keyframe\\_delete](#)
- [bpy\\_struct.keyframe\\_insert](#)
- [bpy\\_struct.keys](#)
- [bpy\\_struct.path\\_from\\_id](#)
- [bpy\\_struct.path\\_resolve](#)
- [bpy\\_struct.type\\_recast](#)

- `bpy_struct.values`

## 2.4.525 Text(ID)

base classes — `bpy_struct, ID`

**class bpy.types.Text (ID)**

Text datablock referencing an external or packed text file

**current\_character**

Index of current character in current line, and also start index of character in selection if one exists

**Type** int in [0, inf], default 0, (readonly)

**current\_line**

Current line, and start line of selection if one exists

**Type** `TextLine`, (readonly, never None)

**filepath**

Filename of the text file

**Type** string, default “”

**is\_dirty**

Text file has been edited since last save

**Type** boolean, default False, (readonly)

**is\_in\_memory**

Text file is in memory, without a corresponding file on disk

**Type** boolean, default False, (readonly)

**is\_modified**

Text file on disk is different than the one in memory

**Type** boolean, default False, (readonly)

**lines**

Lines of text

**Type** `bpy_prop_collection` of `TextLine`, (readonly)

**markers**

Text markers highlighting part of the text

**Type** `bpy_prop_collection` of `TextMarker`, (readonly)

**select\_end\_character**

Index of character after end of selection in the selection end line

**Type** int in [0, inf], default 0, (readonly)

**select\_end\_line**

End line of selection

**Type** `TextLine`, (readonly, never None)

**use\_module**

Register this text as a module on loading, Text name must end with “.py”

**Type** boolean, default False

**use\_tabs\_as\_spaces**

Automatically converts all new tabs into spaces

**Type** boolean, default False

**users\_logic**

Logic bricks that use this text (readonly)

**clear()**

clear the text block.

**write(text)**

write text at the cursor location and advance to the end of the text block.

**Parameters** **text** (string) – New text for this datablock.

**static as\_string(self)**

Return the text as a string.

**from\_string(string)**

Replace text with this string.

## Inherited Properties

- bpy\_struct.id\_data
- ID.name
- ID.use\_fake\_user
- ID.library
- ID.tag
- ID.users

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- ID.copy
- ID.user\_clear
- ID.animation\_data\_create
- ID.animation\_data\_clear
- ID.update\_tag

## References

- BlendData.texts
- BlendDataTexts.load
- BlendDataTexts.new
- BlendDataTexts.remove
- Filter2DActuator.gsl\_shader
- PythonConstraint.text
- PythonController.text
- SceneGameData.dome\_text
- SpaceTextEditor.text

## 2.4.526 TextBox(bpy\_struct)

base class — `bpy_struct`

```
class bpy.types.TextBox(bpy_struct)
    Text bounding box for layout

    height
        Type float in [0, 50], default 0.0

    width
        Type float in [0, 50], default 0.0

    x
        Type float in [-50, 50], default 0.0

    y
        Type float in [-50, 50], default 0.0
```

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`

- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `TextCurve.text_boxes`

### 2.4.527 TextCharacterFormat(`bpy_struct`)

base class — `bpy_struct`

```
class bpy.types.TextCharacterFormat (bpy_struct)
    Text character formatting settings

    use_bold
        Type boolean, default False

    use_italic
        Type boolean, default False

    use_small_caps
        Type boolean, default False

    use_underline
        Type boolean, default False
```

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `TextCurve.body_format`
- `TextCurve.edit_format`

### 2.4.528 `TextCurve(Curve)`

base classes — `bpy_struct, ID, Curve`

**class** `bpy.types.TextCurve(Curve)`

Curve datablock used for storing text

**active\_textbox**

**Type** int in [-inf, inf], default 0

**align**

Text align from the object center

**Type** enum in ['LEFT', 'CENTER', 'RIGHT', 'JUSTIFY', 'FLUSH'], default 'LEFT'

**body**

contents of this text object

**Type** string, default ""

**body\_format**

Stores the style of each character

**Type** `bpy_prop_collection` of `TextCharacterFormat`, (readonly)

**edit\_format**

Editing settings character formatting

**Type** `TextCharacterFormat`, (readonly)

**family**

Use Blender Objects as font characters. Give font objects a common name followed by the character it represents, eg. familya, familyb etc, and turn on Verts Duplication

**Type** string, default ""

**follow\_curve**

Curve deforming text object

**Type** `Object`

**font**

**Type** `VectorFont`

**font\_bold**

**Type** `VectorFont`

**font\_bold\_italic**

**Type** `VectorFont`

**font\_italic**

**Type** `VectorFont`

**offset\_x**

Horizontal offset from the object origin

**Type** float in [-50, 50], default 0.0  
**offset\_y**  
Vertical offset from the object origin  
**Type** float in [-50, 50], default 0.0  
**shear**  
Italic angle of the characters  
**Type** float in [-1, 1], default 0.0  
**size**  
**Type** float in [0.0001, 10000], default 0.0  
**small\_caps\_scale**  
Scale of small capitals  
**Type** float in [-inf, inf], default 0.0  
**space\_character**  
**Type** float in [0, 10], default 0.0  
**space\_line**  
**Type** float in [0, 10], default 0.0  
**space\_word**  
**Type** float in [0, 10], default 0.0  
**text\_boxes**  
**Type** bpy\_prop\_collection of TextBox, (readonly)  
**underline\_height**  
**Type** float in [-0.2, 0.8], default 0.0  
**underline\_position**  
Vertical position of underline  
**Type** float in [-0.2, 0.8], default 0.0  
**use\_fast\_edit**  
Don't fill polygons while editing  
**Type** boolean, default False  
**use\_uv\_as\_generated**  
Uses the UV values as Generated textured coordinates  
**Type** boolean, default False

## Inherited Properties

- bpy\_struct.id\_data
- ID.name
- ID.use\_fake\_user
- ID.library
- ID.tag
- ID.users
- Curve.animation\_data

- `Curve.use_auto_texspace`
- `Curve.use_fill_back`
- `Curve.bevel_depth`
- `Curve.bevel_object`
- `Curve.bevel_resolution`
- `Curve.use_deform_bounds`
- `Curve.dimensions`
- `Curve.show_handles`
- `Curve.show_normal_face`
- `Curve.eval_time`
- `Curve.extrude`
- `Curve.use_fill_deform`
- `Curve.use_path_follow`
- `Curve.use_fill_front`
- `Curve.materials`
- `Curve.offset`
- `Curve.use_time_offset`
- `Curve.use_path`
- `Curve.path_duration`
- `Curve.use_radius`
- `Curve.render_resolution_u`
- `Curve.render_resolution_v`
- `Curve.resolution_u`
- `Curve.resolution_v`
- `Curve.shape_keys`
- `Curve.splines`
- `Curve.use_stretch`
- `Curve.taper_object`
- `Curve.texspace_location`
- `Curve.texspace_size`
- `Curve.twist_mode`
- `Curve.twist_smooth`
- `Curve.use_uv_as_generated`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`
- `ID.copy`

- ID.user\_clear
- ID.animation\_data\_create
- ID.animation\_data\_clear
- ID.update\_tag

## 2.4.529 TextLine(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.TextLine (*bpy\_struct*)  
Line of text in a Text datablock

### body

Text in the line

**Type** string, default “”

### Inherited Properties

- bpy\_struct.id\_data

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

### References

- Text.current\_line
- Text.lines
- Text.select\_end\_line

## 2.4.530 TextMarker(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.TextMarker (*bpy\_struct*)  
Marker highlighting a portion of text in a Text datablock

**character\_index\_end**

Start position of the marker in the line

**Type** int in [0, inf], default 0, (readonly)

**character\_index\_start**

Start position of the marker in the line

**Type** int in [0, inf], default 0, (readonly)

**color**

Color to display the marker with

**Type** float array of 4 items in [0, 1], default (0.0, 0.0, 0.0, 0.0)

**group**

**Type** int in [0, 65535], default 0, (readonly)

**is\_temporary**

Marker is temporary

**Type** boolean, default False, (readonly)

**line**

Line in which the marker is located

**Type** int in [0, inf], default 0, (readonly)

**use\_edit\_all**

Edit all markers of the same group as one

**Type** boolean, default False, (readonly)

**Inherited Properties**

- bpy\_struct.id\_data

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- `Text.markers`

### 2.4.531 Texture(ID)

base classes — `bpy_struct, ID`

subclasses — `ImageTexture, MarbleTexture, EnvironmentMapTexture, PointDensityTexture, VoxelDataTexture, BlendTexture, MusgraveTexture, StucciTexture, VoronoiTexture, MagicTexture, PluginTexture, WoodTexture, CloudsTexture, DistortedNoiseTexture, NoiseTexture`

**class bpy.types.Texture(ID)**

Texture datablock used by materials, lamps, worlds and brushes

#### **animation\_data**

Animation data for this datablock

**Type** `AnimData, (readonly)`

#### **color\_ramp**

**Type** `ColorRamp, (readonly)`

#### **contrast**

Adjusts the contrast of the texture

**Type** float in [0.01, 5], default 0.0

#### **factor\_blue**

**Type** float in [0, 2], default 0.0

#### **factor\_green**

**Type** float in [0, 2], default 0.0

#### **factor\_red**

**Type** float in [0, 2], default 0.0

#### **intensity**

Adjusts the brightness of the texture

**Type** float in [0, 2], default 0.0

#### **node\_tree**

Node tree for node-based textures

**Type** `NodeTree, (readonly)`

#### **saturation**

Adjusts the saturation of colors in the texture

**Type** float in [0, 2], default 0.0

#### **type**

**Type** enum in ['NONE', 'BLEND', 'CLOUDS', 'DISTORTED\_NOISE', 'ENVIRONMENT\_MAP', 'IMAGE', 'MAGIC', 'MARBLE', 'MUSGRAVE', 'NOISE', 'POINT\_DENSITY', 'STUCCI', 'VORONOI', 'VOXEL\_DATA', 'WOOD'], default 'NONE'

**use\_color\_ramp**  
Toggle color ramp operations  
**Type** boolean, default False

**use\_nodes**  
Make this a node-based texture  
**Type** boolean, default False

**use\_preview\_alpha**  
Show Alpha in Preview Render  
**Type** boolean, default False

**users\_material**  
Materials that use this texture (readonly)

**users\_object\_modifier**  
Object modifiers that use this texture (readonly)

## Inherited Properties

- bpy\_struct.id\_data
- ID.name
- ID.use\_fake\_user
- ID.library
- ID.tag
- ID.users

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- ID.copy
- ID.user\_clear
- ID.animation\_data\_create
- ID.animation\_data\_clear
- ID.update\_tag

## References

- BlendData.textures
- BlendDataTextures.new
- BlendDataTextures.remove
- Brush.texture
- CompositorNodeTexture.texture
- DisplaceModifier.texture
- FieldSettings.texture
- Lamp.active\_texture
- Material.active\_texture
- ParticleSettings.active\_texture
- ShaderNodeTexture.texture
- TextureNodeTexture.texture
- TextureSlot.texture
- WarpModifier.texture
- WaveModifier.texture
- World.active\_texture

## 2.4.532 TextureNode(Node)

base classes — `bpy_struct, Node`

subclasses — `TextureNodeScale, TextureNodeRGBToBW, TextureNodeTranslate, TextureNodeTexture, TextureNodeCompose, TextureNodeValToNor, TextureNodeDecompose, TextureNodeHueSaturation, TextureNodeImage, TextureNodeBricks, TextureNodeCurveTime, TextureNodeInvert, TextureNodeCurveRGB, TextureNodeDistance, TextureNodeRotate, TextureNodeMixRGB, TextureNodeChecker, TextureNodeOutput, TextureNodeCoordinates, TextureNodeValToRGB, TextureNodeMath, TextureNodeViewer`

`class bpy.types.TextureNode (Node)`

### `type`

**Type** enum in ['OUTPUT', 'CHECKER', 'TEXTURE', 'BRICKS', 'MATH', 'MIX\_RGB', 'RGBTOBW', 'VALTORGB', 'IMAGE', 'CURVE\_RGB', 'INVERT', 'HUE\_SAT', 'CURVE\_TIME', 'ROTATE', 'VIEWER', 'TRANSLATE', 'COORD', 'DISTANCE', 'COMPOSE', 'DECOMPOSE', 'VALTONOR', 'SCALE', 'SCRIPT', 'GROUP'], default 'OUTPUT', (readonly)

### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`

### Inherited Functions

- `bpy_struct.as_pointer`

- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.533 TextureNodeBricks(`TextureNode`)

base classes — `bpy_struct`, `Node`, `TextureNode`

`class bpy.types.TextureNodeBricks (TextureNode)`

### `offset`

**Type** float in [0, 1], default 0.0

### `offset_frequency`

Offset every N rows

**Type** int in [2, 99], default 0

### `squash`

**Type** float in [0, 99], default 0.0

### `squash_frequency`

Squash every N rows

**Type** int in [2, 99], default 0

## Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `TextureNode.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`

- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.534 TextureNodeChecker(TextureNode)

base classes — `bpy_struct, Node, TextureNode`

`class bpy.types.TextureNodeChecker (TextureNode)`

### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `TextureNode.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.535 TextureNodeCompose(TextureNode)

base classes — `bpy_struct`, `Node`, `TextureNode`

`class bpy.types.TextureNodeCompose (TextureNode)`

### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `TextureNode.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.536 TextureNodeCoordinates(TextureNode)

base classes — `bpy_struct`, `Node`, `TextureNode`

`class bpy.types.TextureNodeCoordinates (TextureNode)`

### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `TextureNode.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.537 TextureNodeCurveRGB(TextureNode)

base classes — `bpy_struct, Node, TextureNode`

`class bpy.types.TextureNodeCurveRGB (TextureNode)`

### `mapping`

Type `CurveMapping, (readonly)`

## Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `TextureNode.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`

- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.538 TextureNodeCurveTime(TextureNode)

base classes — bpy\_struct, Node, TextureNode

class bpy.types.TextureNodeCurveTime (TextureNode)

**curve**

Type CurveMapping, (readonly)

**frame\_end**

Type int in [-32768, 32767], default 0

**frame\_start**

Type int in [-32768, 32767], default 0

### Inherited Properties

- bpy\_struct.id\_data
- Node.name
- Node.inputs
- Node.label
- Node.location
- Node.outputs
- TextureNode.type

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.539 TextureNodeDecompose(TextureNode)

base classes — `bpy_struct`, `Node`, `TextureNode`

`class bpy.types.TextureNodeDecompose (TextureNode)`

### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `TextureNode.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.540 TextureNodeDistance(TextureNode)

base classes — `bpy_struct`, `Node`, `TextureNode`

`class bpy.types.TextureNodeDistance (TextureNode)`

### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `TextureNode.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.541 TextureNodeHueSaturation(TextureNode)

base classes — `bpy_struct, Node, TextureNode`

`class bpy.types.TextureNodeHueSaturation (TextureNode)`

### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `TextureNode.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`

- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.542 TextureNodeImage(TextureNode)

base classes — `bpy_struct, Node, TextureNode`

`class bpy.types.TextureNodeImage (TextureNode)`

**image**

Type `Image`

### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `TextureNode.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.543 TextureNodeInvert(TextureNode)

base classes — `bpy_struct, Node, TextureNode`

`class bpy.types.TextureNodeInvert (TextureNode)`

## Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `TextureNode.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.544 TextureNodeMath(TextureNode)

base classes — `bpy_struct, Node, TextureNode`

`class bpy.types.TextureNodeMath(TextureNode)`

### `operation`

**Type** enum in ['ADD', 'SUBTRACT', 'MULTIPLY', 'DIVIDE', 'SINE', 'COSINE', 'TANGENT', 'ARCSINE', 'ARCCOSINE', 'ARCTANGENT', 'POWER', 'LOGARITHM', 'MINIMUM', 'MAXIMUM', 'ROUND', 'LESS\_THAN', 'GREATER\_THAN'], default 'ADD'

## Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `TextureNode.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.545 TextureNodeMixRGB(TextureNode)

base classes — `bpy_struct, Node, TextureNode`

`class bpy.types.TextureNodeMixRGB (TextureNode)`

### `blend_type`

**Type** enum in ['MIX', 'ADD', 'MULTIPLY', 'SUBTRACT', 'SCREEN', 'DIVIDE', 'DIFFERENCE', 'DARKEN', 'LIGHTEN', 'OVERLAY', 'DODGE', 'BURN', 'HUE', 'SATURATION', 'VALUE', 'COLOR', 'SOFT\_LIGHT', 'LINEAR\_LIGHT'], default 'MIX'

### `use_alpha`

Include alpha of second input in this operation

**Type** boolean, default False

## Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `TextureNode.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`

- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.546 TextureNodeOutput(TextureNode)

base classes — bpy\_struct, Node, TextureNode

**class** bpy.types.**TextureNodeOutput** (*TextureNode*)

### **filepath**

**Type** string, default “”

### Inherited Properties

- bpy\_struct.id\_data
- Node.name
- Node.inputs
- Node.label
- Node.location
- Node.outputs
- TextureNode.type

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.547 TextureNodeRGBToBW(TextureNode)

base classes — `bpy_struct`, `Node`, `TextureNode`

`class bpy.types.TextreeNodeRGBToBW (TextureNode)`

### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `TextureNode.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.548 TextureNodeRotate(TextureNode)

base classes — `bpy_struct`, `Node`, `TextureNode`

`class bpy.types.TextreeNodeRotate (TextureNode)`

### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `TextureNode.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.549 TextureNodeScale(TextureNode)

base classes — `bpy_struct, Node, TextureNode`

```
class bpy.types.TextureNodeScale (TextureNode)
```

## Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `TextureNode.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`

- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.550 TextureNodeTexture(TextureNode)

base classes — `bpy_struct, Node, TextureNode`

`class bpy.types.TextureNodeTexture (TextureNode)`

### `node_output`

For node-based textures, which output node to use

**Type** int in [-32768, 32767], default 0

### `texture`

**Type** `Texture`

### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `TextureNode.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.551 TextureNodeTranslate(TextureNode)

base classes — `bpy_struct, Node, TextureNode`

`class bpy.types.TextureNodeTranslate (TextureNode)`

## Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `TextureNode.type`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.552 TextureNodeTree(NodeTree)

base classes — `bpy_struct, ID, NodeTree`

**class** `bpy.types.TextureNodeTree (NodeTree)`

Node tree consisting of linked nodes used for textures

**nodes**

**Type** `TextureNodes bpy_prop_collection of Node, (readonly)`

## Inherited Properties

- `bpy_struct.id_data`
- `ID.name`
- `ID.use_fake_user`
- `ID.library`
- `ID.tag`
- `ID.users`
- `NodeTree.animation_data`
- `NodeTree.grease_pencil`
- `NodeTree.inputs`
- `NodeTree.links`

- `NodeTree.outputs`
- `NodeTree.type`

#### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`
- `ID.copy`
- `ID.user_clear`
- `ID.animation_data_create`
- `ID.animation_data_clear`
- `ID.update_tag`

### 2.4.553 TextureNodeValToNor(TextureNode)

base classes — `bpy_struct, Node, TextureNode`

`class bpy.types.TextureNodeValToNor (TextureNode)`

#### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `TextureNode.type`

#### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`

- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.554 TextureNodeValToRGB(TextureNode)

base classes — bpy\_struct, Node, TextureNode

class bpy.types.TextureNodeValToRGB (TextureNode)

**color\_ramp**

Type ColorRamp, (readonly)

### Inherited Properties

- bpy\_struct.id\_data
- Node.name
- Node.inputs
- Node.label
- Node.location
- Node.outputs
- TextureNode.type

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.555 TextureNodeViewer(TextureNode)

base classes — `bpy_struct`, `Node`, `TextureNode`

`class bpy.types.TextureNodeViewer (TextureNode)`

### Inherited Properties

- `bpy_struct.id_data`
- `Node.name`
- `Node.inputs`
- `Node.label`
- `Node.location`
- `Node.outputs`
- `TextureNode.type`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.556 TextureNodes(bpy\_struct)

base class — `bpy_struct`

`class bpy.types.TextureNodes (bpy_struct)`

Collection of Texture Nodes

`new (type, group=None)`

Add a node to this node tree.

### Parameters

- `type (enum in ['OUTPUT', 'CHECKER', 'TEXTURE', 'BRICKS', 'MATH', 'MIX_RGB', 'RGBTOBW', 'VALTORGB', 'IMAGE', 'CURVE_RGB', 'INVERT', 'HUE_SAT', 'CURVE_TIME', 'ROTATE', 'VIEWER', 'TRANSLATE', 'COORD', 'DISTANCE', 'COMPOSE', 'DECOMPOSE', 'VALTONOR', 'SCALE', 'SCRIPT', 'GROUP']) – Type, Type of node to add`
- `group (NodeTree, (optional)) – The group tree`

**Returns** New node.

**Return type** [Node](#)

**remove** (*node*)

remove a node from this node tree.

**Parameters** **node** ([Node](#)) – The node to remove.

## Inherited Properties

- [bpy\\_struct.id\\_data](#)

## Inherited Functions

- [bpy\\_struct.as\\_pointer](#)
- [bpy\\_struct.callback\\_add](#)
- [bpy\\_struct.callback\\_remove](#)
- [bpy\\_struct.driver\\_add](#)
- [bpy\\_struct.driver\\_remove](#)
- [bpy\\_struct.get](#)
- [bpy\\_struct.is\\_property\\_hidden](#)
- [bpy\\_struct.is\\_property\\_set](#)
- [bpy\\_struct.items](#)
- [bpy\\_struct.keyframe\\_delete](#)
- [bpy\\_struct.keyframe\\_insert](#)
- [bpy\\_struct.keys](#)
- [bpy\\_struct.path\\_from\\_id](#)
- [bpy\\_struct.path\\_resolve](#)
- [bpy\\_struct.type\\_recast](#)
- [bpy\\_struct.values](#)

## References

- [TextureNodeTree.nodes](#)

## 2.4.557 TextureSlot([bpy\\_struct](#))

base class — [bpy\\_struct](#)

subclasses — [ParticleSettingsTextureSlot](#), [MaterialTextureSlot](#), [LampTextureSlot](#), [BrushTextureSlot](#), [WorldTextureSlot](#)

**class** [bpy.types.TextureSlot](#) ([bpy\\_struct](#))

Texture slot defining the mapping and influence of a texture

**blend\_type**

The mode used to apply the texture

**Type** enum in ['MIX', 'ADD', 'SUBTRACT', 'MULTIPLY', 'SCREEN', 'OVERLAY', 'DIFFERENCE', 'DIVIDE', 'DARKEN', 'LIGHTEN', 'HUE', 'SATURATION', 'VALUE', 'COLOR', 'SOFT\_LIGHT', 'LINEAR\_LIGHT'], default 'MIX'

**color**

The default color for textures that don't return RGB or when RGB to intensity is enabled

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**default\_value**

Value to use for Ref, Spec, Amb, Emit, Alpha, RayMir, TransLu and Hard

**Type** float in [-inf, inf], default 0.0

**invert**

Inverts the values of the texture to reverse its effect

**Type** boolean, default False

**name**

Texture slot name

**Type** string, default "", (readonly)

**offset**

Fine tunes texture mapping X, Y and Z locations

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**output\_node**

Which output node to use, for node-based textures

**Type** enum in ['DUMMY'], default 'DUMMY'

**scale**

Sets scaling for the texture's X, Y and Z sizes

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**texture**

Texture datablock used by this texture slot

**Type** Texture

**use\_rgb\_to\_intensity**

Converts texture RGB values to intensity (gray) values

**Type** boolean, default False

**use\_stencil**

Use this texture as a blending value on the next texture

**Type** boolean, default False

**Inherited Properties**

- bpy\_struct.id\_data

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get

- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- UILayout.template\_preview

### 2.4.558 Theme(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.Theme (*bpy\_struct*)

Theme settings defining draw style and colors in the user interface

**bone\_color\_sets**

**Type** bpy\_prop\_collection of ThemeBoneColorSet, (readonly, never None)

**console**

**Type** ThemeConsole, (readonly, never None)

**dopesheet\_editor**

**Type** ThemeDopeSheet, (readonly, never None)

**file\_browser**

**Type** ThemeFileDialog, (readonly, never None)

**graph\_editor**

**Type** ThemeGraphEditor, (readonly, never None)

**image\_editor**

**Type** ThemeImageEditor, (readonly, never None)

**info**

**Type** ThemeInfo, (readonly, never None)

**logic\_editor**

**Type** ThemeLogicEditor, (readonly, never None)

**name**

Name of the theme

**Type** string, default “”

**nla\_editor**

**Type** ThemeNLAEditor, (readonly, never None)

**node\_editor**

Type ThemeNodeEditor, (readonly, never None)

**outliner**

Type ThemeOutliner, (readonly, never None)

**properties**

Type ThemeProperties, (readonly, never None)

**sequence\_editor**

Type ThemeSequenceEditor, (readonly, never None)

**text\_editor**

Type ThemeTextEditor, (readonly, never None)

**theme\_area**

Type enum in ['USER\_INTERFACE', 'BONE\_COLOR\_SETS', 'VIEW\_3D', 'TIMELINE', 'GRAPH\_EDITOR', 'DOPESHEET\_EDITOR', 'NLA\_EDITOR', 'IMAGE\_EDITOR', 'SEQUENCE\_EDITOR', 'TEXT\_EDITOR', 'NODE\_EDITOR', 'LOGIC\_EDITOR', 'PROPERTIES', 'OUTLINER', 'USER\_PREFERENCES', 'INFO', 'FILE\_BROWSER', 'CONSOLE'], default 'USER\_INTERFACE'

**timeline**

Type ThemeTimeline, (readonly, never None)

**user\_interface**

Type ThemeUserInterface, (readonly, never None)

**user\_preferences**

Type ThemeUserPreferences, (readonly, never None)

**view\_3d**

Type ThemeView3D, (readonly, never None)

**Inherited Properties**

- bpy\_struct.id\_data

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys

- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `UserPreferences.themes`

### 2.4.559 ThemeAudioWindow(`bpy_struct`)

base class — `bpy_struct`

`class bpy.types.ThemeAudioWindow(bpy_struct)`

Theme settings for the Audio Window

**back**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button\_text**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button\_text\_hi**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button\_title**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**frame\_current**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**grid**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**header**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**header\_text**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**header\_text\_hi**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**text**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**text\_hi**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**title**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**window\_sliders**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**Inherited Properties**

- `bpy_struct.id_data`

**Inherited Functions**

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.560 ThemeBoneColorSet(`bpy_struct`)

base class — `bpy_struct`

`class bpy.types.ThemeBoneColorSet(bpy_struct)`

Theme settings for bone color sets

**active**

Color used for active bones

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**normal**

Color used for the surface of bones

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**select**

Color used for selected bones

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**show\_colored\_constraints**

Allow the use of colors indicating constraints/keyed status

**Type** boolean, default False

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `BoneGroup.colors`
- `Theme.bone_color_sets`

## 2.4.561 ThemeConsole(`bpy_struct`)

base class — `bpy_struct`

**class bpy.types.ThemeConsole (`bpy_struct`)**

Theme settings for the Console

**back**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button\_text**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button\_text\_hi**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button\_title**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**cursor**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**header**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**header\_text**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**header\_text\_hi**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**line\_error**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**line\_info**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**line\_input**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**line\_output**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**text**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**text\_hi**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**title**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`

- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `Theme.console`

### 2.4.562 ThemeDopeSheet(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.ThemeDopeSheet` (`bpy_struct`)

Theme settings for the DopeSheet

**active\_channels\_group**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**back**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button\_text**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button\_text\_hi**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button\_title**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**channel\_group**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**channels**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**channels\_selected**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**dopesheet\_channel**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**dopesheet\_subchannel**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**frame\_current**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**grid**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**header**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**header\_text**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**header\_text\_hi**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**list**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**list\_text**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**list\_text\_hi**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**list\_title**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**long\_key**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**long\_key\_selected**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**text**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**text\_hi**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**title**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**value\_sliders**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**view\_sliders**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**Inherited Properties**

- `bpy_struct.id_data`

**Inherited Functions**

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`

- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `Theme.dopesheet_editor`

### 2.4.563 ThemeFileBrowser(`bpy_struct`)

base class — `bpy_struct`

**class bpy.types.ThemeFileBrowser (`bpy_struct`)**  
Theme settings for the File Browser

**active\_file**  
**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**active\_file\_text**  
**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**back**  
**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button**  
**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button\_text**  
**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button\_text\_hi**  
**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button\_title**  
**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**header**  
**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**header\_text**  
**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**header\_text\_hi**  
**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**list**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**list\_text**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**list\_text\_hi**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**list\_title**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**scroll\_handle**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**scrollbar**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**selected\_file**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**text**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**text\_hi**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**tiles**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**title**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`

- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `Theme.file_browser`

### 2.4.564 `ThemeFontStyle(bpy_struct)`

base class — `bpy_struct`

**class bpy.types.ThemeFontStyle (bpy\_struct)**

Theme settings for Font

**font\_kerning\_style**

Which style to use for font kerning

**Type** enum in ['UNFITTED', 'DEFAULT'], default 'UNFITTED'

**points**

**Type** int in [6, 48], default 0

**shadow**

Shadow size in pixels (0, 3 and 5 supported)

**Type** int in [0, 5], default 0

**shadow\_offset\_x**

Shadow offset in pixels

**Type** int in [-10, 10], default 0

**shadow\_offset\_y**

Shadow offset in pixels

**Type** int in [-10, 10], default 0

**shadowalpha**

**Type** float in [0, 1], default 0.0

**shadowcolor**

Shadow color in grey value

**Type** float in [0, 1], default 0.0

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`

- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `ThemeStyle.panel_title`
- `ThemeStyle.widget`
- `ThemeStyle.widget_label`

## 2.4.565 ThemeGraphEditor(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.ThemeGraphEditor(bpy_struct)`  
Theme settings for the graph editor

**active\_channels\_group**  
**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**back**  
**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button**  
**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button\_text**  
**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button\_text\_hi**  
**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button\_title**  
**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**channel\_group**  
**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**channels\_region**  
**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**dopesheet\_channel**  
**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**dopesheet\_subchannel**  
  **Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**frame\_current**  
  **Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**grid**  
  **Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**handle\_align**  
  **Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**handle\_auto**  
  **Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**handle\_free**  
  **Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**handle\_sel\_align**  
  **Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**handle\_sel\_auto**  
  **Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**handle\_sel\_free**  
  **Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**handle\_sel\_vect**  
  **Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**handle\_vect**  
  **Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**handle\_vertex**  
  **Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**handle\_vertex\_select**  
  **Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**handle\_vertex\_size**  
  **Type** int in [0, 255], default 0

**header**  
  **Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**header\_text**  
  **Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**header\_text\_hi**  
  **Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**lastsel\_point**  
  **Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**list**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**list\_text**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**list\_text\_hi**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**list\_title**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**panel**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**text**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**text\_hi**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**title**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**vertex**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**vertex\_select**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**vertex\_size**

**Type** int in [1, 10], default 0

**window\_sliders**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**Inherited Properties**

- [bpy\\_struct.id\\_data](#)

**Inherited Functions**

- [bpy\\_struct.as\\_pointer](#)
- [bpy\\_struct.callback\\_add](#)
- [bpy\\_struct.callback\\_remove](#)
- [bpy\\_struct.driver\\_add](#)
- [bpy\\_struct.driver\\_remove](#)
- [bpy\\_struct.get](#)
- [bpy\\_struct.is\\_property\\_hidden](#)
- [bpy\\_struct.is\\_property\\_set](#)
- [bpy\\_struct.items](#)
- [bpy\\_struct.keyframe\\_delete](#)

- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `Theme.graph_editor`

### 2.4.566 ThemelImageEditor(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.ThemelImageEditor(bpy_struct)`

Theme settings for the Image Editor

**back**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button\_text**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button\_text\_hi**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button\_title**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**editmesh\_active**

**Type** float array of 4 items in [-inf, inf], default (0.0, 0.0, 0.0, 0.0)

**face**

**Type** float array of 4 items in [-inf, inf], default (0.0, 0.0, 0.0, 0.0)

**face\_dot**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**face\_select**

**Type** float array of 4 items in [-inf, inf], default (0.0, 0.0, 0.0, 0.0)

**facedot\_size**

**Type** int in [1, 10], default 0

**header**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**header\_text**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**header\_text\_hi**  
  **Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**scope\_back**  
  **Type** float array of 4 items in [-inf, inf], default (0.0, 0.0, 0.0, 0.0)

**text**  
  **Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**text\_hi**  
  **Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**title**  
  **Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**vertex**  
  **Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**vertex\_select**  
  **Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**vertex\_size**  
  **Type** int in [1, 10], default 0

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `Theme.image_editor`

## 2.4.567 ThemeInfo(bpy\_struct)

base class — [bpy\\_struct](#)

**class bpy.types.ThemeInfo (bpy\_struct)**  
Theme settings for Info

**back**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button\_text**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button\_text\_hi**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button\_title**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**header**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**header\_text**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**header\_text\_hi**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**text**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**text\_hi**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**title**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

### Inherited Properties

- [bpy\\_struct.id\\_data](#)

### Inherited Functions

- [bpy\\_struct.as\\_pointer](#)
- [bpy\\_struct.callback\\_add](#)
- [bpy\\_struct.callback\\_remove](#)
- [bpy\\_struct.driver\\_add](#)
- [bpy\\_struct.driver\\_remove](#)
- [bpy\\_struct.get](#)
- [bpy\\_struct.is\\_property\\_hidden](#)

- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- [Theme.info](#)

### 2.4.568 ThemeLogicEditor(bpy\_struct)

base class — `bpy_struct`

**class** `bpy.types.ThemeLogicEditor(bpy_struct)`  
Theme settings for the Logic Editor

**back**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button\_text**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button\_text\_hi**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button\_title**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**header**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**header\_text**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**header\_text\_hi**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**panel**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**text**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**text\_hi**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**title**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**Inherited Properties**

- bpy\_struct.id\_data

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

**References**

- Theme.logic\_editor

## 2.4.569 ThemeNLAEditor(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.ThemeNLAEditor (*bpy\_struct*)

Theme settings for the NLA Editor

**back**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**bars**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**bars\_selected**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button\_text**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button\_text\_hi**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button\_title**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**frame\_current**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**grid**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**header**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**header\_text**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**header\_text\_hi**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**list**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**list\_text**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**list\_text\_hi**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**list\_title**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**strips**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**strips\_selected**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**text**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**text\_hi**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**title**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**view\_sliders**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `Theme.nla_editor`

## 2.4.570 ThemeNodeEditor(`bpy_struct`)

base class — `bpy_struct`

`class bpy.types.ThemeNodeEditor(bpy_struct)`

Theme settings for the Node Editor

**back**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button\_text**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button\_text\_hi**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button\_title**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**converter\_node**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**group\_node**  
  **Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**header**  
  **Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**header\_text**  
  **Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**header\_text\_hi**  
  **Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**in\_out\_node**  
  **Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**list**  
  **Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**list\_text**  
  **Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**list\_text\_hi**  
  **Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**list\_title**  
  **Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**nodeBackdrop**  
  **Type** float array of 4 items in [-inf, inf], default (0.0, 0.0, 0.0, 0.0)

**noodle\_curving**  
  Curving of the noodle  
  **Type** int in [0, 10], default 5

**operator\_node**  
  **Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**selected\_text**  
  **Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**text**  
  **Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**text\_hi**  
  **Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**title**  
  **Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**wire**  
  **Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**wire\_select**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

### Inherited Properties

- bpy\_struct.id\_data

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

### References

- Theme.node\_editor

## 2.4.571 ThemeOutliner(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.ThemeOutliner(bpy\_struct)

Theme settings for the Outliner

**back**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button\_text**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button\_text\_hi**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button\_title**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**header**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**header\_text**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**header\_text\_hi**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**text**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**text\_hi**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**title**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**Inherited Properties**

- `bpy_struct.id_data`

**Inherited Functions**

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

**References**

- `Theme.outliner`

## 2.4.572 ThemeProperties(`bpy_struct`)

base class — `bpy_struct`

```
class bpy.types.ThemeProperties(bpy_struct)
    Theme settings for the Properties

    back
        Type float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

    button
        Type float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

    button_text
        Type float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

    button_text_hi
        Type float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

    button_title
        Type float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

    header
        Type float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

    header_text
        Type float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

    header_text_hi
        Type float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

    panel
        Type float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

    text
        Type float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

    text_hi
        Type float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

    title
        Type float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)
```

## Inherited Properties

- [bpy\\_struct.id\\_data](#)

## Inherited Functions

- [bpy\\_struct.as\\_pointer](#)
- [bpy\\_struct.callback\\_add](#)
- [bpy\\_struct.callback\\_remove](#)
- [bpy\\_struct.driver\\_add](#)
- [bpy\\_struct.driver\\_remove](#)
- [bpy\\_struct.get](#)
- [bpy\\_struct.is\\_property\\_hidden](#)

- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- Theme.properties

### 2.4.573 ThemeSequenceEditor(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.ThemeSequenceEditor (*bpy\_struct*)

Theme settings for the Sequence Editor

**audio\_strip**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**back**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button\_text**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button\_text\_hi**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button\_title**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**draw\_action**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**effect\_strip**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**frame\_current**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**grid**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**header**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**header\_text**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**header\_text\_hi**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**image\_strip**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**keyframe**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**meta\_strip**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**movie\_strip**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**plugin\_strip**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**scene\_strip**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**text**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**text\_hi**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**title**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**transition\_strip**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**window\_sliders**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**Inherited Properties**

- `bpy_struct.id_data`

**Inherited Functions**

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`

- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- Theme.sequence\_editor

## 2.4.574 ThemeStyle(bpy\_struct)

base class — bpy\_struct

```
class bpy.types.ThemeStyle(bpy_struct)
    Theme settings for style sets

    panel_title
        Type ThemeFontStyle, (readonly, never None)

    widget
        Type ThemeFontStyle, (readonly, never None)

    widget_label
        Type ThemeFontStyle, (readonly, never None)
```

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast

- `bpy_struct.values`

## References

- `UserPreferences.ui_styles`

### 2.4.575 ThemeTextEditor(`bpy_struct`)

base class — `bpy_struct`

`class bpy.types.ThemeTextEditor(bpy_struct)`

Theme settings for the Text Editor

**back**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button\_text**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button\_text\_hi**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button\_title**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**cursor**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**header**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**header\_text**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**header\_text\_hi**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**line\_numbers\_background**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**scroll\_bar**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**selected\_text**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**syntax\_builtin**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**syntax\_comment**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

#### **syntax\_numbers**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

#### **syntax\_special**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

#### **syntax\_string**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

#### **text**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

#### **text\_hi**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

#### **title**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

### Inherited Properties

- [bpy\\_struct.id\\_data](#)

### Inherited Functions

- [bpy\\_struct.as\\_pointer](#)
- [bpy\\_struct.callback\\_add](#)
- [bpy\\_struct.callback\\_remove](#)
- [bpy\\_struct.driver\\_add](#)
- [bpy\\_struct.driver\\_remove](#)
- [bpy\\_struct.get](#)
- [bpy\\_struct.is\\_property\\_hidden](#)
- [bpy\\_struct.is\\_property\\_set](#)
- [bpy\\_struct.items](#)
- [bpy\\_struct.keyframe\\_delete](#)
- [bpy\\_struct.keyframe\\_insert](#)
- [bpy\\_struct.keys](#)
- [bpy\\_struct.path\\_from\\_id](#)
- [bpy\\_struct.path\\_resolve](#)
- [bpy\\_struct.type\\_recast](#)
- [bpy\\_struct.values](#)

### References

- [Theme.text\\_editor](#)

## 2.4.576 ThemeTimeline(bpy\_struct)

base class — `bpy_struct`

`class bpy.types.ThemeTimeline(bpy_struct)`

Theme settings for the Timeline

**back**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button\_text**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button\_text\_hi**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button\_title**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**frame\_current**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**grid**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**header**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**header\_text**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**header\_text\_hi**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**text**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**text\_hi**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**title**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

### Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `Theme.timeline`

## 2.4.577 ThemeUserInterface(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.ThemeUserInterface` (`bpy_struct`)  
Theme settings for user interface elements

**icon\_file**  
**Type** string, default “”

**wcol\_box**  
**Type** `ThemeWidgetColors`, (readonly, never None)

**wcol\_list\_item**  
**Type** `ThemeWidgetColors`, (readonly, never None)

**wcol\_menu**  
**Type** `ThemeWidgetColors`, (readonly, never None)

**wcol\_menu\_back**  
**Type** `ThemeWidgetColors`, (readonly, never None)

**wcol\_menu\_item**  
**Type** `ThemeWidgetColors`, (readonly, never None)

**wcol\_num**  
**Type** `ThemeWidgetColors`, (readonly, never None)

**wcol\_numslider**

**Type** `ThemeWidgetColors`, (readonly, never None)

**wcol\_option**

**Type** `ThemeWidgetColors`, (readonly, never None)

**wcol\_progress**

**Type** `ThemeWidgetColors`, (readonly, never None)

**wcol\_pulldown**

**Type** `ThemeWidgetColors`, (readonly, never None)

**wcol\_radio**

**Type** `ThemeWidgetColors`, (readonly, never None)

**wcol\_regular**

**Type** `ThemeWidgetColors`, (readonly, never None)

**wcol\_scroll**

**Type** `ThemeWidgetColors`, (readonly, never None)

**wcol\_state**

**Type** `ThemeWidgetStateColors`, (readonly, never None)

**wcol\_text**

**Type** `ThemeWidgetColors`, (readonly, never None)

**wcol\_toggle**

**Type** `ThemeWidgetColors`, (readonly, never None)

**wcol\_tool**

**Type** `ThemeWidgetColors`, (readonly, never None)

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`

- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `Theme.user_interface`

### 2.4.578 ThemeUserPreferences(`bpy_struct`)

base class — `bpy_struct`

`class bpy.types.ThemeUserPreferences (bpy_struct)`

Theme settings for the User Preferences

**back**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button\_text**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button\_text\_hi**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button\_title**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**header**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**header\_text**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**header\_text\_hi**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**text**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**text\_hi**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**title**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `Theme.user_preferences`

## 2.4.579 ThemeView3D(`bpy_struct`)

base class — `bpy_struct`

`class bpy.types.ThemeView3D (bpy_struct)`

Theme settings for the 3D View

**act\_spline**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**back**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**bone\_pose**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**bone\_solid**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button\_text**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button\_text\_hi**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**button\_title**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**edge\_creature**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**edge\_facesel**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**edge\_seam**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**edge\_select**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**edge\_sharp**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**editmesh\_active**

**Type** float array of 4 items in [-inf, inf], default (0.0, 0.0, 0.0, 0.0)

**extra\_edge\_len**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**extra\_face\_angle**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**extra\_face\_area**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**face**

**Type** float array of 4 items in [-inf, inf], default (0.0, 0.0, 0.0, 0.0)

**face\_dot**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**face\_select**

**Type** float array of 4 items in [-inf, inf], default (0.0, 0.0, 0.0, 0.0)

**facedot\_size**

**Type** int in [1, 10], default 0

**frame\_current**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**grid**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**handle\_align**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**handle\_auto**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**handle\_free**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**handle\_sel\_align**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**handle\_sel\_auto**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**handle\_sel\_free**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**handle\_sel\_vect**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**handle\_vect**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**header**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**header\_text**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**header\_text\_hi**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**lamp**

**Type** float array of 4 items in [-inf, inf], default (0.0, 0.0, 0.0, 0.0)

**lastsel\_point**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**normal**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**nurb\_sel\_uline**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**nurb\_sel\_vline**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**nurb\_uline**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**nurb\_vline**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**object\_active**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**object\_grouped**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**object\_grouped\_active**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**object\_selected**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**outline\_width**

**Type** int in [1, 5], default 0

**panel**

**Type** float array of 4 items in [-inf, inf], default (0.0, 0.0, 0.0, 0.0)

**text**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**text\_hi**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**title**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**transform**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**vertex**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**vertex\_normal**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**vertex\_select**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**vertex\_size**

**Type** int in [1, 10], default 0

**wire**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`

- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `Theme.view_3d`

### 2.4.580 ThemeWidgetColors(`bpy_struct`)

base class — `bpy_struct`

```
class bpy.types.ThemeWidgetColors(bpy_struct)
    Theme settings for widget color sets

    inner
        Type float array of 4 items in [-inf, inf], default (0.0, 0.0, 0.0, 0.0)

    inner_sel
        Type float array of 4 items in [-inf, inf], default (0.0, 0.0, 0.0, 0.0)

    item
        Type float array of 4 items in [-inf, inf], default (0.0, 0.0, 0.0, 0.0)

    outline
        Type float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

    shadedown
        Type int in [-100, 100], default 0

    shadetop
        Type int in [-100, 100], default 0

    show_shaded
        Type boolean, default False

    text
        Type float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

    text_sel
        Type float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)
```

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `ThemeUserInterface.wcol_box`
- `ThemeUserInterface.wcol_list_item`
- `ThemeUserInterface.wcol_menu`
- `ThemeUserInterface.wcol_menu_back`
- `ThemeUserInterface.wcol_menu_item`
- `ThemeUserInterface.wcol_num`
- `ThemeUserInterface.wcol_numslider`
- `ThemeUserInterface.wcol_option`
- `ThemeUserInterface.wcol_progress`
- `ThemeUserInterface.wcol_pulldown`
- `ThemeUserInterface.wcol_radio`
- `ThemeUserInterface.wcol_regular`
- `ThemeUserInterface.wcol_scroll`
- `ThemeUserInterface.wcol_text`
- `ThemeUserInterface.wcol_toggle`
- `ThemeUserInterface.wcol_tool`

## 2.4.581 ThemeWidgetStateColors(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.ThemeWidgetStateColors` (`bpy_struct`)

Theme settings for widget state colors

**blend**

**Type** float in [0, 1], default 0.0

**inner\_anim**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**inner\_anim\_sel**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**inner\_driven**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**inner\_driven\_sel**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**inner\_key**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**inner\_key\_sel**

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- ThemeUserInterface.wcol\_state

## 2.4.582 TimelineMarker(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.TimelineMarker (*bpy\_struct*)  
Marker for noting points in the timeline

**camera**

Camera this timeline sets to active

**Type** Object

**frame**

The frame on which the timeline marker appears

**Type** int in [-inf, inf], default 0

**name**

**Type** string, default “”

**select**

Marker selection state

**Type** boolean, default False

**Inherited Properties**

- bpy\_struct.id\_data

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

**References**

- Action.pose\_markers
- ActionPoseMarkers.active
- ActionPoseMarkers.new
- ActionPoseMarkers.remove
- Scene.timeline\_markers
- TimelineMarkers.new
- TimelineMarkers.remove

## 2.4.583 TimelineMarkers(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.TimelineMarkers (*bpy\_struct*)

Collection of timeline markers

**new** (*name*)

Add a keyframe to the curve.

**Parameters** *name* (*string*) – New name for the marker (not unique).

**Returns** Newly created timeline marker

**Return type** [TimelineMarker](#)

**remove** (*marker*)

Remove a timeline marker.

**Parameters** *marker* ([TimelineMarker](#), (never None)) – Timeline marker to remove.

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `Scene.timeline_markers`

## 2.4.584 Timer(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.Timer` (`bpy_struct`)

Window event timer

**time\_delta**

Time since last step in seconds

**Type** float in [-inf, inf], default 0.0, (readonly)

**time\_duration**

Time since last step in seconds

**Type** float in [-inf, inf], default 0.0, (readonly)

#### time\_step

**Type** float in [-inf, inf], default 0.0, (readonly)

### Inherited Properties

- `bpy_struct.id_data`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

### References

- `WindowManager.event_timer_add`
- `WindowManager.event_timer_remove`

## 2.4.585 ToolSettings(`bpy_struct`)

base class — `bpy_struct`

`class bpy.types.ToolSettings (bpy_struct)`

#### `auto_keying_mode`

Mode of automatic keyframe insertion for Objects and Bones

**Type** enum in ['ADD\_REPLACE\_KEYS', 'REPLACE\_KEYS'], default 'REPLACE\_KEYS'

#### `edge_path_live_unwrap`

Changing edges seam re-calculates UV unwrap

**Type** boolean, default False

#### `edge_path_mode`

The edge flag to tag when selecting the shortest path

**Type** enum in ['SELECT', 'SEAM', 'SHARP', 'CREASE', 'BEVEL'], default 'SELECT'

**etch\_adaptive\_limit**  
Number of bones in the subdivided stroke

**Type** float in [1e-05, 1], default 0.0

**etch\_convert\_mode**  
Method used to convert stroke to bones

**Type** enum in ['FIXED', 'LENGTH', 'ADAPTIVE', 'RETARGET'], default 'FIXED'

**etch\_length\_limit**  
Number of bones in the subdivided stroke

**Type** float in [1e-05, 100000], default 0.0

**etch\_number**  
DOC BROKEN

**Type** string, default ""

**etch\_roll\_mode**  
Method used to adjust the roll of bones when retargeting

**Type** enum in ['NONE', 'VIEW', 'JOINT'], default 'NONE'

**etch\_side**  
DOC BROKEN

**Type** string, default ""

**etch\_subdivision\_number**  
Number of bones in the subdivided stroke

**Type** int in [1, 255], default 0

**etch\_template**  
Template armature that will be retargeted to the stroke

**Type** Object

**image\_paint**

**Type** ImagePaint, (readonly)

**mesh\_select\_mode**  
Which mesh elements selection works on

**Type** boolean array of 3 items, default (False, False, False)

**normal\_size**  
Display size for normals in the 3D view

**Type** float in [1e-05, 1000], default 0.0

**particle\_edit**

**Type** ParticleEdit, (readonly)

**proportional\_edit**  
Proportional Editing mode, allows transforms with distance fall-off

**Type** enum in ['DISABLED', 'ENABLED', 'CONNECTED'], default 'DISABLED'

**proportional\_edit\_falloff**  
Falloff type for proportional editing mode

**Type** enum in ['SMOOTH', 'SPHERE', 'ROOT', 'SHARP', 'LINEAR', 'CONSTANT', 'RANDOM'], default 'SMOOTH'

**proportional\_size**  
Display size for proportional editing circle  
**Type** float in [1e-05, 5000], default 0.0

**sculpt**  
**Type** Sculpt, (readonly)

**sculpt\_paint\_use\_unified\_size**  
Instead of per brush radius, the radius is shared across brushes  
**Type** boolean, default False

**sculpt\_paint\_use\_unified\_strength**  
Instead of per brush strength, the strength is shared across brushes  
**Type** boolean, default False

**show\_uv\_local\_view**  
Draw only faces with the currently displayed image assigned  
**Type** boolean, default False

**snap\_element**  
Type of element to snap to  
**Type** enum in ['INCREMENT', 'VERTEX', 'EDGE', 'FACE', 'VOLUME'], default 'INCREMENT'

**snap\_target**  
Which part to snap onto the target  
**Type** enum in ['CLOSEST', 'CENTER', 'MEDIAN', 'ACTIVE'], default 'CLOSEST'

**use\_auto\_normalize**  
Ensure all bone-deforming vertex groups add up to 1.0 while weight painting  
**Type** boolean, default False

**use\_bone\_sketching**  
DOC BROKEN  
**Type** boolean, default False

**use\_etch\_autoname**  
DOC BROKEN  
**Type** boolean, default False

**use\_etch\_overdraw**  
DOC BROKEN  
**Type** boolean, default False

**use\_etch\_quick**  
DOC BROKEN  
**Type** boolean, default False

**use\_grease\_pencil\_sessions**  
Allow drawing multiple strokes at a time with Grease Pencil  
**Type** boolean, default False

**use\_keyframe\_insert\_auto**

Automatic keyframe insertion for Objects and Bones

**Type** boolean, default False

**use\_keyframe\_insert\_keyingset**

Automatic keyframe insertion using active Keying Set only

**Type** boolean, default False

**use\_mesh\_automerge**

Automatically merge vertices moved to the same location

**Type** boolean, default False

**use\_proportional\_edit\_objects**

Proportional editing object mode

**Type** boolean, default False

**use\_record\_with\_nla**

Add a new NLA Track + Strip for every loop/pass made over the animation to allow non-destructive tweaking

**Type** boolean, default False

**use\_snap**

Snap during transform

**Type** boolean, default False

**use\_snap\_align\_rotation**

Align rotation with the snapping target

**Type** boolean, default False

**use\_snap\_peel\_object**

Consider objects as whole when finding volume center

**Type** boolean, default False

**use\_snap\_project**

Project individual elements on the surface of other objects

**Type** boolean, default False

**use\_snap\_self**

Snap onto its self (editmode)

**Type** boolean, default False

**use\_uv\_select\_sync**

Keep UV and edit mode mesh selection in sync

**Type** boolean, default False

**uv\_select\_mode**

UV selection and display mode

**Type** enum in ['VERTEX', 'EDGE', 'FACE', 'ISLAND'], default 'VERTEX'

**vertex\_group\_weight**

Weight to assign in vertex groups

**Type** float in [0, 1], default 0.0

**vertex\_paint**

**Type** `VertexPaint`, (readonly)

**weight\_paint**

**Type** `VertexPaint`, (readonly)

### Inherited Properties

- `bpy_struct.id_data`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

### References

- `Context.tool_settings`
- `Scene.tool_settings`

## 2.4.586 TouchSensor(*Sensor*)

base classes — `bpy_struct, Sensor`

**class** `bpy.types.TouchSensor` (*Sensor*)  
Sensor to detect objects colliding with the current object

**material**  
Only look for objects with this material (blank = all objects)

**Type** `Material`

### Inherited Properties

- `bpy_struct.id_data`
- `Sensor.name`
- `Sensor.show_expanded`
- `Sensor.frequency`

- Sensor.invert
- Sensor.use\_level
- Sensor.pin
- Sensor.use\_pulse\_false\_level
- Sensor.use\_pulse\_true\_level
- Sensor.use\_tap
- Sensor.type

#### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- Sensor.link
- Sensor.unlink

### 2.4.587 TrackToConstraint(Constraint)

base classes — bpy\_struct, Constraint

**class** bpy.types.TrackToConstraint (*Constraint*)

Aims the constrained object toward the target

**head\_tail**

Target along length of bone: Head=0, Tail=1

**Type** float in [0, 1], default 0.0

**subtarget**

**Type** string, default “”

**target**

Target Object

**Type** Object

**track\_axis**

Axis that points to the target object

**Type** enum in ['TRACK\_X', 'TRACK\_Y', 'TRACK\_Z', 'TRACK\_NEGATIVE\_X', 'TRACK\_NEGATIVE\_Y', 'TRACK\_NEGATIVE\_Z'], default 'TRACK\_X'

**up\_axis**

Axis that points upward

**Type** enum in ['UP\_X', 'UP\_Y', 'UP\_Z'], default 'UP\_X'

**use\_target\_z**

Target's Z axis, not World Z axis, will constraint the Up direction

**Type** boolean, default False

**Inherited Properties**

- bpy\_struct.id\_data
- Constraint.name
- Constraint.active
- Constraint.mute
- Constraint.show\_expanded
- Constraint.influence
- Constraint.error\_location
- Constraint.owner\_space
- Constraint.is\_proxy\_local
- Constraint.error\_rotation
- Constraint.target\_space
- Constraint.type
- Constraint.is\_valid

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.588 TransformConstraint(Constraint)

base classes — bpy\_struct, Constraint

**class** bpy.types.TransformConstraint (*Constraint*)

Maps transformations of the target to the object

**from\_max\_x**

Top range of X axis source motion

**Type** float in [-inf, inf], default 0.0

**from\_max\_y**  
Top range of Y axis source motion

**Type** float in [-inf, inf], default 0.0

**from\_max\_z**  
Top range of Z axis source motion

**Type** float in [-inf, inf], default 0.0

**from\_min\_x**  
Bottom range of X axis source motion

**Type** float in [-inf, inf], default 0.0

**from\_min\_y**  
Bottom range of Y axis source motion

**Type** float in [-inf, inf], default 0.0

**from\_min\_z**  
Bottom range of Z axis source motion

**Type** float in [-inf, inf], default 0.0

**map\_from**  
The transformation type to use from the target

**Type** enum in ['LOCATION', 'ROTATION', 'SCALE'], default 'LOCATION'

**map\_to**  
The transformation type to affect of the constrained object

**Type** enum in ['LOCATION', 'ROTATION', 'SCALE'], default 'LOCATION'

**map\_to\_x\_from**  
The source axis constrained object's X axis uses

**Type** enum in ['X', 'Y', 'Z'], default 'X'

**map\_to\_y\_from**  
The source axis constrained object's Y axis uses

**Type** enum in ['X', 'Y', 'Z'], default 'X'

**map\_to\_z\_from**  
The source axis constrained object's Z axis uses

**Type** enum in ['X', 'Y', 'Z'], default 'X'

**subtarget**

**Type** string, default ""

**target**  
Target Object

**Type** [Object](#)

**to\_max\_x**  
Top range of X axis destination motion

**Type** float in [-inf, inf], default 0.0

**to\_max\_y**

Top range of Y axis destination motion

**Type** float in [-inf, inf], default 0.0

**to\_max\_z**

Top range of Z axis destination motion

**Type** float in [-inf, inf], default 0.0

**to\_min\_x**

Bottom range of X axis destination motion

**Type** float in [-inf, inf], default 0.0

**to\_min\_y**

Bottom range of Y axis destination motion

**Type** float in [-inf, inf], default 0.0

**to\_min\_z**

Bottom range of Z axis destination motion

**Type** float in [-inf, inf], default 0.0

**use\_motion\_extrapolate**

Extrapolate ranges

**Type** boolean, default False

## Inherited Properties

- bpy\_struct.id\_data
- Constraint.name
- Constraint.active
- Constraint.mute
- Constraint.show\_expanded
- Constraint.influence
- Constraint.error\_location
- Constraint.owner\_space
- Constraint.is\_proxy\_local
- Constraint.error\_rotation
- Constraint.target\_space
- Constraint.type
- Constraint.is\_valid

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete

- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.589 TransformOrientation(`bpy_struct`)

base class — `bpy_struct`

```
class bpy.types.TransformOrientation(bpy_struct)
```

### `matrix`

**Type** float array of 9 items in [-inf, inf], default (0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0)

### `name`

**Type** string, default “”

### Inherited Properties

- `bpy_struct.id_data`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

### References

- `Scene.orientations`
- `SpaceView3D.current_orientation`

## 2.4.590 TransformSequence(EffectSequence)

base classes — `bpy_struct`, `Sequence`, `EffectSequence`

**class bpy.types.TransformSequence (EffectSequence)**  
Sequence strip applying affine transformations to other strips

**interpolation**  
**Type** enum in ['NONE', 'BILINEAR', 'BICUBIC'], default 'NONE'

**rotation\_start**  
**Type** float in [-360, 360], default 0.0

**scale\_start\_x**  
**Type** float in [0, inf], default 0.0

**scale\_start\_y**  
**Type** float in [0, inf], default 0.0

**translate\_start\_x**  
**Type** float in [-inf, inf], default 0.0

**translate\_start\_y**  
**Type** float in [-inf, inf], default 0.0

**translation\_unit**  
**Type** enum in ['PIXELS', 'PERCENT'], default 'PIXELS'

**use\_uniform\_scale**  
Scale uniformly, preserving aspect ratio  
**Type** boolean, default False

### Inherited Properties

- `bpy_struct.id_data`
- `Sequence.name`
- `Sequence.blend_type`
- `Sequence.blend_alpha`
- `Sequence.channel`
- `Sequence.effect_fader`
- `Sequence.frame_final_end`
- `Sequence.frame_offset_end`
- `Sequence.frame_still_end`
- `Sequence.input_1`
- `Sequence.input_2`
- `Sequence.input_3`
- `Sequence.select_left_handle`
- `Sequence.frame_final_duration`
- `Sequence.frame_duration`
- `Sequence.lock`
- `Sequence.mute`
- `Sequence.select_right_handle`
- `Sequence.select`

- Sequence.speed\_factor
- Sequence.frame\_start
- Sequence.frame\_final\_start
- Sequence.frame\_offset\_start
- Sequence.frame\_still\_start
- Sequence.type
- Sequence.use\_default\_fade
- Sequence.input\_count
- EffectSequence.color\_balance
- EffectSequence.use\_float
- EffectSequence.crop
- EffectSequence.use\_deinterlace
- EffectSequence.use\_reverse\_frames
- EffectSequence.use\_flip\_x
- EffectSequence.use\_flip\_y
- EffectSequence.color\_multiply
- EffectSequence.use\_premultiply
- EffectSequence.proxy
- EffectSequence.use\_proxy\_custom\_directory
- EffectSequence.use\_proxy\_custom\_file
- EffectSequence.color\_saturation
- EffectSequence.strobe
- EffectSequence.transform
- EffectSequence.use\_color\_balance
- EffectSequence.use\_crop
- EffectSequence.use\_proxy
- EffectSequence.use\_translation

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- Sequence.getStripElem
- Sequence.swap

## 2.4.591 UILayout(bpy\_struct)

base class — bpy\_struct

```
class bpy.typesUILayout (bpy_struct)
    User interface layout in a panel or header

    active
        Type boolean, default False

    alert
        Type boolean, default False

    alignment
        Type enum in ['EXPAND', 'LEFT', 'CENTER', 'RIGHT'], default 'EXPAND'

    enabled
        When false, this (sub)layout is greyed out.
        Type boolean, default False

    operator_context
        Type enum in ['INVOKE_DEFAULT', 'INVOKE_REGION_WIN', 'IN-
            VOKE_REGION_CHANNELS', 'INVOKE_REGION_PREVIEW', 'IN-
            VOKE_AREA', 'INVOKE_SCREEN', 'EXEC_DEFAULT', 'EXEC_REGION_WIN',
            'EXEC_REGION_CHANNELS', 'EXEC_REGION_PREVIEW', 'EXEC_AREA',
            'EXEC_SCREEN'], default 'INVOKE_DEFAULT'

    scale_x
        Scale factor along the X for items in this (sub)layout.
        Type float in [0, inf], default 0.0

    scale_y
        Scale factor along the Y for items in this (sub)layout.
        Type float in [0, inf], default 0.0

    row (align=False)
        Sub-layout. Items placed in this sublayout are placed next to each other in a row.
        Parameters align (boolean, (optional)) – Align buttons to each other.
        Returns Sub-layout to put items in.
        Return type UILayout

    column (align=False)
        Sub-layout. Items placed in this sublayout are placed under each other in a column.
        Parameters align (boolean, (optional)) – Align buttons to each other.
        Returns Sub-layout to put items in.
        Return type UILayout

    column_flow (columns=0, align=False)
        column_flow

        Parameters
            • columns (int in [0, inf], (optional)) – Number of columns, 0 is automatic.
            • align (boolean, (optional)) – Align buttons to each other.
        Returns Sub-layout to put items in.
        Return type UILayout
```

**box**( )

**Sublayout.** Items placed in this sublayout are placed under each other in a column and are surrounded by a box.

**Returns** Sub-layout to put items in.

**Return type** UILayout

**split** (*percentage*=0.0, *align*=False)

\* split

## Parameters

- **percentage** (*float in [0, 1], (optional)*) – Percentage of width to split at.
  - **align** (*boolean, (optional)*) – Align buttons to each other.

**Returns** Sub-layout to put items in.

**Return type** `UILayout`

```
prop(data, property, text=“”, icon=’NONE’, expand=False, slider=False, toggle=False,  
 icon only=False, event=False, full event=False, emboss=True, index=-1)
```

Item. Exposes an RNA item and places it into the layout.

## Parameters

- **data** ([AnyType](#), (never None)) – Data from which to take property.
  - **property** (*string*) – Identifier of property in data.
  - **text** (*string, (optional)*) – Override automatic text of the item.
  - **icon** (*enum in* [‘NONE’, ‘QUESTION’, ‘ERROR’, ‘CANCEL’, ‘TRIA\_RIGHT’, ‘TRIA\_DOWN’, ‘TRIA\_LEFT’, ‘TRIA\_UP’, ‘ARROW\_LFRIGHT’, ‘PLUS’, ‘DISCLOSURE\_TRI\_DOWN’, ‘DISCLOSURE\_TRI\_RIGHT’, ‘RADIOBUT\_OFF’, ‘RADIOBUT\_ON’, ‘MENU\_PANEL’, ‘BLENDER’, ‘DOT’, ‘X’, ‘GO\_LEFT’, ‘PLUG’, ‘UI’, ‘NODE’, ‘NODE\_SEL’, ‘FULLSCREEN’, ‘SPLITSCREEN’, ‘RIGHTARROW\_THIN’, ‘BORDERMOVE’, ‘VIEWZOOM’, ‘ZOOMIN’, ‘ZOOMOUT’, ‘PANEL\_CLOSE’, ‘COPY\_ID’, ‘EYEDROPPER’, ‘LINK\_AREA’, ‘AUTO’, ‘CHECKBOX\_DEHLT’, ‘CHECKBOX\_HLT’, ‘UNLOCKED’, ‘LOCKED’, ‘UNPINNED’, ‘PINNED’, ‘SCREEN\_BACK’, ‘RIGHTARROW’, ‘DOWNARROW\_HLT’, ‘DOTSUP’, ‘DOTSDOWN’, ‘LINK’, ‘INLINK’, ‘PLUGIN’, ‘HELP’, ‘GHOST\_ENABLED’, ‘COLOR’, ‘LINKED’, ‘UNLINKED’, ‘HAND’, ‘ZOOM\_ALL’, ‘ZOOM\_SELECTED’, ‘ZOOM\_PREVIOUS’, ‘ZOOM\_IN’, ‘ZOOM\_OUT’, ‘RENDER\_REGION’, ‘BORDER\_RECT’, ‘BORDER\_LASSO’, ‘FREEZE’, ‘STYLUS\_PRESSURE’, ‘GHOST\_DISABLED’, ‘NEW’, ‘FILE\_TICK’, ‘QUIT’, ‘URL’, ‘RECOVER\_LAST’, ‘FULLSCREEN\_ENTER’, ‘FULLSCREEN\_EXIT’, ‘BLANK1’, ‘LAMP’, ‘MATERIAL’, ‘TEXTURE’, ‘ANIM’, ‘WORLD’, ‘SCENE’, ‘EDIT’, ‘GAME’, ‘RADIO’, ‘SCRIPT’, ‘PARTICLES’, ‘PHYSICS’, ‘SPEAKER’, ‘TEXTURE\_SHADED’, ‘VIEW3D’, ‘IPO’, ‘OOPS’, ‘BUTS’, ‘FILESEL’, ‘IMAGE\_COL’, ‘INFO’, ‘SEQUENCE’, ‘TEXT’, ‘IMASEL’, ‘SOUND’, ‘ACTION’, ‘NLA’, ‘SCRIPTWIN’, ‘TIME’, ‘NODETREE’, ‘LOGIC’, ‘CONSOLE’, ‘PREFERENCES’, ‘ASSET\_MANAGER’, ‘OBJECT\_DATAMODE’, ‘EDITMODE\_HLT’, ‘FACESEL\_HLT’, ‘VPAINT\_HLT’, ‘TPAINT\_HLT’, ‘WPAINT\_HLT’, ‘SCULPTMODE\_HLT’, ‘POSE\_HLT’, ‘PARTICLEMODE’, ‘LIGHTPAINT’, ‘SCENE\_DATA’, ‘RENDERLAYERS’, ‘WORLD\_DATA’, ‘OBJECT\_DATA’, ‘MESH\_DATA’, ‘CURVE\_DATA’, ‘META\_DATA’, ‘LATTICE\_DATA’, ‘LAMP\_DATA’, ‘MATERIAL\_DATA’, ‘TEXTURE\_DATA’, ‘ANIM\_DATA’, ‘CAMERA\_DATA’, ‘PARTICLE\_DATA’, ‘LIBRARY\_DATA\_DIRECT’, ‘GROUP’, ‘ARMATURE\_DATA’, ‘POSE\_DATA’, ‘BONE\_DATA’, ‘CONSTRAINT’, ‘SHAPEKEY\_DATA’, ‘COLLISION\_DATA’, ‘MATERIAL\_SHADING’, ‘SCENE\_RENDERLAYERS’, ‘WORLD\_RENDERLAYERS’, ‘SCENE\_RENDER’, ‘WORLD\_RENDER’, ‘SCENE\_MATERIAL’, ‘WORLD\_MATERIAL’, ‘SCENE\_TEXTURE’, ‘WORLD\_TEXTURE’, ‘SCENE\_ANIM’, ‘WORLD\_ANIM’, ‘SCENE\_CAMERA’, ‘WORLD\_CAMERA’, ‘SCENE\_PARTICLE’, ‘WORLD\_PARTICLE’, ‘SCENE\_LIBRARY’, ‘WORLD\_LIBRARY’, ‘SCENE\_CONSTRAINT’, ‘WORLD\_CONSTRAINT’, ‘SCENE\_SHAPEKEY’, ‘WORLD\_SHAPEKEY’, ‘SCENE\_COLLISION’, ‘WORLD\_COLLISION’, ‘SCENE\_MATERIAL\_SHADING’, ‘WORLD\_MATERIAL\_SHADING’, ‘SCENE\_RENDER\_LAYER’, ‘WORLD\_RENDER\_LAYER’, ‘SCENE\_RENDER\_LAYER\_TYPE’, ‘WORLD\_RENDER\_LAYER\_TYPE’, ‘SCENE\_RENDER\_LAYER\_MODE’, ‘WORLD\_RENDER\_LAYER\_MODE’, ‘SCENE\_RENDER\_LAYER\_MATERIAL’, ‘WORLD\_RENDER\_LAYER\_MATERIAL’, ‘SCENE\_RENDER\_LAYER\_TEXTURE’, ‘WORLD\_RENDER\_LAYER\_TEXTURE’, ‘SCENE\_RENDER\_LAYER\_ANIM’, ‘WORLD\_RENDER\_LAYER\_ANIM’, ‘SCENE\_RENDER\_LAYER\_CAMERA’, ‘WORLD\_RENDER\_LAYER\_CAMERA’, ‘SCENE\_RENDER\_LAYER\_PARTICLE’, ‘WORLD\_RENDER\_LAYER\_PARTICLE’, ‘SCENE\_RENDER\_LAYER\_LIBRARY’, ‘WORLD\_RENDER\_LAYER\_LIBRARY’, ‘SCENE\_RENDER\_LAYER\_CONSTRAINT’, ‘WORLD\_RENDER\_LAYER\_CONSTRAINT’, ‘SCENE\_RENDER\_LAYER\_SHAPEKEY’, ‘WORLD\_RENDER\_LAYER\_SHAPEKEY’, ‘SCENE\_RENDER\_LAYER\_COLLISION’, ‘WORLD\_RENDER\_LAYER\_COLLISION’])

'CONSTRAINT\_BONE', 'PACKAGE', 'UGLYPACKAGE', 'BRUSH\_DATA', 'IMAGE\_DATA', 'FILE', 'FCURVE', 'FONT\_DATA', 'RENDER\_RESULT', 'SURFACE\_DATA', 'EMPTY\_DATA', 'SETTINGS', 'RENDER\_ANIMATION', 'RENDER\_STILL', 'BOIDS', 'STRANDS', 'LIBRARY\_DATA\_INDIRECT', 'GREASEPENCIL', 'GROUP\_BONE', 'GROUP\_VERTEX', 'GROUP\_VCOL', 'GROUP\_UVS', 'RNA', 'RNA\_ADD', 'OUTLINER\_OB\_EMPTY', 'OUTLINER\_OB\_MESH', 'OUTLINER\_OB\_CURVE', 'OUTLINER\_OB\_LATTICE', 'OUTLINER\_OB\_META', 'OUTLINER\_OB\_LAMP', 'OUTLINER\_OB\_CAMERA', 'OUTLINER\_OB\_ARMATURE', 'OUTLINER\_OB\_FONT', 'OUTLINER\_OB\_SURFACE', 'RESTRICT\_VIEW\_OFF', 'RESTRICT\_VIEW\_ON', 'RESTRICT\_SELECT\_OFF', 'RESTRICT\_SELECT\_ON', 'RESTRICT\_RENDER\_OFF', 'RESTRICT\_RENDER\_ON', 'OUTLINER\_DATA\_EMPTY', 'OUTLINER\_DATA\_MESH', 'OUTLINER\_DATA\_CURVE', 'OUTLINER\_DATA\_LATTICE', 'OUTLINER\_DATA\_META', 'OUTLINER\_DATA\_LAMP', 'OUTLINER\_DATA\_CAMERA', 'OUTLINER\_DATA\_ARMATURE', 'OUTLINER\_DATA\_FONT', 'OUTLINER\_DATA\_SURFACE', 'OUTLINER\_DATA\_POSE', 'MESH\_PLANE', 'MESH\_CUBE', 'MESH\_CIRCLE', 'MESH\_UVSPHERE', 'MESH\_ICOSPHERE', 'MESH\_GRID', 'MESH\_MONKEY', 'MESH\_CYLINDER', 'MESH\_TORUS', 'MESH\_CONE', 'LAMP\_POINT', 'LAMP\_SUN', 'LAMP\_SPOT', 'LAMP\_HEMI', 'LAMP\_AREA', 'META\_PLANE', 'META\_CUBE', 'META\_BALL', 'META\_ELLIPSOID', 'META\_CAPSULE', 'SURFACE\_NCURVE', 'SURFACE\_NCIRCLE', 'SURFACE\_NSURFACE', 'SURFACE\_NCYLINDER', 'SURFACE\_NSPHERE', 'SURFACE\_NTORUS', 'CURVE\_BEZCURVE', 'CURVE\_BEZCIRCLE', 'CURVE\_NCURVE', 'CURVE\_NCIRCLE', 'CURVE\_PATH', 'FORCE\_FORCE', 'FORCE\_WIND', 'FORCE\_VORTEX', 'FORCE\_MAGNETIC', 'FORCE\_HARMONIC', 'FORCE\_CHARGE', 'FORCE\_LENNARDJONES', 'FORCE\_TEXTURE', 'FORCE\_CURVE', 'FORCE\_BOID', 'FORCE\_TURBULENCE', 'FORCE\_DRAG', 'MODIFIER', 'MOD\_WAVE', 'MOD\_BUILD', 'MOD\_DECIM', 'MOD\_MIRROR', 'MOD\_SOFT', 'MOD\_SUBSURF', 'HOOK', 'MOD\_PHYSICS', 'MOD\_PARTICLES', 'MOD\_BOOLEAN', 'MOD\_EDGESPLIT', 'MOD\_ARRAY', 'MOD\_UVPROJECT', 'MOD\_DISPLACE', 'MOD\_CURVE', 'MOD\_LATTICE', 'CONSTRAINT\_DATA', 'MOD\_ARMATURE', 'MOD\_SHRINKWRAP', 'MOD\_CAST', 'MOD\_MESHDEFORM', 'MOD\_BEVEL', 'MOD\_SMOOTH', 'MOD\_SIMPLEDEFORM', 'MOD\_MASK', 'MOD\_CLOTH', 'MOD\_EXPLODE', 'MOD\_FLUIDSIM', 'MOD\_MULTRES', 'MOD\_SMOKE', 'MOD\_SOLIDIFY', 'MOD\_SCREW', 'REC', 'PLAY', 'FF', 'REW', 'PAUSE', 'PREV\_KEYFRAME', 'NEXT\_KEYFRAME', 'PLAY\_AUDIO', 'PLAY\_REVERSE', 'PREVIEW\_RANGE', 'PMARKER\_ACT', 'PMARKER\_SEL', 'PMARKER', 'MARKER\_HLT', 'MARKER', 'SPACE2', 'SPACE3', 'KEY\_DEHLT', 'KEY\_HLT', 'MUTE\_IPO\_OFF', 'MUTE\_IPO\_ON', 'VERTEXSEL', 'EDGESEL', 'FACESEL', 'ROTATE', 'CURSOR', 'ROTATECOLLECTION', 'ROTATECENTER', 'ROTACTIVE', 'ALIGN', 'SMOOTHCURVE', 'SPHERECURVE', 'ROOTCURVE', 'SHARPCURVE', 'LINCURVE', 'NOCURVE', 'RNDCURVE', 'PROP\_OFF', 'PROP\_ON', 'PROP\_CON', 'PARTICLE\_POINT', 'PARTICLE\_TIP', 'PARTICLE\_PATH', 'MAN\_TRANS', 'MAN\_ROT', 'MAN\_SCALE', 'MANIPUL', 'SNAP\_OFF', 'SNAP\_ON', 'SNAP\_NORMAL', 'SNAP\_INCREMENT', 'SNAP\_VERTEX', 'SNAP\_EDGE', 'SNAP\_FACE', 'SNAP\_VOLUME', 'STICKY\_UVS\_LOC', 'STICKY\_UVS\_DISABLE', 'STICKY\_UVS\_VERT', 'CLIPUV\_DEHLT', 'CLIPUV\_HLT', 'SNAP\_PEELOBJECT', 'GRID', 'PASTEDOWN', 'COPYDOWN', 'PASTEFILUP', 'PASTEFILDOWN', 'SNAP\_SURFACE', 'RETOPO', 'UV\_VERTEXSEL', 'UV\_EDGESEL', 'UV\_FACESEL', 'UV\_ISLANDSEL', 'UV\_SYNC\_SELECT', 'BBOX', 'WIRE', 'SOLID', 'SMOOTH', 'POTATO', 'ORTHO', 'LOCKVIEW\_OFF', 'LOCKVIEW\_ON', 'AXIS\_SIDE', 'AXIS\_FRONT', 'AXIS\_TOP', 'NDOF\_DOM', 'NDOF\_TURN', 'NDOF\_FLY', 'NDOF\_TRANS', 'LAYER\_USED', 'LAYER\_ACTIVE', 'SORTALPHA', 'SORTBYEXT', 'SORTTIME', 'SORTSIZE', 'LONGDISPLAY', 'SHORT

`'DISPLAY', 'GHOST', 'IMGDISPLAY', 'BOOKMARKS', 'FONTPREVIEW', 'FILTER', 'NEWFOLDER', 'FILE_PARENT', 'FILE_REFRESH', 'FILE_FOLDER', 'FILE_BLANK', 'FILE_BLEND', 'FILE_IMAGE', 'FILE_MOVIE', 'FILE_SCRIPT', 'FILE_SOUND', 'FILE_FONT', 'BACK', 'FORWARD', 'DISK_DRIVE', 'MATERIAL_PLANE', 'MATERIAL_SPHERE', 'MATERIAL_CUBE', 'MONKEY', 'HAIR', 'ALIASED', 'ANTIALIASED', 'MATERIAL_SPHERE_SKY', 'WORDWRAP_OFF', 'WORDWRAP_ON', 'SYNTAX_OFF', 'SYNTAX_ON', 'LINENUMBERS_OFF', 'LINENUMBERS_ON', 'SCRIPTPLUGINS', 'SEQSEQUENCER', 'SEQ_PREVIEW', 'SEQ_LUMA_WAVEFORM', 'SEQ_CHROMA_SCOPE', 'SEQ_HISTOGRAM', 'SEQ_SPLITVIEW', 'IMAGE_RGB', 'IMAGE_RGB_ALPHA', 'IMAGE_ALPHA', 'IMAGE_ZDEPTH', 'IMAGEFILE', 'BRUSH_ADD', 'BRUSH_BLOB', 'BRUSH_BLUR', 'BRUSH_CLAY', 'BRUSH_CLONE', 'BRUSHCREASE', 'BRUSH_DARKEN', 'BRUSH_FILL', 'BRUSH_FLATTEN', 'BRUSH_GRAB', 'BRUSH_INFLATE', 'BRUSH_LAYER', 'BRUSH_LIGHTEN', 'BRUSH_MIX', 'BRUSH_MULTIPLY', 'BRUSH_NUDGE', 'BRUSH_PINCH', 'BRUSH_SCRAPE', 'BRUSH_SCULPT_DRAW', 'BRUSH_SMEAR', 'BRUSH_SMOOTH', 'BRUSH_SNAKE_HOOK', 'BRUSH_SOFTEN', 'BRUSH_SUBTRACT', 'BRUSH_TEXDRAW', 'BRUSH_THUMB', 'BRUSH_ROTATE', 'BRUSH_VERTEXDRAW', 'VIEW3D_VEC', 'EDIT_VEC', 'EDITMODE_DEHLT', 'EDITMODE_HLT', 'DISCLOSURE_TRI_RIGHT_VEC', 'DISCLOSURE_TRI_DOWN_VEC', 'MOVE_UP_VEC', 'MOVE_DOWN_VEC', 'X_VEC', 'SMALL_TRI_RIGHT_VEC']`, (optional)) – Icon, Override automatic icon of the item

- **expand** (boolean, (optional)) – Expand button to show more detail.
- **slider** (boolean, (optional)) – Use slider widget for numeric values.
- **toggle** (boolean, (optional)) – Use toggle widget for boolean values.
- **icon\_only** (boolean, (optional)) – Draw only icons in buttons, no text.
- **event** (boolean, (optional)) – Use button to input key events.
- **full\_event** (boolean, (optional)) – Use button to input full events including modifiers.
- **emboss** (boolean, (optional)) – Draw the button itself, just the icon/text.
- **index** (int in [-2, inf], (optional)) – The index of this button, when set a single member of an array can be accessed, when set to -1 all array members are used.

**props\_enum** (*data, property*)  
props\_enum

#### Parameters

- **data** ([AnyType](#), (never None)) – Data from which to take property.
- **property** (string) – Identifier of property in data.

**prop\_menu\_enum** (*data, property, text=""*, *icon='NONE'*)  
prop\_menu\_enum

#### Parameters

- **data** ([AnyType](#), (never None)) – Data from which to take property.
- **property** (string) – Identifier of property in data.
- **text** (string, (optional)) – Override automatic text of the item.
- **icon** (enum in ['NONE', 'QUESTION', 'ERROR', 'CANCEL', 'TRIA\_RIGHT', 'TRIA\_DOWN', 'TRIA\_LEFT', 'TRIA\_UP', 'ARROW\_LEFTRIGHT', 'PLUS', 'DISCLOSURE\_TRI\_DOWN', 'DISCLOSURE\_TRI\_RIGHT', 'RADIOBUT\_OFF', 'RADIOBUT\_ON', 'MENU\_PANEL', 'BLENDER', 'DOT', 'X', 'GO\_LEFT', 'PLUG',

'UI', 'NODE', 'NODE\_SEL', 'FULLSCREEN', 'SPLITSCREEN', 'RIGHTARROW\_THIN', 'BORDERMOVE', 'VIEWZOOM', 'ZOOMIN', 'ZOOMOUT', 'PANEL\_CLOSE', 'COPY\_ID', 'EYEDROPPER', 'LINK\_AREA', 'AUTO', 'CHECKBOX\_DEHLT', 'CHECKBOX\_HLT', 'UNLOCKED', 'LOCKED', 'UNPINNED', 'PINNED', 'SCREEN\_BACK', 'RIGHTARROW', 'DOWNARROW\_HLT', 'DOTSUP', 'DOTSDOWN', 'LINK', 'INLINK', 'PLUGIN', 'HELP', 'GHOST\_ENABLED', 'COLOR', 'LINKED', 'UNLINKED', 'HAND', 'ZOOM\_ALL', 'ZOOM\_SELECTED', 'ZOOM\_PREVIOUS', 'ZOOM\_IN', 'ZOOM\_OUT', 'RENDER\_REGION', 'BORDER\_RECT', 'BORDER\_LASSO', 'FREEZE', 'STYLUS\_PRESSURE', 'GHOST\_DISABLED', 'NEW', 'FILE\_TICK', 'QUIT', 'URL', 'RECOVER\_LAST', 'FULLSCREEN\_ENTER', 'FULLSCREEN\_EXIT', 'BLANK1', 'LAMP', 'MATERIAL', 'TEXTURE', 'ANIM', 'WORLD', 'SCENE', 'EDIT', 'GAME', 'RADIO', 'SCRIPT', 'PARTICLES', 'PHYSICS', 'SPEAKER', 'TEXTURE\_SHADED', 'VIEW3D', 'IPO', 'OOPS', 'BUTS', 'FILESEL', 'IMAGE\_COL', 'INFO', 'SEQUENCE', 'TEXT', 'IMASEL', 'SOUND', 'ACTION', 'NLA', 'SCRIPTWIN', 'TIME', 'NODETREE', 'LOGIC', 'CONSOLE', 'PREFERENCES', 'ASSET\_MANAGER', 'OBJECT\_DATAMODE', 'EDITMODE\_HLT', 'FACESEL\_HLT', 'VPAINT\_HLT', 'TPAINT\_HLT', 'WPAINT\_HLT', 'SCULPTMODE\_HLT', 'POSE\_HLT', 'PARTICLEMODE', 'LIGHTPAINT', 'SCENE\_DATA', 'RENDERLAYERS', 'WORLD\_DATA', 'OBJECT\_DATA', 'MESH\_DATA', 'CURVE\_DATA', 'META\_DATA', 'LATTICE\_DATA', 'LAMP\_DATA', 'MATERIAL\_DATA', 'TEXTURE\_DATA', 'ANIM\_DATA', 'CAMERA\_DATA', 'PARTICLE\_DATA', 'LIBRARY\_DATA\_DIRECT', 'GROUP', 'ARMATURE\_DATA', 'POSE\_DATA', 'BONE\_DATA', 'CONSTRAINT', 'SHAPEKEY\_DATA', 'CONSTRAINT\_BONE', 'PACKAGE', 'UGLYPACKAGE', 'BRUSH\_DATA', 'IMAGE\_DATA', 'FILE', 'FCURVE', 'FONT\_DATA', 'RENDER\_RESULT', 'SURFACE\_DATA', 'EMPTY\_DATA', 'SETTINGS', 'RENDER\_ANIMATION', 'RENDER\_STILL', 'BOIDS', 'STRANDS', 'LIBRARY\_DATA\_INDIRECT', 'GREASEPENCIL', 'GROUP\_BONE', 'GROUP\_VERTEX', 'GROUP\_VCOL', 'GROUP\_UVS', 'RNA', 'RNA\_ADD', 'OUTLINER\_OB\_EMPTY', 'OUTLINER\_OB\_MESH', 'OUTLINER\_OB\_CURVE', 'OUTLINER\_OB\_LATTICE', 'OUTLINER\_OB\_META', 'OUTLINER\_OB\_LAMP', 'OUTLINER\_OB\_CAMERA', 'OUTLINER\_OB\_ARMATURE', 'OUTLINER\_OB\_FONT', 'OUTLINER\_OB\_SURFACE', 'RESTRICT\_VIEW\_OFF', 'RESTRICT\_VIEW\_ON', 'RESTRICT\_SELECT\_OFF', 'RESTRICT\_SELECT\_ON', 'RESTRICT\_RENDER\_OFF', 'RESTRICT\_RENDER\_ON', 'OUTLINER\_DATA\_EMPTY', 'OUTLINER\_DATA\_MESH', 'OUTLINER\_DATA\_CURVE', 'OUTLINER\_DATA\_LATTICE', 'OUTLINER\_DATA\_META', 'OUTLINER\_DATA\_LAMP', 'OUTLINER\_DATA\_CAMERA', 'OUTLINER\_DATA\_ARMATURE', 'OUTLINER\_DATA\_FONT', 'OUTLINER\_DATA\_SURFACE', 'OUTLINER\_DATA\_POSE', 'MESH\_PLANE', 'MESH\_CUBE', 'MESH\_CIRCLE', 'MESH\_UVSHERE', 'MESH\_ICOSPHERE', 'MESH\_GRID', 'MESH\_MONKEY', 'MESH\_CYLINDER', 'MESH\_TORUS', 'MESH\_CONE', 'LAMP\_POINT', 'LAMP\_SUN', 'LAMP\_SPOT', 'LAMP\_HEMI', 'LAMP\_AREA', 'META\_PLANE', 'META\_CUBE', 'META\_BALL', 'META\_ELLIPSOID', 'META\_CAPSULE', 'SURFACE\_NCURVE', 'SURFACE\_NCIRCLE', 'SURFACE\_NSURFACE', 'SURFACE\_NCYLINDER', 'SURFACE\_NSPHERE', 'SURFACE\_NTORUS', 'CURVE\_BEZCURVE', 'CURVE\_BEZCIRCLE', 'CURVE\_NCURVE', 'CURVE\_NCIRCLE', 'CURVE\_PATH', 'FORCE\_FORCE', 'FORCE\_WIND', 'FORCE\_VORTEX', 'FORCE\_MAGNETIC', 'FORCE\_HARMONIC', 'FORCE\_CHARGE', 'FORCE\_LENNARDJONES', 'FORCE\_TEXTURE', 'FORCE\_CURVE', 'FORCE\_BOID', 'FORCE\_TURBULENCE', 'FORCE\_DRAG', 'MODIFIER', 'MOD\_WAVE', 'MOD\_BUILD', 'MOD\_DECIM', 'MOD\_MIRROR', 'MOD\_SOFT', 'MOD\_SUBSURF', 'HOOK', 'MOD\_PHYSICS', 'MOD\_PARTICLES', 'MOD\_BOOLEAN', 'MOD\_EDGESPLIT', 'MOD\_ARRAY', 'MOD\_UVPROJECT', 'MOD\_DISPLACE', 'MOD\_CURVE', 'MOD\_LATTICE', 'CONSTRAINT\_DATA', 'MOD\_ARMATURE', 'MOD\_SHRINKWRAP',

'MOD\_CAST', 'MOD\_MESHDEFORM', 'MOD\_BEVEL', 'MOD\_SMOOTH',  
'MOD\_SIMPLEDEFORM', 'MOD\_MASK', 'MOD\_CLOTH', 'MOD\_EXPLODE',  
'MOD\_FLUIDSIM', 'MOD\_MULTIRES', 'MOD\_SMOKE', 'MOD\_SOLIDIFY',  
'MOD\_SCREW', 'REC', 'PLAY', 'FF', 'REW', 'PAUSE', 'PREV\_KEYFRAME',  
'NEXT\_KEYFRAME', 'PLAY\_AUDIO', 'PLAY\_REVERSE', 'PREVIEW\_RANGE',  
'PMARKER\_ACT', 'PMARKER\_SEL', 'PMARKER', 'MARKER\_HLT', 'MARKER',  
'SPACE2', 'SPACE3', 'KEY\_DEHLT', 'KEY\_HLT', 'MUTE\_IPO\_OFF',  
'MUTE\_IPO\_ON', 'VERTEXSEL', 'EDGESEL', 'FACESEL', 'ROTATE', 'CUR-  
SOR', 'ROTATECOLLECTION', 'ROTATECENTER', 'ROTACTIVE', 'ALIGN',  
'SMOOTHCURVE', 'SPHERECURVE', 'ROOTCURVE', 'SHARPCURVE',  
'LINCURVE', 'NOCURVE', 'RNDCURVE', 'PROP\_OFF', 'PROP\_ON',  
'PROP\_CON', 'PARTICLE\_POINT', 'PARTICLE\_TIP', 'PARTICLE\_PATH',  
'MAN\_TRANS', 'MAN\_ROT', 'MAN\_SCALE', 'MANIPUL', 'SNAP\_OFF', 'SNAP\_ON',  
'SNAP\_NORMAL', 'SNAP\_INCREMENT', 'SNAP\_VERTEX', 'SNAP\_EDGE',  
'SNAP\_FACE', 'SNAP\_VOLUME', 'STICKY\_UVS\_LOC', 'STICKY\_UVS\_DISABLE',  
'STICKY\_UVS\_VERT', 'CLIPUV\_DEHLT', 'CLIPUV\_HLT', 'SNAP\_PEEL\_OBJECT',  
'GRID', 'PASTEDOWN', 'COPYDOWN', 'PASTEFLIPUP', 'PASTEFLIP-  
DOWN', 'SNAP\_SURFACE', 'RETOPO', 'UV\_VERTEXSEL', 'UV\_EDGESSEL',  
'UV\_FACESSEL', 'UV\_ISLANDSEL', 'UV\_SYNC\_SELECT', 'BBOX', 'WIRE',  
'SOLID', 'SMOOTH', 'POTATO', 'ORTHO', 'LOCKVIEW\_OFF', 'LOCKVIEW\_ON',  
'AXIS\_SIDE', 'AXIS\_FRONT', 'AXIS\_TOP', 'NDOF\_DOM', 'NDOF\_TURN',  
'NDOF\_FLY', 'NDOF\_TRANS', 'LAYER\_USED', 'LAYER\_ACTIVE', 'SORTAL-  
PHA', 'SORTBYEXT', 'SORTTIME', 'SORTSIZE', 'LONGDISPLAY', 'SHORT-  
DISPLAY', 'GHOST', 'IMGDISPLAY', 'BOOKMARKS', 'FONTPREVIEW', 'FIL-  
TER', 'NEWFOLDER', 'FILE\_PARENT', 'FILE\_REFRESH', 'FILE\_FOLDER',  
'FILE\_BLANK', 'FILE\_BLEND', 'FILE\_IMAGE', 'FILE\_MOVIE', 'FILE\_SCRIPT',  
'FILE\_SOUND', 'FILE\_FONT', 'BACK', 'FORWARD', 'DISK\_DRIVE', 'MAT-  
PLANE', 'MATSHERE', 'MATCUBE', 'MONKEY', 'HAIR', 'ALIASED',  
'ANTIALIASED', 'MAT\_SPHERE\_SKY', 'WORDWRAP\_OFF', 'WORD-  
WRAP\_ON', 'SYNTAX\_OFF', 'SYNTAX\_ON', 'LINENUMBERS\_OFF', 'LINENUM-  
BERS\_ON', 'SCRIPTPLUGINS', 'SEQ\_SEQUENCER', 'SEQ\_PREVIEW',  
'SEQ\_LUMA\_WAVEFORM', 'SEQ\_CHROMA\_SCOPE', 'SEQ\_HISTOGRAM',  
'SEQ\_SPLITVIEW', 'IMAGE\_RGB', 'IMAGE\_RGB\_ALPHA', 'IMAGE\_ALPHA', 'IM-  
AGE\_ZDEPTH', 'IMAGEFILE', 'BRUSH\_ADD', 'BRUSH\_BLOB', 'BRUSH\_BLUR',  
'BRUSH\_CLAY', 'BRUSH\_CLONE', 'BRUSHCREASE', 'BRUSH\_DARKEN',  
'BRUSH\_FILL', 'BRUSH\_FLATTEN', 'BRUSH\_GRAB', 'BRUSH\_INFLATE',  
'BRUSH\_LAYER', 'BRUSH\_LIGHTEN', 'BRUSH\_MIX', 'BRUSH\_MULTIPLY',  
'BRUSH\_NUDGE', 'BRUSH\_PINCH', 'BRUSH\_SCRAPE', 'BRUSH\_SCULPT\_DRAW',  
'BRUSH\_SMEAR', 'BRUSH\_SMOOTH', 'BRUSH\_SNAKE\_HOOK',  
'BRUSH\_SOFTEN', 'BRUSH\_SUBTRACT', 'BRUSH\_TEXDRAW', 'BRUSH\_THUMB',  
'BRUSH\_ROTATE', 'BRUSH\_VERTEXDRAW', 'VIEW3D\_VEC', 'EDIT\_VEC', 'ED-  
ITMODE\_DEHLT', 'EDITMODE\_HLT', 'DISCLOSURE\_TRI\_RIGHT\_VEC', 'DIS-  
CLOSURE\_TRI\_DOWN\_VEC', 'MOVE\_UP\_VEC', 'MOVE\_DOWN\_VEC', 'X\_VEC',  
'SMALL\_TRI\_RIGHT\_VEC'], (optional)) – Icon, Override automatic icon of the item

**prop\_enum** (*data*, *property*, *value*, *text*= "", *icon*='NONE')  
prop\_enum

#### Parameters

- **data** ([AnyType](#), (never None)) – Data from which to take property.
- **property** (*string*) – Identifier of property in data.
- **value** (*string*) – Enum property value.
- **text** (*string*, (optional)) – Override automatic text of the item.

- **icon** (*enum in* ['NONE', 'QUESTION', 'ERROR', 'CANCEL', 'TRIA\_RIGHT', 'TRIA\_DOWN', 'TRIA\_LEFT', 'TRIA\_UP', 'ARROW\_LEFTRIGHT', 'PLUS', 'DISCLOSURE\_TRI\_DOWN', 'DISCLOSURE\_TRI\_RIGHT', 'RADIOBUT\_OFF', 'RADIOBUT\_ON', 'MENU\_PANEL', 'BLENDER', 'DOT', 'X', 'GO\_LEFT', 'PLUG', 'UI', 'NODE', 'NODE\_SEL', 'FULLSCREEN', 'SPLITSCREEN', 'RIGHTARROW\_THIN', 'BORDERMOVE', 'VIEWZOOM', 'ZOOMIN', 'ZOOMOUT', 'PANEL\_CLOSE', 'COPY\_ID', 'EYEDROPPER', 'LINK\_AREA', 'AUTO', 'CHECKBOX\_DEHLT', 'CHECKBOX\_HLT', 'UNLOCKED', 'LOCKED', 'UNPINNED', 'PINNED', 'SCREEN\_BACK', 'RIGHTARROW', 'DOWNARROW\_HLT', 'DOTSUP', 'DOTSDOWN', 'LINK', 'INLINK', 'PLUGIN', 'HELP', 'GHOST\_ENABLED', 'COLOR', 'LINKED', 'UNLINKED', 'HAND', 'ZOOM\_ALL', 'ZOOM\_SELECTED', 'ZOOM\_PREVIOUS', 'ZOOM\_IN', 'ZOOM\_OUT', 'RENDER\_REGION', 'BORDER\_RECT', 'BORDER\_LASSO', 'FREEZE', 'STYLUS\_PRESSURE', 'GHOST\_DISABLED', 'NEW', 'FILE\_TICK', 'QUIT', 'URL', 'RECOVER\_LAST', 'FULLSCREEN\_ENTER', 'FULLSCREEN\_EXIT', 'BLANK1', 'LAMP', 'MATERIAL', 'TEXTURE', 'ANIM', 'WORLD', 'SCENE', 'EDIT', 'GAME', 'RADIO', 'SCRIPT', 'PARTICLES', 'PHYSICS', 'SPEAKER', 'TEXTURE\_SHADED', 'VIEW3D', 'IPO', 'OOPS', 'BUTS', 'FILESEL', 'IMAGE\_COL', 'INFO', 'SEQUENCE', 'TEXT', 'IMASEL', 'SOUND', 'ACTION', 'NLA', 'SCRIPTWIN', 'TIME', 'NODETREE', 'LOGIC', 'CONSOLE', 'PREFERENCES', 'ASSET\_MANAGER', 'OBJECT\_DATAMODE', 'EDITMODE\_HLT', 'FACESEL\_HLT', 'VPAINT\_HLT', 'TPAINT\_HLT', 'WPAINT\_HLT', 'SCULPTMODE\_HLT', 'POSE\_HLT', 'PARTICLEMODE', 'LIGHTPAINT', 'SCENE\_DATA', 'RENDERLAYERS', 'WORLD\_DATA', 'OBJECT\_DATA', 'MESH\_DATA', 'CURVE\_DATA', 'META\_DATA', 'LATTICE\_DATA', 'LAMP\_DATA', 'MATERIAL\_DATA', 'TEXTURE\_DATA', 'ANIM\_DATA', 'CAMERA\_DATA', 'PARTICLE\_DATA', 'LIBRARY\_DATA\_DIRECT', 'GROUP', 'ARMATURE\_DATA', 'POSE\_DATA', 'BONE\_DATA', 'CONSTRAINT', 'SHAPEKEY\_DATA', 'CONSTRAINT\_BONE', 'PACKAGE', 'UGLYPACKAGE', 'BRUSH\_DATA', 'IMAGE\_DATA', 'FILE', 'FCURVE', 'FONT\_DATA', 'RENDER\_RESULT', 'SURFACE\_DATA', 'EMPTY\_DATA', 'SETTINGS', 'RENDER\_ANIMATION', 'RENDER\_STILL', 'BOIDS', 'STRANDS', 'LIBRARY\_DATA\_INDIRECT', 'GREASEPENCIL', 'GROUP\_BONE', 'GROUP\_VERTEX', 'GROUP\_VCOL', 'GROUP\_UVS', 'RNA', 'RNA\_ADD', 'OUTLINER\_OB\_EMPTY', 'OUTLINER\_OB\_MESH', 'OUTLINER\_OB\_CURVE', 'OUTLINER\_OB\_LATTICE', 'OUTLINER\_OB\_META', 'OUTLINER\_OB\_LAMP', 'OUTLINER\_OB\_CAMERA', 'OUTLINER\_OB\_ARMATURE', 'OUTLINER\_OB\_FONT', 'OUTLINER\_OB\_SURFACE', 'RESTRICT\_VIEW\_OFF', 'RESTRICT\_VIEW\_ON', 'RESTRICT\_SELECT\_OFF', 'RESTRICT\_SELECT\_ON', 'RESTRICT\_RENDER\_OFF', 'RESTRICT\_RENDER\_ON', 'OUTLINER\_DATA\_EMPTY', 'OUTLINER\_DATA\_MESH', 'OUTLINER\_DATA\_CURVE', 'OUTLINER\_DATA\_LATTICE', 'OUTLINER\_DATA\_META', 'OUTLINER\_DATA\_LAMP', 'OUTLINER\_DATA\_CAMERA', 'OUTLINER\_DATA\_ARMATURE', 'OUTLINER\_DATA\_FONT', 'OUTLINER\_DATA\_SURFACE', 'OUTLINER\_DATA\_POSE', 'MESH\_PLANE', 'MESH\_CUBE', 'MESH\_CIRCLE', 'MESH\_UVSHERE', 'MESH\_ICOSPHERE', 'MESH\_GRID', 'MESH\_MONKEY', 'MESH\_CYLINDER', 'MESH\_TORUS', 'MESH\_CONE', 'LAMP\_POINT', 'LAMP\_SUN', 'LAMP\_SPOT', 'LAMP\_HEMI', 'LAMP\_AREA', 'META\_PLANE', 'META\_CUBE', 'META BALL', 'META\_ELLIPSOID', 'META\_CAPSULE', 'SURFACE\_NCURVE', 'SURFACE\_NCIRCLE', 'SURFACE\_NSURFACE', 'SURFACE\_NCYLINDER', 'SURFACE\_NSPHERE', 'SURFACE\_NTORUS', 'CURVE\_BEZCURVE', 'CURVE\_BEZCIRCLE', 'CURVE\_NCURVE', 'CURVE\_NCIRCLE', 'CURVE\_PATH', 'FORCE\_FORCE', 'FORCE\_WIND', 'FORCE\_VORTEX', 'FORCE\_MAGNETIC', 'FORCE\_HARMONIC', 'FORCE\_CHARGE', 'FORCE\_LENNARDJONES', 'FORCE\_TEXTURE', 'FORCE\_CURVE', 'FORCE\_BOID', 'FORCE\_TURBULENCE', 'FORCE\_DRAG', 'MODIFIER', 'MOD\_WAVE', 'MOD\_BUILD', 'MOD\_DECIM',

'MOD\_MIRROR', 'MOD\_SOFT', 'MOD\_SUBSURF', 'HOOK', 'MOD\_PHYSICS',  
'MOD\_PARTICLES', 'MOD\_BOOLEAN', 'MOD\_EDGESPLIT', 'MOD\_ARRAY',  
'MOD\_UVPROJECT', 'MOD\_DISPLACE', 'MOD\_CURVE', 'MOD\_LATTICE',  
'CONSTRAINT\_DATA', 'MOD\_ARMATURE', 'MOD\_SHRINKWRAP',  
'MOD\_CAST', 'MOD\_MESHDEFORM', 'MOD\_BEVEL', 'MOD\_SMOOTH',  
'MOD\_SIMPLEDEFORM', 'MOD\_MASK', 'MOD\_CLOTH', 'MOD\_EXPLODE',  
'MOD\_FLUIDSIM', 'MOD\_MULTIRES', 'MOD\_SMOKE', 'MOD\_SOLIDIFY',  
'MOD\_SCREW', 'REC', 'PLAY', 'FF', 'REW', 'PAUSE', 'PREV\_KEYFRAME',  
'NEXT\_KEYFRAME', 'PLAY\_AUDIO', 'PLAY\_REVERSE', 'PREVIEW\_RANGE',  
'PMARKER\_ACT', 'PMARKER\_SEL', 'PMARKER', 'MARKER\_HLT', 'MARKER',  
'SPACE2', 'SPACE3', 'KEY\_DEHLT', 'KEY\_HLT', 'MUTE\_IPO\_OFF',  
'MUTE\_IPO\_ON', 'VERTEXSEL', 'EDGESEL', 'FACESEL', 'ROTATE', 'CURSOR',  
'ROTATECOLLECTION', 'ROTATECENTER', 'ROTACTIVE', 'ALIGN',  
'SMOOTHCURVE', 'SPHERERECURVE', 'ROOTCURVE', 'SHARPCURVE',  
'LINCURVE', 'NOCURVE', 'RNDCURVE', 'PROP\_OFF', 'PROP\_ON',  
'PROP\_CON', 'PARTICLE\_POINT', 'PARTICLE\_TIP', 'PARTICLE\_PATH',  
'MAN\_TRANS', 'MAN\_ROT', 'MAN\_SCALE', 'MANIPUL', 'SNAP\_OFF', 'SNAP\_ON',  
'SNAP\_NORMAL', 'SNAP\_INCREMENT', 'SNAP\_VERTEX', 'SNAP\_EDGE',  
'SNAP\_FACE', 'SNAP\_VOLUME', 'STICKY\_UVS\_LOC', 'STICKY\_UVS\_DISABLE',  
'STICKY\_UVS\_VERT', 'CLIPUV\_DEHLT', 'CLIPUV\_HLT', 'SNAP\_PEELED\_OBJECT',  
'GRID', 'PASTEDOWN', 'COPYDOWN', 'PASTEFLIPUP', 'PASTEFLIPDOWN',  
'SNAP\_SURFACE', 'RETOPO', 'UV\_VERTEXSEL', 'UV\_EDGESEL',  
'UV\_FACESEL', 'UV\_ISLANDSEL', 'UV\_SYNC\_SELECT', 'BBOX', 'WIRE',  
'SOLID', 'SMOOTH', 'POTATO', 'ORTHO', 'LOCKVIEW\_OFF', 'LOCKVIEW\_ON',  
'AXIS\_SIDE', 'AXIS\_FRONT', 'AXIS\_TOP', 'NDOF\_DOM', 'NDOF\_TURN',  
'NDOF\_FLY', 'NDOF\_TRANS', 'LAYER\_USED', 'LAYER\_ACTIVE', 'SORTALPHA',  
'SORTBYEXT', 'SORTTIME', 'SORTSIZE', 'LONGDISPLAY', 'SHORTDISPLAY',  
'GHOST', 'IMGDISPLAY', 'BOOKMARKS', 'FONTPREVIEW', 'FILTER',  
'NEWFOLDER', 'FILE\_PARENT', 'FILE\_REFRESH', 'FILE\_FOLDER',  
'FILE\_BLANK', 'FILE\_BLEND', 'FILE\_IMAGE', 'FILE\_MOVIE', 'FILE\_SCRIPT',  
'FILE\_SOUND', 'FILE\_FONT', 'BACK', 'FORWARD', 'DISK\_DRIVE', 'MATPLANE',  
'MATSHERE', 'MATCUBE', 'MONKEY', 'HAIR', 'ALIASED',  
'ANTIALIASED', 'MAT\_SPHERE\_SKY', 'WORDWRAP\_OFF', 'WORDWRAP\_ON',  
'SYNTAX\_OFF', 'SYNTAX\_ON', 'LINENUMBERS\_OFF', 'LINENUMBERS\_ON',  
'SCRIPTPLUGINS', 'SEQSEQUENCER', 'SEQ\_PREVIEW',  
'SEQ\_LUMA\_WAVEFORM', 'SEQ\_CHROMA\_SCOPE', 'SEQ\_HISTOGRAM',  
'SEQ\_SPLITVIEW', 'IMAGE\_RGB', 'IMAGE\_RGB\_ALPHA', 'IMAGE\_ALPHA', 'IMAGE\_ZDEPTH',  
'IMAGEFILE', 'BRUSH\_ADD', 'BRUSH\_BLOB', 'BRUSH\_BLUR',  
'BRUSH\_CLAY', 'BRUSH\_CLONE', 'BRUSHCREASE', 'BRUSH\_DARKEN',  
'BRUSH\_FILL', 'BRUSH\_FLATTEN', 'BRUSH\_GRAB', 'BRUSH\_INFLATE',  
'BRUSH\_LAYER', 'BRUSH\_LIGHTEN', 'BRUSH\_MIX', 'BRUSH\_MULTIPLY',  
'BRUSH\_NUDGE', 'BRUSH\_PINCH', 'BRUSH\_SCRAPE', 'BRUSH\_SCULPT\_DRAW',  
'BRUSH\_SMEAR', 'BRUSH\_SMOOTH', 'BRUSH\_SNAKE\_HOOK',  
'BRUSH\_SOFTEN', 'BRUSH\_SUBTRACT', 'BRUSH\_TEXDRAW', 'BRUSH\_THUMB',  
'BRUSH\_ROTATE', 'BRUSH\_VERTEXDRAW', 'VIEW3D\_VEC', 'EDIT\_VEC', 'EDITMODE\_DEHLT',  
'EDITMODE\_HLT', 'DISCLOSURE\_TRI\_RIGHT\_VEC', 'DISCLOSURE\_TRI\_DOWN\_VEC',  
'MOVE\_UP\_VEC', 'MOVE\_DOWN\_VEC', 'X\_VEC', 'SMALL\_TRI\_RIGHT\_VEC'], (optional)) – Icon, Override automatic icon of the item

**prop\_search** (*data*, *property*, *search\_data*, *search\_property*, *text*= "", *icon*= 'NONE')  
prop\_search

#### Parameters

- **data** ([AnyType](#), (never None)) – Data from which to take property.

- **property** (*string*) – Identifier of property in data.
- **search\_data** ([AnyType](#), (never None)) – Data from which to take collection to search in.
- **search\_property** (*string*) – Identifier of search collection property.
- **text** (*string, (optional)*) – Override automatic text of the item.
- **icon** (*enum in* ['NONE', 'QUESTION', 'ERROR', 'CANCEL', 'TRIA\_RIGHT', 'TRIA\_DOWN', 'TRIA\_LEFT', 'TRIA\_UP', 'ARROW\_LEFTRIGHT', 'PLUS', 'DISCLOSURE\_TRI\_DOWN', 'DISCLOSURE\_TRI\_RIGHT', 'RADIOBUT\_OFF', 'RADIOBUT\_ON', 'MENU\_PANEL', 'BLENDER', 'DOT', 'X', 'GO\_LEFT', 'PLUG', 'UI', 'NODE', 'NODE\_SEL', 'FULLSCREEN', 'SPLITSCREEN', 'RIGHTARROW\_THIN', 'BORDERMOVE', 'VIEWZOOM', 'ZOOMIN', 'ZOOMOUT', 'PANEL\_CLOSE', 'COPY\_ID', 'EYEDROPPER', 'LINK\_AREA', 'AUTO', 'CHECKBOX\_DEHLT', 'CHECKBOX\_HLT', 'UNLOCKED', 'LOCKED', 'UNPINNED', 'PINNED', 'SCREEN\_BACK', 'RIGHTARROW', 'DOWNARROW\_HLT', 'DOTSUP', 'DOTSDOWN', 'LINK', 'INLINK', 'PLUGIN', 'HELP', 'GHOST\_ENABLED', 'COLOR', 'LINKED', 'UNLINKED', 'HAND', 'ZOOM\_ALL', 'ZOOM\_SELECTED', 'ZOOM\_PREVIOUS', 'ZOOM\_IN', 'ZOOM\_OUT', 'RENDER\_REGION', 'BORDER\_RECT', 'BORDER\_LASSO', 'FREEZE', 'STYLUS\_PRESSURE', 'GHOST\_DISABLED', 'NEW', 'FILE\_TICK', 'QUIT', 'URL', 'RECOVER\_LAST', 'FULLSCREEN\_ENTER', 'FULLSCREEN\_EXIT', 'BLANK1', 'LAMP', 'MATERIAL', 'TEXTURE', 'ANIM', 'WORLD', 'SCENE', 'EDIT', 'GAME', 'RADIO', 'SCRIPT', 'PARTICLES', 'PHYSICS', 'SPEAKER', 'TEXTURE\_SHADED', 'VIEW3D', 'IPO', 'OOPS', 'BUTS', 'FILESEL', 'IMAGE\_COL', 'INFO', 'SEQUENCE', 'TEXT', 'IMASEL', 'SOUND', 'ACTION', 'NLA', 'SCRIPTWIN', 'TIME', 'NODETREE', 'LOGIC', 'CONSOLE', 'PREFERENCES', 'ASSET\_MANAGER', 'OBJECT\_DATAMODE', 'EDITMODE\_HLT', 'FACESEL\_HLT', 'VPAINT\_HLT', 'TPAINT\_HLT', 'WPAINT\_HLT', 'SCULPTMODE\_HLT', 'POSE\_HLT', 'PARTICLEMODE', 'LIGHTPAINT', 'SCENE\_DATA', 'RENDERLAYERS', 'WORLD\_DATA', 'OBJECT\_DATA', 'MESH\_DATA', 'CURVE\_DATA', 'META\_DATA', 'LATTICE\_DATA', 'LAMP\_DATA', 'MATERIAL\_DATA', 'TEXTURE\_DATA', 'ANIM\_DATA', 'CAMERA\_DATA', 'PARTICLE\_DATA', 'LIBRARY\_DATA\_DIRECT', 'GROUP', 'ARMATURE\_DATA', 'POSE\_DATA', 'BONE\_DATA', 'CONSTRAINT', 'SHAPEKEY\_DATA', 'CONSTRAINT\_BONE', 'PACKAGE', 'UGLYPACKAGE', 'BRUSH\_DATA', 'IMAGE\_DATA', 'FILE', 'FCURVE', 'FONT\_DATA', 'RENDER\_RESULT', 'SURFACE\_DATA', 'EMPTY\_DATA', 'SETTINGS', 'RENDER\_ANIMATION', 'RENDER\_STILL', 'BOIDS', 'STRANDS', 'LIBRARY\_DATA\_INDIRECT', 'GREASEPENCIL', 'GROUP\_BONE', 'GROUP\_VERTEX', 'GROUP\_VCOL', 'GROUP\_UVS', 'RNA', 'RNA\_ADD', 'OUTLINER\_OB\_EMPTY', 'OUTLINER\_OB\_MESH', 'OUTLINER\_OB\_CURVE', 'OUTLINER\_OB\_LATTICE', 'OUTLINER\_OB\_META', 'OUTLINER\_OB\_LAMP', 'OUTLINER\_OB\_CAMERA', 'OUTLINER\_OB\_ARMATURE', 'OUTLINER\_OB\_FONT', 'OUTLINER\_OB\_SURFACE', 'RESTRICT\_VIEW\_OFF', 'RESTRICT\_VIEW\_ON', 'RESTRICT\_SELECT\_OFF', 'RESTRICT\_SELECT\_ON', 'RESTRICT\_RENDER\_OFF', 'RESTRICT\_RENDER\_ON', 'OUTLINER\_DATA\_EMPTY', 'OUTLINER\_DATA\_MESH', 'OUTLINER\_DATA\_CURVE', 'OUTLINER\_DATA\_LATTICE', 'OUTLINER\_DATA\_META', 'OUTLINER\_DATA\_LAMP', 'OUTLINER\_DATA\_CAMERA', 'OUTLINER\_DATA\_ARMATURE', 'OUTLINER\_DATA\_FONT', 'OUTLINER\_DATA\_SURFACE', 'OUTLINER\_DATA\_POSE', 'MESH\_PLANE', 'MESH\_CUBE', 'MESH\_CIRCLE', 'MESH\_UVSHERE', 'MESH\_ICOSPHERE', 'MESH\_GRID', 'MESH\_MONKEY', 'MESH\_CYLINDER', 'MESH\_TORUS', 'MESH\_CONE', 'LAMP\_POINT', 'LAMP\_SUN', 'LAMP\_SPOT', 'LAMP\_HEMI', 'LAMP\_AREA', 'META\_PLANE', 'META\_CUBE', 'META BALL', 'META\_ELLIPSOID', 'META\_CAPSULE', 'SURFACE\_NCURVE', 'SURFACE\_NCIRCLE', 'SURFACE\_NSURFACE', 'SURFACE\_NCYLINDER',

'SURFACE\_NSPHERE', 'SURFACE\_NTORUS', 'CURVE\_BEZCURVE',  
'CURVE\_BEZCIRCLE', 'CURVE\_NCURVE', 'CURVE\_NCIRCLE', 'CURVE\_PATH',  
'FORCE\_FORCE', 'FORCE\_WIND', 'FORCE\_VORTEX', 'FORCE\_MAGNETIC',  
'FORCE\_HARMONIC', 'FORCE\_CHARGE', 'FORCE\_LENNARDJONES',  
'FORCE\_TEXTURE', 'FORCE\_CURVE', 'FORCE\_BOID', 'FORCE\_TURBULENCE',  
'FORCE\_DRAG', 'MODIFIER', 'MOD\_WAVE', 'MOD\_BUILD', 'MOD\_DECIM',  
'MOD\_MIRROR', 'MOD\_SOFT', 'MOD\_SUBSURF', 'HOOK', 'MOD\_PHYSICS',  
'MOD\_PARTICLES', 'MOD\_BOOLEAN', 'MOD\_EDGESPLIT', 'MOD\_ARRAY',  
'MOD\_UVPROJECT', 'MOD\_DISPLACE', 'MOD\_CURVE', 'MOD\_LATTICE',  
'CONSTRAINT\_DATA', 'MOD\_ARMATURE', 'MOD\_SHRINKWRAP',  
'MOD\_CAST', 'MOD\_MESHDEFORM', 'MOD\_BEVEL', 'MOD\_SMOOTH',  
'MOD\_SIMPLEDEFORM', 'MOD\_MASK', 'MOD\_CLOTH', 'MOD\_EXPLODE',  
'MOD\_FLUIDSIM', 'MOD\_MULTIRES', 'MOD\_SMOKE', 'MOD\_SOLIDIFY',  
'MOD\_SCREW', 'REC', 'PLAY', 'FF', 'REW', 'PAUSE', 'PREV\_KEYFRAME',  
'NEXT\_KEYFRAME', 'PLAY\_AUDIO', 'PLAY\_REVERSE', 'PREVIEW\_RANGE',  
'PMARKER\_ACT', 'PMARKER\_SEL', 'PMARKER', 'MARKER\_HLT', 'MARKER',  
'SPACE2', 'SPACE3', 'KEY\_DEHLT', 'KEY\_HLT', 'MUTE\_IPO\_OFF',  
'MUTE\_IPO\_ON', 'VERTEXSEL', 'EDGESEL', 'FACESEL', 'ROTATE', 'CURSOR',  
'ROTATECOLLECTION', 'ROTATECENTER', 'ROTACTIVE', 'ALIGN',  
'SMOOTHCURVE', 'SPHERECURVE', 'ROOTCURVE', 'SHARPCURVE',  
'LINCURVE', 'NOCURVE', 'RNDCURVE', 'PROP\_OFF', 'PROP\_ON',  
'PROP\_CON', 'PARTICLE\_POINT', 'PARTICLE\_TIP', 'PARTICLE\_PATH',  
'MAN\_TRANS', 'MAN\_ROT', 'MAN\_SCALE', 'MANIPUL', 'SNAP\_OFF', 'SNAP\_ON',  
'SNAP\_NORMAL', 'SNAP\_INCREMENT', 'SNAP\_VERTEX', 'SNAP\_EDGE',  
'SNAP\_FACE', 'SNAP\_VOLUME', 'STICKY\_UVS\_LOC', 'STICKY\_UVS\_DISABLE',  
'STICKY\_UVS\_VERT', 'CLIPUV\_DEHLT', 'CLIPUV\_HLT', 'SNAP\_PEELED\_OBJECT',  
'GRID', 'PASTEDOWN', 'COPYDOWN', 'PASTEFLIPUP', 'PASTEFLIPDOWN',  
'SNAP\_SURFACE', 'RETOPO', 'UV\_VERTEXSEL', 'UV\_EDGESEL',  
'UV\_FACESEL', 'UV\_ISLANDSEL', 'UV\_SYNC\_SELECT', 'BBOX', 'WIRE',  
'SOLID', 'SMOOTH', 'POTATO', 'ORTHO', 'LOCKVIEW\_OFF', 'LOCKVIEW\_ON',  
'AXIS\_SIDE', 'AXIS\_FRONT', 'AXIS\_TOP', 'NDOF\_DOM', 'NDOF\_TURN',  
'NDOF\_FLY', 'NDOF\_TRANS', 'LAYER\_USED', 'LAYER\_ACTIVE', 'SORTALPHA',  
'SORTBYEXT', 'SORTTIME', 'SORTSIZE', 'LONGDISPLAY', 'SHORTDISPLAY',  
'GHOST', 'IMGDISPLAY', 'BOOKMARKS', 'FONTPREVIEW', 'FILTER',  
'NEWFOLDER', 'FILE\_PARENT', 'FILE\_REFRESH', 'FILE\_FOLDER',  
'FILE\_BLANK', 'FILE\_BLEND', 'FILE\_IMAGE', 'FILE\_MOVIE', 'FILE\_SCRIPT',  
'FILE\_SOUND', 'FILE\_FONT', 'BACK', 'FORWARD', 'DISK\_DRIVE', 'MATPLANE',  
'MATSPHERE', 'MATCUBE', 'MONKEY', 'HAIR', 'ALIASED',  
'ANTIALIASED', 'MAT\_SPHERE\_SKY', 'WORDWRAP\_OFF', 'WORDWRAP\_ON',  
'SYNTAX\_OFF', 'SYNTAX\_ON', 'LINENUMBERS\_OFF', 'LINENUMBERS\_ON',  
'SCRIPTPLUGINS', 'SEQ\_SEQUENCER', 'SEQ\_PREVIEW',  
'SEQ\_LUMA\_WAVEFORM', 'SEQ\_CHROMA\_SCOPE', 'SEQ\_HISTOGRAM',  
'SEQ\_SPLITVIEW', 'IMAGE\_RGB', 'IMAGE\_RGB\_ALPHA', 'IMAGE\_ALPHA', 'IMAGE\_ZDEPTH',  
'IMAGEFILE', 'BRUSH\_ADD', 'BRUSH\_BLOB', 'BRUSH\_BLUR',  
'BRUSH\_CLAY', 'BRUSH\_CLONE', 'BRUSHCREASE', 'BRUSH\_DARKEN',  
'BRUSH\_FILL', 'BRUSH\_FLATTEN', 'BRUSH\_GRAB', 'BRUSH\_INFLATE',  
'BRUSH\_LAYER', 'BRUSH\_LIGHTEN', 'BRUSH\_MIX', 'BRUSH\_MULTIPLY',  
'BRUSH\_NUDGE', 'BRUSH\_PINCH', 'BRUSH\_SCRAPE', 'BRUSH\_SCULPT\_DRAW',  
'BRUSH\_SMEAR', 'BRUSH\_SMOOTH', 'BRUSH\_SNAKE\_HOOK',  
'BRUSH\_SOFTEN', 'BRUSH\_SUBTRACT', 'BRUSH\_TEXDRAW', 'BRUSH\_THUMB',  
'BRUSH\_ROTATE', 'BRUSH\_VERTEXDRAW', 'VIEW3D\_VEC', 'EDIT\_VEC', 'EDITMODE\_DEHLT',  
'EDITMODE\_HLT', 'DISCLOSURE\_TRI\_RIGHT\_VEC', 'DISCLOSURE\_TRI\_DOWN\_VEC',  
'MOVE\_UP\_VEC', 'MOVE\_DOWN\_VEC', 'X\_VEC', 'SMALL\_TRI\_RIGHT\_VEC], (optional)) – Icon, Override automatic icon of the item

**operator** (*operator*, *text*=“”, *icon*=‘NONE’, *emboss*=True)

Item. Places a button into the layout to call an Operator.

**Parameters**

- **operator** (*string*) – Identifier of the operator.
- **text** (*string, (optional)*) – Override automatic text of the item.
- **icon** (*enum in [‘NONE’, ‘QUESTION’, ‘ERROR’, ‘CANCEL’, ‘TRIA\_RIGHT’, ‘TRIA\_DOWN’, ‘TRIA\_LEFT’, ‘TRIA\_UP’, ‘ARROW\_LEFTRIGHT’, ‘PLUS’, ‘DISCLOSURE\_TRI\_DOWN’, ‘DISCLOSURE\_TRI\_RIGHT’, ‘RADIOBUT\_OFF’, ‘RADIOBUT\_ON’, ‘MENU\_PANEL’, ‘BLENDER’, ‘DOT’, ‘X’, ‘GO\_LEFT’, ‘PLUG’, ‘UI’, ‘NODE’, ‘NODE\_SEL’, ‘FULLSCREEN’, ‘SPLITSCREEN’, ‘RIGHTARROW\_THIN’, ‘BORDERMOVE’, ‘VIEWZOOM’, ‘ZOOMIN’, ‘ZOOMOUT’, ‘PANEL\_CLOSE’, ‘COPY\_ID’, ‘EYEDROPPER’, ‘LINK\_AREA’, ‘AUTO’, ‘CHECKBOX\_DEHLT’, ‘CHECKBOX\_HLT’, ‘UNLOCKED’, ‘LOCKED’, ‘UNPINNED’, ‘PINNED’, ‘SCREEN\_BACK’, ‘RIGHTARROW’, ‘DOWNARROW\_HLT’, ‘DOTSUP’, ‘DOTSDOWN’, ‘LINK’, ‘INLINK’, ‘PLUGIN’, ‘HELP’, ‘GHOST\_ENABLED’, ‘COLOR’, ‘LINKED’, ‘UNLINKED’, ‘HAND’, ‘ZOOM\_ALL’, ‘ZOOM\_SELECTED’, ‘ZOOM\_PREVIOUS’, ‘ZOOM\_IN’, ‘ZOOM\_OUT’, ‘RENDER\_REGION’, ‘BORDER\_RECT’, ‘BORDER\_LASSO’, ‘FREEZE’, ‘STYLUS\_PRESSURE’, ‘GHOST\_DISABLED’, ‘NEW’, ‘FILE\_TICK’, ‘QUIT’, ‘URL’, ‘RECOVER\_LAST’, ‘FULLSCREEN\_ENTER’, ‘FULLSCREEN\_EXIT’, ‘BLANK1’, ‘LAMP’, ‘MATERIAL’, ‘TEXTURE’, ‘ANIM’, ‘WORLD’, ‘SCENE’, ‘EDIT’, ‘GAME’, ‘RADIO’, ‘SCRIPT’, ‘PARTICLES’, ‘PHYSICS’, ‘SPEAKER’, ‘TEXTURE\_SHADED’, ‘VIEW3D’, ‘IPO’, ‘OOPS’, ‘BUTS’, ‘FILESEL’, ‘IMAGE\_COL’, ‘INFO’, ‘SEQUENCE’, ‘TEXT’, ‘IMASEL’, ‘SOUND’, ‘ACTION’, ‘NLA’, ‘SCRIPTWIN’, ‘TIME’, ‘NODETREE’, ‘LOGIC’, ‘CONSOLE’, ‘PREFERENCES’, ‘ASSET\_MANAGER’, ‘OBJECT\_DATAMODE’, ‘EDITMODE\_HLT’, ‘FACESEL\_HLT’, ‘VPAINT\_HLT’, ‘TPAINT\_HLT’, ‘WPAINT\_HLT’, ‘SCULPTMODE\_HLT’, ‘POSE\_HLT’, ‘PARTICLEMODE’, ‘LIGHTPAINT’, ‘SCENE\_DATA’, ‘RENDERLAYERS’, ‘WORLD\_DATA’, ‘OBJECT\_DATA’, ‘MESH\_DATA’, ‘CURVE\_DATA’, ‘META\_DATA’, ‘LATTICE\_DATA’, ‘LAMP\_DATA’, ‘MATERIAL\_DATA’, ‘TEXTURE\_DATA’, ‘ANIM\_DATA’, ‘CAMERA\_DATA’, ‘PARTICLE\_DATA’, ‘LIBRARY\_DATA\_DIRECT’, ‘GROUP’, ‘ARMATURE\_DATA’, ‘POSE\_DATA’, ‘BONE\_DATA’, ‘CONSTRAINT’, ‘SHAPEKEY\_DATA’, ‘CONSTRAINT\_BONE’, ‘PACKAGE’, ‘UGLYPACKAGE’, ‘BRUSH\_DATA’, ‘IMAGE\_DATA’, ‘FILE’, ‘FCURVE’, ‘FONT\_DATA’, ‘RENDER\_RESULT’, ‘SURFACE\_DATA’, ‘EMPTY\_DATA’, ‘SETTINGS’, ‘RENDER\_ANIMATION’, ‘RENDER\_STILL’, ‘BOIDS’, ‘STRANDS’, ‘LIBRARY\_DATA\_INDIRECT’, ‘GREASEPENCIL’, ‘GROUP\_BONE’, ‘GROUP\_VERTEX’, ‘GROUP\_VCOL’, ‘GROUP\_UVS’, ‘RNA’, ‘RNA\_ADD’, ‘OUTLINER\_OB\_EMPTY’, ‘OUTLINER\_OB\_MESH’, ‘OUTLINER\_OB\_CURVE’, ‘OUTLINER\_OB\_LATTICE’, ‘OUTLINER\_OB\_META’, ‘OUTLINER\_OB\_LAMP’, ‘OUTLINER\_OB\_CAMERA’, ‘OUTLINER\_OB\_ARMATURE’, ‘OUTLINER\_OB\_FONT’, ‘OUTLINER\_OB\_SURFACE’, ‘RESTRICT\_VIEW\_OFF’, ‘RESTRICT\_VIEW\_ON’, ‘RESTRICT\_SELECT\_OFF’, ‘RESTRICT\_SELECT\_ON’, ‘RESTRICT\_RENDER\_OFF’, ‘RESTRICT\_RENDER\_ON’, ‘OUTLINER\_DATA\_EMPTY’, ‘OUTLINER\_DATA\_MESH’, ‘OUTLINER\_DATA\_CURVE’, ‘OUTLINER\_DATA\_LATTICE’, ‘OUTLINER\_DATA\_META’, ‘OUTLINER\_DATA\_LAMP’, ‘OUTLINER\_DATA\_CAMERA’, ‘OUTLINER\_DATA\_ARMATURE’, ‘OUTLINER\_DATA\_FONT’, ‘OUTLINER\_DATA\_SURFACE’, ‘OUTLINER\_DATA\_POSE’, ‘MESH\_PLANE’, ‘MESH\_CUBE’, ‘MESH\_CIRCLE’, ‘MESH\_UVSPHERE’, ‘MESH\_ICOSPHERE’, ‘MESH\_GRID’, ‘MESH\_MONKEY’, ‘MESH\_CYLINDER’, ‘MESH\_TORUS’, ‘MESH\_CONE’, ‘LAMP\_POINT’, ‘LAMP\_SUN’, ‘LAMP\_SPOT’, ‘LAMP\_HEMI’, ‘LAMP\_AREA’, ‘META\_PLANE’, ‘META\_CUBE’, ‘META BALL’, ‘META\_ELLIPSOID’, ‘META\_CAPSULE’, ‘SURFACE\_NCURVE’, ‘SUR-*

'FACE\_NCIRCLE', 'SURFACE\_NSURFACE', 'SURFACE\_NCYLINDER',  
'SURFACE\_NSPHERE', 'SURFACE\_NTORUS', 'CURVE\_BEZCURVE',  
'CURVE\_BEZCIRCLE', 'CURVE\_NCURVE', 'CURVE\_NCIRCLE', 'CURVE\_PATH',  
'FORCE\_FORCE', 'FORCE\_WIND', 'FORCE\_VORTEX', 'FORCE\_MAGNETIC',  
'FORCE\_HARMONIC', 'FORCE\_CHARGE', 'FORCE\_LENNARDJONES',  
'FORCE\_TEXTURE', 'FORCE\_CURVE', 'FORCE\_BOID', 'FORCE\_TURBULENCE',  
'FORCE\_DRAG', 'MODIFIER', 'MOD\_WAVE', 'MOD\_BUILD', 'MOD\_DECIM',  
'MOD\_MIRROR', 'MOD\_SOFT', 'MOD\_SUBSURF', 'HOOK', 'MOD\_PHYSICS',  
'MOD\_PARTICLES', 'MOD\_BOOLEAN', 'MOD\_EDGESPLIT', 'MOD\_ARRAY',  
'MOD\_UVPROJECT', 'MOD\_DISPLACE', 'MOD\_CURVE', 'MOD\_LATTICE',  
'CONSTRAINT\_DATA', 'MOD\_ARMATURE', 'MOD\_SHRINKWRAP',  
'MOD\_CAST', 'MOD\_MESHDEFORM', 'MOD\_BEVEL', 'MOD\_SMOOTH',  
'MOD\_SIMPLEDEFORM', 'MOD\_MASK', 'MOD\_CLOTH', 'MOD\_EXPLODE',  
'MOD\_FLUIDSIM', 'MOD\_MULTIRES', 'MOD\_SMOKE', 'MOD\_SOLIDIFY',  
'MOD\_SCREW', 'REC', 'PLAY', 'FF', 'REW', 'PAUSE', 'PREV\_KEYFRAME',  
'NEXT\_KEYFRAME', 'PLAY\_AUDIO', 'PLAY\_REVERSE', 'PREVIEW\_RANGE',  
'PMARKER\_ACT', 'PMARKER\_SEL', 'PMARKER', 'MARKER\_HLT', 'MARKER',  
'SPACE2', 'SPACE3', 'KEY\_DEHLT', 'KEY\_HLT', 'MUTE\_IPO\_OFF',  
'MUTE\_IPO\_ON', 'VERTEXSEL', 'EDGESEL', 'FACESEL', 'ROTATE', 'CURSOR',  
'ROTATECOLLECTION', 'ROTATECENTER', 'ROTACTIVE', 'ALIGN',  
'SMOOTHCURVE', 'SPHERECURVE', 'ROOTCURVE', 'SHARPCURVE',  
'LINCURVE', 'NOCURVE', 'RNDCURVE', 'PROP\_OFF', 'PROP\_ON',  
'PROP\_CON', 'PARTICLE\_POINT', 'PARTICLE\_TIP', 'PARTICLE\_PATH',  
'MAN\_TRANS', 'MAN\_ROT', 'MAN\_SCALE', 'MANIPUL', 'SNAP\_OFF', 'SNAP\_ON',  
'SNAP\_NORMAL', 'SNAP\_INCREMENT', 'SNAP\_VERTEX', 'SNAP\_EDGE',  
'SNAP\_FACE', 'SNAP\_VOLUME', 'STICKY\_UVS\_LOC', 'STICKY\_UVS\_DISABLE',  
'STICKY\_UVS\_VERT', 'CLIPUV\_DEHLT', 'CLIPUV\_HLT', 'SNAP\_PEELED\_OBJECT',  
'GRID', 'PASTEDOWN', 'COPYDOWN', 'PASTEFLIPUP', 'PASTEFLIPDOWN',  
'SNAP\_SURFACE', 'RETOPO', 'UV\_VERTEXSEL', 'UV\_EDGESEL',  
'UV\_FACESEL', 'UV\_ISLANDSEL', 'UV\_SYNC\_SELECT', 'BBOX', 'WIRE',  
'SOLID', 'SMOOTH', 'POTATO', 'ORTHO', 'LOCKVIEW\_OFF', 'LOCKVIEW\_ON',  
'AXIS\_SIDE', 'AXIS\_FRONT', 'AXIS\_TOP', 'NDOF\_DOM', 'NDOF\_TURN',  
'NDOF\_FLY', 'NDOF\_TRANS', 'LAYER\_USED', 'LAYER\_ACTIVE', 'SORTALPHA',  
'SORTBYEXT', 'SORTTIME', 'SORTSIZE', 'LONGDISPLAY', 'SHORTDISPLAY',  
'GHOST', 'IMGDISPLAY', 'BOOKMARKS', 'FONTPREVIEW', 'FILTER',  
'NEWFOLDER', 'FILE\_PARENT', 'FILE\_REFRESH', 'FILE\_FOLDER',  
'FILE\_BLANK', 'FILE\_BLEND', 'FILE\_IMAGE', 'FILE\_MOVIE', 'FILE\_SCRIPT',  
'FILE\_SOUND', 'FILE\_FONT', 'BACK', 'FORWARD', 'DISK\_DRIVE', 'MATPLANE',  
'MATSOSPHERE', 'MATCUBE', 'MONKEY', 'HAIR', 'ALIASED',  
'ANTIALIASED', 'MAT\_SPHERE\_SKY', 'WORDWRAP\_OFF', 'WORDWRAP\_ON',  
'SYNTAX\_OFF', 'SYNTAX\_ON', 'LINENUMBERS\_OFF', 'LINENUMBERS\_ON',  
'SCRIPTPLUGINS', 'SEQ\_SEQUENCER', 'SEQ\_PREVIEW',  
'SEQ\_LUMA\_WAVEFORM', 'SEQ\_CHROMA\_SCOPE', 'SEQ\_HISTOGRAM',  
'SEQ\_SPLITVIEW', 'IMAGE\_RGB', 'IMAGE\_RGB\_ALPHA', 'IMAGE\_ALPHA', 'IMAGE\_ZDEPTH',  
'IMAGEFILE', 'BRUSH\_ADD', 'BRUSH\_BLOB', 'BRUSH\_BLUR',  
'BRUSH\_CLAY', 'BRUSH\_CLONE', 'BRUSHCREASE', 'BRUSH\_DARKEN',  
'BRUSH\_FILL', 'BRUSH\_FLATTEN', 'BRUSH\_GRAB', 'BRUSH\_INFLATE',  
'BRUSH\_LAYER', 'BRUSH\_LIGHTEN', 'BRUSH\_MIX', 'BRUSH\_MULTIPLY',  
'BRUSH\_NUDGE', 'BRUSH\_PINCH', 'BRUSH\_SCRAPE', 'BRUSH\_SCULPT\_DRAW',  
'BRUSH\_SMEAR', 'BRUSH\_SMOOTH', 'BRUSH\_SNAKE\_HOOK',  
'BRUSH\_SOFTEN', 'BRUSH\_SUBTRACT', 'BRUSH\_TEXDRAW', 'BRUSH\_THUMB',  
'BRUSH\_ROTATE', 'BRUSH\_VERTEXDRAW', 'VIEW3D\_VEC', 'EDIT\_VEC', 'EDITMODE\_DEHLT',  
'EDITMODE\_HLT', 'DISCLOSURE\_TRI\_RIGHT\_VEC', 'DISCLOSURE\_TRI\_DOWN\_VEC', 'MOVE\_UP\_VEC',  
'MOVE\_DOWN\_VEC', 'X\_VEC'

‘SMALL\_TRI\_RIGHT\_VEC’], (optional)) – Icon, Override automatic icon of the item

- **emboss** (boolean, (optional)) – Draw the button itself, just the icon/text.

**Returns** Operator properties to fill in, return when ‘properties’ is set to true.

**Return type** `OperatorProperties`

**operator\_enum** (*operator, property*)

operator\_enum

**Parameters**

- **operator** (string) – Identifier of the operator.
- **property** (string) – Identifier of property in operator.

**operator\_menu\_enum** (*operator, property, text=""*, *icon='NONE'*)

operator\_menu\_enum

**Parameters**

- **operator** (string) – Identifier of the operator.
- **property** (string) – Identifier of property in operator.
- **text** (string, (optional)) – Override automatic text of the item.
- **icon** (enum in [‘NONE’, ‘QUESTION’, ‘ERROR’, ‘CANCEL’, ‘TRIA\_RIGHT’, ‘TRIA\_DOWN’, ‘TRIA\_LEFT’, ‘TRIA\_UP’, ‘ARROW\_LEFTRIGHT’, ‘PLUS’, ‘DISCLOSURE\_TRI\_DOWN’, ‘DISCLOSURE\_TRI\_RIGHT’, ‘RADIOBUT\_OFF’, ‘RADIOBUT\_ON’, ‘MENU\_PANEL’, ‘BLENDER’, ‘DOT’, ‘X’, ‘GO\_LEFT’, ‘PLUG’, ‘UT’, ‘NODE’, ‘NODE\_SEL’, ‘FULLSCREEN’, ‘SPLITSCREEN’, ‘RIGHTARROW\_THIN’, ‘BORDERMOVE’, ‘VIEWZOOM’, ‘ZOOMIN’, ‘ZOOMOUT’, ‘PANEL\_CLOSE’, ‘COPY\_ID’, ‘EYEDROPPER’, ‘LINK\_AREA’, ‘AUTO’, ‘CHECKBOX\_DEHLT’, ‘CHECKBOX\_HLT’, ‘UNLOCKED’, ‘LOCKED’, ‘UNPINNED’, ‘PINNED’, ‘SCREEN\_BACK’, ‘RIGHTARROW’, ‘DOWNARROW\_HLT’, ‘DOTSUP’, ‘DOTSDOWN’, ‘LINK’, ‘INLINK’, ‘PLUGIN’, ‘HELP’, ‘GHOST\_ENABLED’, ‘COLOR’, ‘LINKED’, ‘UNLINKED’, ‘HAND’, ‘ZOOM\_ALL’, ‘ZOOM\_SELECTED’, ‘ZOOM\_PREVIOUS’, ‘ZOOM\_IN’, ‘ZOOM\_OUT’, ‘RENDER\_REGION’, ‘BORDER\_RECT’, ‘BORDER\_LASSO’, ‘FREEZE’, ‘STYLUS\_PRESSURE’, ‘GHOST\_DISABLED’, ‘NEW’, ‘FILE\_TICK’, ‘QUIT’, ‘URL’, ‘RECOVER\_LAST’, ‘FULLSCREEN\_ENTER’, ‘FULLSCREEN\_EXIT’, ‘BLANKI’, ‘LAMP’, ‘MATERIAL’, ‘TEXTURE’, ‘ANIM’, ‘WORLD’, ‘SCENE’, ‘EDIT’, ‘GAME’, ‘RADIO’, ‘SCRIPT’, ‘PARTICLES’, ‘PHYSICS’, ‘SPEAKER’, ‘TEXTURE\_SHADED’, ‘VIEW3D’, ‘IPO’, ‘OOPS’, ‘BUTS’, ‘FILESEL’, ‘IMAGE\_COL’, ‘INFO’, ‘SEQUENCE’, ‘TEXT’, ‘IMASEL’, ‘SOUND’, ‘ACTION’, ‘NLA’, ‘SCRIPTWIN’, ‘TIME’, ‘NODETREE’, ‘LOGIC’, ‘CONSOLE’, ‘PREFERENCES’, ‘ASSET\_MANAGER’, ‘OBJECT\_DATAMODE’, ‘EDITMODE\_HLT’, ‘FACESEL\_HLT’, ‘VPAINT\_HLT’, ‘TPAINT\_HLT’, ‘WPAINT\_HLT’, ‘SCULPTMODE\_HLT’, ‘POSE\_HLT’, ‘PARTICLEMODE’, ‘LIGHTPAINT’, ‘SCENE\_DATA’, ‘RENDERLAYERS’, ‘WORLD\_DATA’, ‘OBJECT\_DATA’, ‘MESH\_DATA’, ‘CURVE\_DATA’, ‘META\_DATA’, ‘LATTICE\_DATA’, ‘LAMP\_DATA’, ‘MATERIAL\_DATA’, ‘TEXTURE\_DATA’, ‘ANIM\_DATA’, ‘CAMERA\_DATA’, ‘PARTICLE\_DATA’, ‘LIBRARY\_DATA\_DIRECT’, ‘GROUP’, ‘ARMATURE\_DATA’, ‘POSE\_DATA’, ‘BONE\_DATA’, ‘CONSTRAINT’, ‘SHAPEKEY\_DATA’, ‘CONSTRAINT\_BONE’, ‘PACKAGE’, ‘UGLYPACKAGE’, ‘BRUSH\_DATA’, ‘IMAGE\_DATA’, ‘FILE’, ‘FCURVE’, ‘FONT\_DATA’, ‘RENDER\_RESULT’, ‘SURFACE\_DATA’, ‘EMPTY\_DATA’, ‘SETTINGS’, ‘RENDER\_ANIMATION’, ‘RENDER\_STILL’, ‘BOIDS’, ‘STRANDS’, ‘LIBRARY\_DATA\_INDIRECT’, ‘GREASEPENCIL’, ‘GROUP\_BONE’, ‘GROUP\_VERTEX’, ‘GROUP\_VCOL’, ‘GROUP\_UVS’,

'RNA', 'RNA\_ADD', 'OUTLINER\_OB\_EMPTY', 'OUTLINER\_OB\_MESH', 'OUTLINER\_OB\_CURVE', 'OUTLINER\_OB\_LATTICE', 'OUTLINER\_OB\_META', 'OUTLINER\_OB\_LAMP', 'OUTLINER\_OB\_CAMERA', 'OUTLINER\_OB\_ARMATURE', 'OUTLINER\_OB\_FONT', 'OUTLINER\_OB\_SURFACE', 'RESTRICT\_VIEW\_OFF', 'RESTRICT\_VIEW\_ON', 'RESTRICT\_SELECT\_OFF', 'RESTRICT\_SELECT\_ON', 'RESTRICT\_RENDER\_OFF', 'RESTRICT\_RENDER\_ON', 'OUTLINER\_DATA\_EMPTY', 'OUTLINER\_DATA\_MESH', 'OUTLINER\_DATA\_CURVE', 'OUTLINER\_DATA\_LATTICE', 'OUTLINER\_DATA\_META', 'OUTLINER\_DATA\_LAMP', 'OUTLINER\_DATA\_CAMERA', 'OUTLINER\_DATA\_ARMATURE', 'OUTLINER\_DATA\_FONT', 'OUTLINER\_DATA\_SURFACE', 'OUTLINER\_DATA\_POSE', 'MESH\_PLANE', 'MESH\_CUBE', 'MESH\_CIRCLE', 'MESH\_UVSHERE', 'MESH\_ICOSPHERE', 'MESH\_GRID', 'MESH\_MONKEY', 'MESH\_CYLINDER', 'MESH\_TORUS', 'MESH\_CONE', 'LAMP\_POINT', 'LAMP\_SUN', 'LAMP\_SPOT', 'LAMP\_HEMI', 'LAMP\_AREA', 'META\_PLANE', 'META\_CUBE', 'META\_BALL', 'META\_ELLIPSOID', 'META\_CAPSULE', 'SURFACE\_NCURVE', 'SURFACE\_NCIRCLE', 'SURFACE\_NSURFACE', 'SURFACE\_NCYLINDER', 'SURFACE\_NSPHERE', 'SURFACE\_NTORUS', 'CURVE\_BEZCURVE', 'CURVE\_BEZCIRCLE', 'CURVE\_NCURVE', 'CURVE\_NCIRCLE', 'CURVE\_PATH', 'FORCE\_FORCE', 'FORCE\_WIND', 'FORCE\_VORTEX', 'FORCE\_MAGNETIC', 'FORCE\_HARMONIC', 'FORCE\_CHARGE', 'FORCE\_LENNARDJONES', 'FORCE\_TEXTURE', 'FORCE\_CURVE', 'FORCE\_BOID', 'FORCE\_TURBULENCE', 'FORCE\_DRAG', 'MODIFIER', 'MOD\_WAVE', 'MOD\_BUILD', 'MOD\_DECIM', 'MOD\_MIRROR', 'MOD\_SOFT', 'MOD\_SUBSURF', 'HOOK', 'MOD\_PHYSICS', 'MOD\_PARTICLES', 'MOD\_BOOLEAN', 'MOD\_EDGESPLIT', 'MOD\_ARRAY', 'MOD\_UVPROJECT', 'MOD\_DISPLACE', 'MOD\_CURVE', 'MOD\_LATTICE', 'CONSTRAINT\_DATA', 'MOD\_ARMATURE', 'MOD\_SHRINKWRAP', 'MOD\_CAST', 'MOD\_MESHDEFORM', 'MOD\_BEVEL', 'MOD\_SMOOTH', 'MOD\_SIMPLEDEFORM', 'MOD\_MASK', 'MOD\_CLOTH', 'MOD\_EXPLODE', 'MOD\_FLUIDSIM', 'MOD\_MULTRES', 'MOD\_SMOKE', 'MOD\_SOLIDIFY', 'MOD\_SCREW', 'REC', 'PLAY', 'FF', 'REW', 'PAUSE', 'PREV\_KEYFRAME', 'NEXT\_KEYFRAME', 'PLAY\_AUDIO', 'PLAY\_REVERSE', 'PREVIEW\_RANGE', 'PMARKER\_ACT', 'PMARKER\_SEL', 'PMARKER', 'MARKER\_HLT', 'MARKER', 'SPACE2', 'SPACE3', 'KEY\_DEHLT', 'KEY\_HLT', 'MUTE\_IPO\_OFF', 'MUTE\_IPO\_ON', 'VERTEXSEL', 'EDGESEL', 'FACESEL', 'ROTATE', 'CURSOR', 'ROTATECOLLECTION', 'ROTATECENTER', 'ROTACTIVE', 'ALIGN', 'SMOOTHCURVE', 'SPHEREREVERSE', 'ROOTCURVE', 'SHARPCURVE', 'LINCURVE', 'NOCURVE', 'RNDCURVE', 'PROP\_OFF', 'PROP\_ON', 'PROP\_CON', 'PARTICLE\_POINT', 'PARTICLE\_TIP', 'PARTICLE\_PATH', 'MAN\_TRANS', 'MAN\_ROT', 'MAN\_SCALE', 'MANIPUL', 'SNAP\_OFF', 'SNAP\_ON', 'SNAP\_NORMAL', 'SNAP\_INCREMENT', 'SNAP\_VERTEX', 'SNAP\_EDGE', 'SNAP\_FACE', 'SNAP\_VOLUME', 'STICKY\_UVS\_LOC', 'STICKY\_UVS\_DISABLE', 'STICKY\_UVS\_VERT', 'CLIPUV\_DEHLT', 'CLIPUV\_HLT', 'SNAP\_PEELOBJECT', 'GRID', 'PASTEDOWN', 'COPYDOWN', 'PASTEFILIPUP', 'PASTEFILIPDOWN', 'SNAP\_SURFACE', 'RETOPO', 'UV\_VERTEXSEL', 'UV\_EDGESSEL', 'UV\_FACESEL', 'UV\_ISLANDSEL', 'UV\_SYNC\_SELECT', 'BBOX', 'WIRE', 'SOLID', 'SMOOTH', 'POTATO', 'ORTHO', 'LOCKVIEW\_OFF', 'LOCKVIEW\_ON', 'AXIS\_SIDE', 'AXIS\_FRONT', 'AXIS\_TOP', 'NDOF\_DOM', 'NDOF\_TURN', 'NDOF\_FLY', 'NDOF\_TRANS', 'LAYER\_USED', 'LAYER\_ACTIVE', 'SORTALPHA', 'SORTBYEXT', 'SORTTIME', 'SORTSIZE', 'LONGDISPLAY', 'SHORTDISPLAY', 'GHOST', 'IMGDISPLAY', 'BOOKMARKS', 'FONTPREVIEW', 'FILTER', 'NEWFOLDER', 'FILE\_PARENT', 'FILE\_REFRESH', 'FILE\_FOLDER', 'FILE\_BLANK', 'FILE\_BLEND', 'FILE\_IMAGE', 'FILE\_MOVIE', 'FILE\_SCRIPT', 'FILE\_SOUND', 'FILE\_FONT', 'BACK', 'FORWARD', 'DISK\_DRIVE', 'MATPLANE', 'MATSPHERE', 'MATCUBE', 'MONKEY', 'HAIR', 'ALIASED',

'ANTIALIASED', 'MAT\_SPHERE\_SKY', 'WORDWRAP\_OFF', 'WORDWRAP\_ON', 'SYNTAX\_OFF', 'SYNTAX\_ON', 'LINENUMBERS\_OFF', 'LINENUMBERS\_ON', 'SCRIPTPLUGINS', 'SEQ\_SEQUENCER', 'SEQ\_PREVIEW', 'SEQ\_LUMA\_WAVEFORM', 'SEQ\_CHROMA\_SCOPE', 'SEQ\_HISTOGRAM', 'SEQ\_SPLITVIEW', 'IMAGE\_RGB', 'IMAGE\_RGB\_ALPHA', 'IMAGE\_ALPHA', 'IMAGE\_ZDEPTH', 'IMAGEFILE', 'BRUSH\_ADD', 'BRUSH\_BLOB', 'BRUSH\_BLUR', 'BRUSH\_CLAY', 'BRUSH\_CLONE', 'BRUSHCREASE', 'BRUSH\_DARKEN', 'BRUSH\_FILL', 'BRUSH\_FLATTEN', 'BRUSH\_GRAB', 'BRUSH\_INFLATE', 'BRUSH\_LAYER', 'BRUSH\_LIGHTEN', 'BRUSH\_MIX', 'BRUSH\_MULTIPLY', 'BRUSH\_NUDGE', 'BRUSH\_PINCH', 'BRUSH\_SCRAPE', 'BRUSH\_SCULPT\_DRAW', 'BRUSH\_SMEAR', 'BRUSH\_SMOOTH', 'BRUSH\_SNAKE\_HOOK', 'BRUSH\_SOFTEN', 'BRUSH\_SUBTRACT', 'BRUSH\_TEXDRAW', 'BRUSH\_THUMB', 'BRUSH\_ROTATE', 'BRUSH\_VERTEXDRAW', 'VIEW3D\_VEC', 'EDIT\_VEC', 'EDITMODE\_DEHLT', 'EDITMODE\_HLT', 'DISCLOSURE\_TRI\_RIGHT\_VEC', 'DISCLOSURE\_TRI\_DOWN\_VEC', 'MOVE\_UP\_VEC', 'MOVE\_DOWN\_VEC', 'X\_VEC', 'SMALL\_TRI\_RIGHT\_VEC'], (optional)) – Icon, Override automatic icon of the item

**label** (*text*=““, *icon*=’NONE’)

Item. Display text in the layout.

**Parameters**

- **text** (*string*, (optional)) – Override automatic text of the item.
- **icon** (*enum in* [‘NONE’, ‘QUESTION’, ‘ERROR’, ‘CANCEL’, ‘TRIA\_RIGHT’, ‘TRIA\_DOWN’, ‘TRIA\_LEFT’, ‘TRIA\_UP’, ‘ARROW\_LEFTRIGHT’, ‘PLUS’, ‘DISCLOSURE\_TRI\_DOWN’, ‘DISCLOSURE\_TRI\_RIGHT’, ‘RADIOBUT\_OFF’, ‘RADIOBUT\_ON’, ‘MENU\_PANEL’, ‘BLENDER’, ‘DOT’, ‘X’, ‘GO\_LEFT’, ‘PLUG’, ‘UI’, ‘NODE’, ‘NODE\_SEL’, ‘FULLSCREEN’, ‘SPLITSCREEN’, ‘RIGHTARROW\_THIN’, ‘BORDERMOVE’, ‘VIEWZOOM’, ‘ZOOMIN’, ‘ZOOMOUT’, ‘PANEL\_CLOSE’, ‘COPY\_ID’, ‘EYEDROPPER’, ‘LINK\_AREA’, ‘AUTO’, ‘CHECKBOX\_DEHLT’, ‘CHECKBOX\_HLT’, ‘UNLOCKED’, ‘LOCKED’, ‘UNPINNED’, ‘PINNED’, ‘SCREEN\_BACK’, ‘RIGHTARROW’, ‘DOWNARROW\_HLT’, ‘DOTSUP’, ‘DOTSDOWN’, ‘LINK’, ‘INLINK’, ‘PLUGIN’, ‘HELP’, ‘GHOST\_ENABLED’, ‘COLOR’, ‘LINKED’, ‘UNLINKED’, ‘HAND’, ‘ZOOM\_ALL’, ‘ZOOM\_SELECTED’, ‘ZOOM\_PREVIOUS’, ‘ZOOM\_IN’, ‘ZOOM\_OUT’, ‘RENDER\_REGION’, ‘BORDER\_RECT’, ‘BORDER\_LASSO’, ‘FREEZE’, ‘STYLUS\_PRESSURE’, ‘GHOST\_DISABLED’, ‘NEW’, ‘FILE\_TICK’, ‘QUIT’, ‘URL’, ‘RECOVER\_LAST’, ‘FULLSCREEN\_ENTER’, ‘FULLSCREEN\_EXIT’, ‘BLANK1’, ‘LAMP’, ‘MATERIAL’, ‘TEXTURE’, ‘ANIM’, ‘WORLD’, ‘SCENE’, ‘EDIT’, ‘GAME’, ‘RADIO’, ‘SCRIPT’, ‘PARTICLES’, ‘PHYSICS’, ‘SPEAKER’, ‘TEXTURE\_SHADED’, ‘VIEW3D’, ‘IPO’, ‘OOPS’, ‘BUTS’, ‘FILESEL’, ‘IMAGE\_COL’, ‘INFO’, ‘SEQUENCE’, ‘TEXT’, ‘IMASEL’, ‘SOUND’, ‘ACTION’, ‘NLA’, ‘SCRIPTWIN’, ‘TIME’, ‘NODETREE’, ‘LOGIC’, ‘CONSOLE’, ‘PREFERENCES’, ‘ASSET\_MANAGER’, ‘OBJECT\_DATAMODE’, ‘EDITMODE\_HLT’, ‘FACESEL\_HLT’, ‘VPAINT\_HLT’, ‘TPAINT\_HLT’, ‘WPAINT\_HLT’, ‘SCULPTMODE\_HLT’, ‘POSE\_HLT’, ‘PARTICLEMODE’, ‘LIGHTPAINT’, ‘SCENE\_DATA’, ‘RENDERLAYERS’, ‘WORLD\_DATA’, ‘OBJECT\_DATA’, ‘MESH\_DATA’, ‘CURVE\_DATA’, ‘META\_DATA’, ‘LATTICE\_DATA’, ‘LAMP\_DATA’, ‘MATERIAL\_DATA’, ‘TEXTURE\_DATA’, ‘ANIM\_DATA’, ‘CAMERA\_DATA’, ‘PARTICLE\_DATA’, ‘LIBRARY\_DATA\_DIRECT’, ‘GROUP’, ‘ARMATURE\_DATA’, ‘POSE\_DATA’, ‘BONE\_DATA’, ‘CONSTRAINT’, ‘SHAPEKEY\_DATA’, ‘CONSTRAINT\_BONE’, ‘PACKAGE’, ‘UGLYPACKAGE’, ‘BRUSH\_DATA’, ‘IMAGE\_DATA’, ‘FILE’, ‘FCURVE’, ‘FONT\_DATA’, ‘RENDER\_RESULT’, ‘SURFACE\_DATA’, ‘EMPTY\_DATA’, ‘SETTINGS’, ‘RENDER\_ANIMATION’, ‘RENDER\_STILL’, ‘BOIDS’, ‘STRANDS’, ‘LIBRARY\_DATA\_INDIRECT’, ‘GREASEPENCIL’, ‘GROUP\_BONE’, ‘GROUP\_VERTEX’, ‘GROUP\_VCOL’, ‘GROUP\_UVS’,

'RNA', 'RNA\_ADD', 'OUTLINER\_OB\_EMPTY', 'OUTLINER\_OB\_MESH', 'OUTLINER\_OB\_CURVE', 'OUTLINER\_OB\_LATTICE', 'OUTLINER\_OB\_META', 'OUTLINER\_OB\_LAMP', 'OUTLINER\_OB\_CAMERA', 'OUTLINER\_OB\_ARMATURE', 'OUTLINER\_OB\_FONT', 'OUTLINER\_OB\_SURFACE', 'RESTRICT\_VIEW\_OFF', 'RESTRICT\_VIEW\_ON', 'RESTRICT\_SELECT\_OFF', 'RESTRICT\_SELECT\_ON', 'RESTRICT\_RENDER\_OFF', 'RESTRICT\_RENDER\_ON', 'OUTLINER\_DATA\_EMPTY', 'OUTLINER\_DATA\_MESH', 'OUTLINER\_DATA\_CURVE', 'OUTLINER\_DATA\_LATTICE', 'OUTLINER\_DATA\_META', 'OUTLINER\_DATA\_LAMP', 'OUTLINER\_DATA\_CAMERA', 'OUTLINER\_DATA\_ARMATURE', 'OUTLINER\_DATA\_FONT', 'OUTLINER\_DATA\_SURFACE', 'OUTLINER\_DATA\_POSE', 'MESH\_PLANE', 'MESH\_CUBE', 'MESH\_CIRCLE', 'MESH\_UVSHERE', 'MESH\_ICOSPHERE', 'MESH\_GRID', 'MESH\_MONKEY', 'MESH\_CYLINDER', 'MESH\_TORUS', 'MESH\_CONE', 'LAMP\_POINT', 'LAMP\_SUN', 'LAMP\_SPOT', 'LAMP\_HEMI', 'LAMP\_AREA', 'META\_PLANE', 'META\_CUBE', 'META\_BALL', 'META\_ELLIPSOID', 'META\_CAPSULE', 'SURFACE\_NCURVE', 'SURFACE\_NCIRCLE', 'SURFACE\_NSURFACE', 'SURFACE\_NCYLINDER', 'SURFACE\_NSPHERE', 'SURFACE\_NTORUS', 'CURVE\_BEZCURVE', 'CURVE\_BEZCIRCLE', 'CURVE\_NCURVE', 'CURVE\_NCIRCLE', 'CURVE\_PATH', 'FORCE\_FORCE', 'FORCE\_WIND', 'FORCE\_VORTEX', 'FORCE\_MAGNETIC', 'FORCE\_HARMONIC', 'FORCE\_CHARGE', 'FORCE\_LENNARDJONES', 'FORCE\_TEXTURE', 'FORCE\_CURVE', 'FORCE\_BOID', 'FORCE\_TURBULENCE', 'FORCE\_DRAG', 'MODIFIER', 'MOD\_WAVE', 'MOD\_BUILD', 'MOD\_DECIM', 'MOD\_MIRROR', 'MOD\_SOFT', 'MOD\_SUBSURF', 'HOOK', 'MOD\_PHYSICS', 'MOD\_PARTICLES', 'MOD\_BOOLEAN', 'MOD\_EDGESPLIT', 'MOD\_ARRAY', 'MOD\_UVPROJECT', 'MOD\_DISPLACE', 'MOD\_CURVE', 'MOD\_LATTICE', 'CONSTRAINT\_DATA', 'MOD\_ARMATURE', 'MOD\_SHRINKWRAP', 'MOD\_CAST', 'MOD\_MESHDEFORM', 'MOD\_BEVEL', 'MOD\_SMOOTH', 'MOD\_SIMPLEDEFORM', 'MOD\_MASK', 'MOD\_CLOTH', 'MOD\_EXPLODE', 'MOD\_FLUIDSIM', 'MOD\_MULTRES', 'MOD\_SMOKE', 'MOD\_SOLIDIFY', 'MOD\_SCREW', 'REC', 'PLAY', 'FF', 'REW', 'PAUSE', 'PREV\_KEYFRAME', 'NEXT\_KEYFRAME', 'PLAY\_AUDIO', 'PLAY\_REVERSE', 'PREVIEW\_RANGE', 'PMARKER\_ACT', 'PMARKER\_SEL', 'PMARKER', 'MARKER\_HLT', 'MARKER', 'SPACE2', 'SPACE3', 'KEY\_DEHLT', 'KEY\_HLT', 'MUTE\_IPO\_OFF', 'MUTE\_IPO\_ON', 'VERTEXSEL', 'EDGESEL', 'FACESEL', 'ROTATE', 'CURSOR', 'ROTATECOLLECTION', 'ROTATECENTER', 'ROTACTIVE', 'ALIGN', 'SMOOTHCURVE', 'SPHEREREVERSE', 'ROOTCURVE', 'SHARPCURVE', 'LINCURVE', 'NOCURVE', 'RNDCURVE', 'PROP\_OFF', 'PROP\_ON', 'PROP\_CON', 'PARTICLE\_POINT', 'PARTICLE\_TIP', 'PARTICLE\_PATH', 'MAN\_TRANS', 'MAN\_ROT', 'MAN\_SCALE', 'MANIPUL', 'SNAP\_OFF', 'SNAP\_ON', 'SNAP\_NORMAL', 'SNAP\_INCREMENT', 'SNAP\_VERTEX', 'SNAP\_EDGE', 'SNAP\_FACE', 'SNAP\_VOLUME', 'STICKY\_UVS\_LOC', 'STICKY\_UVS\_DISABLE', 'STICKY\_UVS\_VERT', 'CLIPUV\_DEHLT', 'CLIPUV\_HLT', 'SNAP\_PEELOBJECT', 'GRID', 'PASTEDOWN', 'COPYDOWN', 'PASTEFILIPUP', 'PASTEFILIPDOWN', 'SNAP\_SURFACE', 'RETOPO', 'UV\_VERTEXSEL', 'UV\_EDGESSEL', 'UV\_FACESEL', 'UV\_ISLANDSEL', 'UV\_SYNC\_SELECT', 'BBOX', 'WIRE', 'SOLID', 'SMOOTH', 'POTATO', 'ORTHO', 'LOCKVIEW\_OFF', 'LOCKVIEW\_ON', 'AXIS\_SIDE', 'AXIS\_FRONT', 'AXIS\_TOP', 'NDOF\_DOM', 'NDOF\_TURN', 'NDOF\_FLY', 'NDOF\_TRANS', 'LAYER\_USED', 'LAYER\_ACTIVE', 'SORTALPHA', 'SORTBYEXT', 'SORTTIME', 'SORTSIZE', 'LONGDISPLAY', 'SHORTDISPLAY', 'GHOST', 'IMGDISPLAY', 'BOOKMARKS', 'FONTPREVIEW', 'FILTER', 'NEWFOLDER', 'FILE\_PARENT', 'FILE\_REFRESH', 'FILE\_FOLDER', 'FILE\_BLANK', 'FILE\_BLEND', 'FILE\_IMAGE', 'FILE\_MOVIE', 'FILE\_SCRIPT', 'FILE\_SOUND', 'FILE\_FONT', 'BACK', 'FORWARD', 'DISK\_DRIVE', 'MATPLANE', 'MATSPHERE', 'MATCUBE', 'MONKEY', 'HAIR', 'ALIASED',

'ANTIALIASED', 'MAT\_SPHERE\_SKY', 'WORDWRAP\_OFF', 'WORDWRAP\_ON', 'SYNTAX\_OFF', 'SYNTAX\_ON', 'LINENUMBERS\_OFF', 'LINENUMBERS\_ON', 'SCRIPTPLUGINS', 'SEQ\_SEQUENCER', 'SEQ\_PREVIEW', 'SEQ\_LUMA\_WAVEFORM', 'SEQ\_CHROMA\_SCOPE', 'SEQ\_HISTOGRAM', 'SEQ\_SPLITVIEW', 'IMAGE\_RGB', 'IMAGE\_RGB\_ALPHA', 'IMAGE\_ALPHA', 'IMAGE\_ZDEPTH', 'IMAGEFILE', 'BRUSH\_ADD', 'BRUSH\_BLOB', 'BRUSH\_BLUR', 'BRUSH\_CLAY', 'BRUSH\_CLONE', 'BRUSHCREASE', 'BRUSH\_DARKEN', 'BRUSH\_FILL', 'BRUSH\_FLATTEN', 'BRUSH\_GRAB', 'BRUSH\_INFLATE', 'BRUSH\_LAYER', 'BRUSH\_LIGHTEN', 'BRUSH\_MIX', 'BRUSH\_MULTIPLY', 'BRUSH\_NUDGE', 'BRUSH\_PINCH', 'BRUSH\_SCRAPE', 'BRUSH\_SCULPT\_DRAW', 'BRUSH\_SMEAR', 'BRUSH\_SMOOTH', 'BRUSH\_SNAKE\_HOOK', 'BRUSH\_SOFTEN', 'BRUSH\_SUBTRACT', 'BRUSH\_TEXDRAW', 'BRUSH\_THUMB', 'BRUSH\_ROTATE', 'BRUSH\_VERTEXDRAW', 'VIEW3D\_VEC', 'EDIT\_VEC', 'EDITMODE\_DEHLT', 'EDITMODE\_HLT', 'DISCLOSURE\_TRI\_RIGHT\_VEC', 'DISCLOSURE\_TRI\_DOWN\_VEC', 'MOVE\_UP\_VEC', 'MOVE\_DOWN\_VEC', 'X\_VEC', 'SMALL\_TRI\_RIGHT\_VEC'], (optional)) – Icon, Override automatic icon of the item

**menu** (*menu, text=""*, *icon='NONE'*)

menu

### Parameters

- **menu** (*string*) – Identifier of the menu.
- **text** (*string, (optional)*) – Override automatic text of the item.
- **icon** (*enum in ['NONE', 'QUESTION', 'ERROR', 'CANCEL', 'TRIA\_RIGHT', 'TRIA\_DOWN', 'TRIA\_LEFT', 'TRIA\_UP', 'ARROW\_LEFTRIGHT', 'PLUS', 'DISCLOSURE\_TRI\_DOWN', 'DISCLOSURE\_TRI\_RIGHT', 'RADIOBUT\_OFF', 'RADIOBUT\_ON', 'MENU\_PANEL', 'BLENDER', 'DOT', 'X', 'GO\_LEFT', 'PLUG', 'UI', 'NODE', 'NODE\_SEL', 'FULLSCREEN', 'SPLITSCREEN', 'RIGHTARROW\_THIN', 'BORDERMOVE', 'VIEWZOOM', 'ZOOMIN', 'ZOOMOUT', 'PANEL\_CLOSE', 'COPY\_ID', 'EYEDROPPER', 'LINK\_AREA', 'AUTO', 'CHECKBOX\_DEHLT', 'CHECKBOX\_HLT', 'UNLOCKED', 'LOCKED', 'UNPINNED', 'PINNED', 'SCREEN\_BACK', 'RIGHTARROW', 'DOWNNARROW\_HLT', 'DOTSUP', 'DOTSDOWN', 'LINK', 'INLINK', 'PLUGIN', 'HELP', 'GHOST\_ENABLED', 'COLOR', 'LINKED', 'UNLINKED', 'HAND', 'ZOOM\_ALL', 'ZOOM\_SELECTED', 'ZOOM\_PREVIOUS', 'ZOOM\_IN', 'ZOOM\_OUT', 'RENDER\_REGION', 'BORDER\_RECT', 'BORDER\_LASSO', 'FREEZE', 'STYLUS\_PRESSURE', 'GHOST\_DISABLED', 'NEW', 'FILE\_TICK', 'QUIT', 'URL', 'RECOVER\_LAST', 'FULLSCREEN\_ENTER', 'FULLSCREEN\_EXIT', 'BLANK1', 'LAMP', 'MATERIAL', 'TEXTURE', 'ANIM', 'WORLD', 'SCENE', 'EDIT', 'GAME', 'RADIO', 'SCRIPT', 'PARTICLES', 'PHYSICS', 'SPEAKER', 'TEXTURE\_SHADED', 'VIEW3D', 'IPO', 'OOPS', 'BUTS', 'FILESEL', 'IMAGE\_COL', 'INFO', 'SEQUENCE', 'TEXT', 'IMASEL', 'SOUND', 'ACTION', 'NLA', 'SCRIPTWIN', 'TIME', 'NODETREE', 'LOGIC', 'CONSOLE', 'PREFERENCES', 'ASSET\_MANAGER', 'OBJECT\_DATAMODE', 'EDITMODE\_HLT', 'FACESEL\_HLT', 'VPAINT\_HLT', 'TPAINT\_HLT', 'WPAINT\_HLT', 'SCULPTMODE\_HLT', 'POSE\_HLT', 'PARTICLEMODE', 'LIGHTPAINT', 'SCENE\_DATA', 'RENDERLAYERS', 'WORLD\_DATA', 'OBJECT\_DATA', 'MESH\_DATA', 'CURVE\_DATA', 'META\_DATA', 'LATTICE\_DATA', 'LAMP\_DATA', 'MATERIAL\_DATA', 'TEXTURE\_DATA', 'ANIM\_DATA', 'CAMERA\_DATA', 'PARTICLE\_DATA', 'LIBRARY\_DATA\_DIRECT', 'GROUP', 'ARMATURE\_DATA', 'POSE\_DATA', 'BONE\_DATA', 'CONSTRAINT', 'SHAPEKEY\_DATA', 'CONSTRAINT\_BONE', 'PACKAGE', 'UGLYPACKAGE', 'BRUSH\_DATA', 'IMAGE\_DATA', 'FILE', 'FCURVE', 'FONT\_DATA', 'RENDER\_RESULT', 'SURFACE\_DATA', 'EMPTY\_DATA', 'SETTINGS', 'RENDER\_ANIMATION', 'REN-*

'DER\_STILL', 'BOIDS', 'STRANDS', 'LIBRARY\_DATA\_INDIRECT', 'GREASEPENCIL', 'GROUP\_BONE', 'GROUP\_VERTEX', 'GROUP\_VCOL', 'GROUP\_UVS', 'RNA', 'RNA\_ADD', 'OUTLINER\_OB\_EMPTY', 'OUTLINER\_OB\_MESH', 'OUTLINER\_OB\_CURVE', 'OUTLINER\_OB\_LATTICE', 'OUTLINER\_OB\_META', 'OUTLINER\_OB\_LAMP', 'OUTLINER\_OB\_CAMERA', 'OUTLINER\_OB\_ARMATURE', 'OUTLINER\_OB\_FONT', 'OUTLINER\_OB\_SURFACE', 'RESTRICT\_VIEW\_OFF', 'RESTRICT\_VIEW\_ON', 'RESTRICT\_SELECT\_OFF', 'RESTRICT\_SELECT\_ON', 'RESTRICT\_RENDER\_OFF', 'RESTRICT\_RENDER\_ON', 'OUTLINER\_DATA\_EMPTY', 'OUTLINER\_DATA\_MESH', 'OUTLINER\_DATA\_CURVE', 'OUTLINER\_DATA\_LATTICE', 'OUTLINER\_DATA\_META', 'OUTLINER\_DATA\_LAMP', 'OUTLINER\_DATA\_CAMERA', 'OUTLINER\_DATA\_ARMATURE', 'OUTLINER\_DATA\_FONT', 'OUTLINER\_DATA\_SURFACE', 'OUTLINER\_DATA\_POSE', 'MESH\_PLANE', 'MESH\_CUBE', 'MESH\_CIRCLE', 'MESH\_UVSPHERE', 'MESH\_ICOSPHERE', 'MESH\_GRID', 'MESH\_MONKEY', 'MESH\_CYLINDER', 'MESH\_TORUS', 'MESH\_CONE', 'LAMP\_POINT', 'LAMP\_SUN', 'LAMP\_SPOT', 'LAMP\_HEMI', 'LAMP\_AREA', 'META\_PLANE', 'META\_CUBE', 'META BALL', 'META\_ELLIPSOID', 'META\_CAPSULE', 'SURFACE\_NCURVE', 'SURFACE\_NCIRCLE', 'SURFACE\_NSURFACE', 'SURFACE\_NCYLINDER', 'SURFACE\_NSPHERE', 'SURFACE\_NTORUS', 'CURVE\_BEZCURVE', 'CURVE\_BEZCIRCLE', 'CURVE\_NCURVE', 'CURVE\_NCIRCLE', 'CURVE\_PATH', 'FORCE\_FORCE', 'FORCE\_WIND', 'FORCE\_VORTEX', 'FORCE\_MAGNETIC', 'FORCE\_HARMONIC', 'FORCE\_CHARGE', 'FORCE\_LENNARDJONES', 'FORCE\_TEXTURE', 'FORCE\_CURVE', 'FORCE\_BOID', 'FORCE\_TURBULENCE', 'FORCE\_DRAG', 'MODIFIER', 'MOD\_WAVE', 'MOD\_BUILD', 'MOD\_DECIM', 'MOD\_MIRROR', 'MOD\_SOFT', 'MOD\_SUBSURF', 'HOOK', 'MOD\_PHYSICS', 'MOD\_PARTICLES', 'MOD\_BOOLEAN', 'MOD\_EDGESPLIT', 'MOD\_ARRAY', 'MOD\_UVPROJECT', 'MOD\_DISPLACE', 'MOD\_CURVE', 'MOD\_LATTICE', 'CONSTRAINT\_DATA', 'MOD\_ARMATURE', 'MOD\_SHRINKWRAP', 'MOD\_CAST', 'MOD\_MESHDEFORM', 'MOD\_BEVEL', 'MOD\_SMOOTH', 'MOD\_SIMPLEDEFORM', 'MOD\_MASK', 'MOD\_CLOTH', 'MOD\_EXPLODE', 'MOD\_FLUIDSIM', 'MOD\_MULTRES', 'MOD\_SMOKE', 'MOD\_SOLIDIFY', 'MOD\_SCREW', 'REC', 'PLAY', 'FF', 'REW', 'PAUSE', 'PREV\_KEYFRAME', 'NEXT\_KEYFRAME', 'PLAY\_AUDIO', 'PLAY\_REVERSE', 'PREVIEW\_RANGE', 'PMARKER\_ACT', 'PMARKER\_SEL', 'PMARKER', 'MARKER\_HLT', 'MARKER', 'SPACE2', 'SPACE3', 'KEY\_DEHLT', 'KEY\_HLT', 'MUTE\_IPO\_OFF', 'MUTE\_IPO\_ON', 'VERTEXSEL', 'EDGESEL', 'FACESEL', 'ROTATE', 'CURSOR', 'ROTATECOLLECTION', 'ROTATECENTER', 'ROTACTIVE', 'ALIGN', 'SMOOTHCURVE', 'SPHERECURVE', 'ROOTCURVE', 'SHARPCURVE', 'LINCURVE', 'NOCURVE', 'RNDCURVE', 'PROP\_OFF', 'PROP\_ON', 'PROP\_CON', 'PARTICLE\_POINT', 'PARTICLE\_TIP', 'PARTICLE\_PATH', 'MAN\_TRANS', 'MAN\_ROT', 'MAN\_SCALE', 'MANIPUL', 'SNAP\_OFF', 'SNAP\_ON', 'SNAP\_NORMAL', 'SNAP\_INCREMENT', 'SNAP\_VERTEX', 'SNAP\_EDGE', 'SNAP\_FACE', 'SNAP\_VOLUME', 'STICKY\_UVS\_LOC', 'STICKY\_UVS\_DISABLE', 'STICKY\_UVS\_VERT', 'CLIPUV\_DEHLT', 'CLIPUV\_HLT', 'SNAP\_PEELOBJECT', 'GRID', 'PASTEDOWN', 'COPYDOWN', 'PASTEFLIPUP', 'PASTEFLIPDOWN', 'SNAP\_SURFACE', 'RETOPO', 'UV\_VERTEXSEL', 'UV\_EDGESEL', 'UV\_FACESEL', 'UV\_ISLANDSEL', 'UV\_SYNC\_SELECT', 'BBOX', 'WIRE', 'SOLID', 'SMOOTH', 'POTATO', 'ORTHO', 'LOCKVIEW\_OFF', 'LOCKVIEW\_ON', 'AXIS\_SIDE', 'AXIS\_FRONT', 'AXIS\_TOP', 'NDOF\_DOM', 'NDOF\_TURN', 'NDOF\_FLY', 'NDOF\_TRANS', 'LAYER\_USED', 'LAYER\_ACTIVE', 'SORTALPHA', 'SORTBYEXT', 'SORTTIME', 'SORTSIZE', 'LONGDISPLAY', 'SHORTDISPLAY', 'GHOST', 'IMGDISPLAY', 'BOOKMARKS', 'FONTPREVIEW', 'FILTER', 'NEWFOLDER', 'FILE\_PARENT', 'FILE\_REFRESH', 'FILE\_FOLDER', 'FILE\_BLANK', 'FILE\_BLEND', 'FILE\_IMAGE', 'FILE\_MOVIE', 'FILE\_SCRIPT',

'FILE\_SOUND', 'FILE\_FONT', 'BACK', 'FORWARD', 'DISK\_DRIVE', 'MAT\_PLANE', 'MATSHERE', 'MATCUBE', 'MONKEY', 'HAIR', 'ALIASED', 'ANTIALIASED', 'MAT\_SPHERE\_SKY', 'WORDWRAP\_OFF', 'WORDWRAP\_ON', 'SYNTAX\_OFF', 'SYNTAX\_ON', 'LINENUMBERS\_OFF', 'LINENUMBERS\_ON', 'SCRIPTPLUGINS', 'SEQ\_SEQUENCER', 'SEQ\_PREVIEW', 'SEQ\_LUMA\_WAVEFORM', 'SEQ\_CHROMA\_SCOPE', 'SEQ\_HISTOGRAM', 'SEQ\_SPLITVIEW', 'IMAGE\_RGB', 'IMAGE\_RGB\_ALPHA', 'IMAGE\_ALPHA', 'IMAGE\_ZDEPTH', 'IMAGEFILE', 'BRUSH\_ADD', 'BRUSH\_BLOB', 'BRUSH\_BLUR', 'BRUSH\_CLAY', 'BRUSH\_CLONE', 'BRUSHCREASE', 'BRUSH\_DARKEN', 'BRUSH\_FILL', 'BRUSH\_FLATTEN', 'BRUSH\_GRAB', 'BRUSH\_INFLATE', 'BRUSH\_LAYER', 'BRUSH\_LIGHTEN', 'BRUSH\_MIX', 'BRUSH\_MULTIPLY', 'BRUSH\_NUDGE', 'BRUSH\_PINCH', 'BRUSH\_SCRAPE', 'BRUSH\_SCULPT\_DRAW', 'BRUSH\_SMEAR', 'BRUSH\_SMOOTH', 'BRUSH\_SNAKE\_HOOK', 'BRUSH\_SOFTEN', 'BRUSH\_SUBTRACT', 'BRUSH\_TEXDRAW', 'BRUSH\_THUMB', 'BRUSH\_ROTATE', 'BRUSH\_VERTEXDRAW', 'VIEW3D\_VEC', 'EDIT\_VEC', 'EDITMODE\_DEHLT', 'EDITMODE\_HLT', 'DISCLOSURE\_TRI\_RIGHT\_VEC', 'DISCLOSURE\_TRI\_DOWN\_VEC', 'MOVE\_UP\_VEC', 'MOVE\_DOWN\_VEC', 'X\_VEC', 'SMALL\_TRI\_RIGHT\_VEC'], (optional)) – Icon, Override automatic icon of the item

**separator()**

Item. Inserts empty space into the layout between items.

**context\_pointer\_set(name, data)**

context\_pointer\_set

**Parameters**

- **name** (string) – Name, Name of entry in the context.
- **data** ([AnyType](#)) – Pointer to put in context.

**template\_header(menus=True)**

template\_header

**Parameters** **menus** (boolean, (optional)) – The header has menus, and should show menu expander.

**template\_ID(data, property, new=""“, open=""“, unlink=""“)**

template\_ID

**Parameters**

- **data** ([AnyType](#), (never None)) – Data from which to take property.
- **property** (string) – Identifier of property in data.
- **new** (string, (optional)) – Operator identifier to create a new ID block.
- **open** (string, (optional)) – Operator identifier to open a file for creating a new ID block.
- **unlink** (string, (optional)) – Operator identifier to unlink the ID block.

**template\_ID\_preview(data, property, new=""“, open=""“, unlink=""“, rows=0, cols=0)**

template\_ID\_preview

**Parameters**

- **data** ([AnyType](#), (never None)) – Data from which to take property.
- **property** (string) – Identifier of property in data.
- **new** (string, (optional)) – Operator identifier to create a new ID block.
- **open** (string, (optional)) – Operator identifier to open a file for creating a new ID block.

- **unlink** (*string, (optional)*) – Operator identifier to unlink the ID block.
- **rows** (*int in [0, inf], (optional)*) – Number of thumbnail preview rows to display
- **cols** (*int in [0, inf], (optional)*) – Number of thumbnail preview columns to display

**template\_any\_ID** (*data, property, type\_property, text=""*)  
template\_any\_ID

#### Parameters

- **data** ([AnyType](#), (never None)) – Data from which to take property.
- **property** (*string*) – Identifier of property in data.
- **type\_property** (*string*) – Identifier of property in data giving the type of the ID-blocks to use.
- **text** (*string, (optional)*) – Custom label to display in UI.

**template\_path\_builder** (*data, property, root, text=""*)  
template\_path\_builder

#### Parameters

- **data** ([AnyType](#), (never None)) – Data from which to take property.
- **property** (*string*) – Identifier of property in data.
- **root** ([ID](#)) – ID-block from which path is evaluated from.
- **text** (*string, (optional)*) – Custom label to display in UI.

**template\_modifier** (*data*)

Layout . Generates the UI layout for modifiers.

**Parameters** **data** ([Modifier](#), (never None)) – Modifier data.

**Returns** Sub-layout to put items in.

**Return type** [UILayout](#)

**template\_constraint** (*data*)

Layout . Generates the UI layout for constraints.

**Parameters** **data** ([Constraint](#), (never None)) – Constraint data.

**Returns** Sub-layout to put items in.

**Return type** [UILayout](#)

**template\_preview** (*id, show\_buttons=True, parent=None, slot=None*)

Item. A preview window for materials, textures, lamps, etc.

#### Parameters

- **id** ([ID](#)) – ID datablock.
- **show\_buttons** (*boolean, (optional)*) – Show preview buttons?
- **parent** ([ID](#), (optional)) – ID datablock.
- **slot** ([TextureSlot](#), (optional)) – Texture slot.

**template\_curve\_mapping** (*data, property, type='NONE', levels=False, brush=False*)

Item. A curve mapping widget used for e.g falloff curves for lamps.

#### Parameters

- **data** (`AnyType`, (never None)) – Data from which to take property.
- **property** (`string`) – Identifier of property in data.
- **type** (`enum in ['NONE', 'VECTOR', 'COLOR'], (optional)`) – Type, Type of curves to display.
- **levels** (`boolean, (optional)`) – Show black/white levels.
- **brush** (`boolean, (optional)`) – Show brush options.

**template\_color\_ramp** (`data, property, expand=False`)

Item. A color ramp widget.

#### Parameters

- **data** (`AnyType`, (never None)) – Data from which to take property.
- **property** (`string`) – Identifier of property in data.
- **expand** (`boolean, (optional)`) – Expand button to show more detail.

**template\_histogram** (`data, property`)

Item. A histogramm widget to analyze imaga data.

#### Parameters

- **data** (`AnyType`, (never None)) – Data from which to take property.
- **property** (`string`) – Identifier of property in data.

**template\_waveform** (`data, property`)

Item. A waveform widget to analyze imaga data.

#### Parameters

- **data** (`AnyType`, (never None)) – Data from which to take property.
- **property** (`string`) – Identifier of property in data.

**template\_vectorscope** (`data, property`)

Item. A vectorscope widget to analyze imaga data.

#### Parameters

- **data** (`AnyType`, (never None)) – Data from which to take property.
- **property** (`string`) – Identifier of property in data.

**template\_layers** (`data, property, used_layers_data, used_layers_property, active_layer`)

template\_layers

#### Parameters

- **data** (`AnyType`, (never None)) – Data from which to take property.
- **property** (`string`) – Identifier of property in data.
- **used\_layers\_data** (`AnyType`) – Data from which to take property.
- **used\_layers\_property** (`string`) – Identifier of property in data.
- **active\_layer** (`int in [0, inf]`) – Active Layer

**template\_color\_wheel** (`data, property, value_slider=False, lock=False, lock_luminosity=False, cubic=True`)

Item. A color wheel widget to pick colors.

#### Parameters

- **data** ([AnyType](#), (never None)) – Data from which to take property.
- **property** (*string*) – Identifier of property in data.
- **value\_slider** (*boolean*, (*optional*)) – Display the value slider to the right of the color wheel
- **lock** (*boolean*, (*optional*)) – Lock the color wheel display to value 1.0 regardless of actual color
- **lock\_luminosity** (*boolean*, (*optional*)) – Keep the color at its original vector length
- **cubic** (*boolean*, (*optional*)) – Cubic saturation for picking values close to white

**template\_image\_layers** (*image*, *image\_user*)  
template\_image\_layers

**template\_image** (*data*, *property*, *image\_user*, *compact=False*)  
Item(s). User interface for selecting images and their source paths.

#### Parameters

- **data** ([AnyType](#), (never None)) – Data from which to take property.
- **property** (*string*) – Identifier of property in data.
- **compact** (*boolean*, (*optional*)) – Use more compact layout.

**template\_list** (*data*, *property*, *active\_data*, *active\_property*, *rows=5*, *maxrows=5*,  
*type='DEFAULT'*)  
Item. A list widget to display data. e.g. vertexgroups.

#### Parameters

- **data** ([AnyType](#)) – Data from which to take property.
- **property** (*string*) – Identifier of property in data.
- **active\_data** ([AnyType](#), (never None)) – Data from which to take property for the active element.
- **active\_property** (*string*) – Identifier of property in data, for the active element.
- **rows** (*int in [0, inf]*, (*optional*)) – Number of rows to display.
- **maxrows** (*int in [0, inf]*, (*optional*)) – Maximum number of rows to display.
- **type** (*enum in ['DEFAULT', 'COMPACT', 'ICONS']*, (*optional*)) – Type, Type of list to use.

**template\_running\_jobs** ()  
template\_running\_jobs

**template\_operator\_search** ()  
template\_operator\_search

**template\_header\_3D** ()  
template\_header\_3D

**template\_edit\_mode\_selection** ()  
template\_edit\_mode\_selection

**template\_reports\_banner** ()  
template\_reports\_banner

**introspect** ()  
introspect

**Returns** Descr, DESCRIPTOR

**Return type** string

### Inherited Properties

- bpy\_struct.id\_data

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

### References

- Header.layout
- Menu.layout
- Operator.layout
- Panel.layout
- UILayout.box
- UILayout.column
- UILayout.column\_flow
- UILayout.row
- UILayout.split
- UILayout.template\_constraint
- UILayout.template\_modifier

## 2.4.592 UVProjectModifier(Modifier)

base classes — bpy\_struct, Modifier

**class** bpy.types.UVProjectModifier (*Modifier*)  
UV projection modifier to sets UVs from a projector

**aspect\_x**  
**Type** float in [1, inf], default 0.0

**aspect\_y**

**Type** float in [1, inf], default 0.0

**image**

**Type** [Image](#)

**projector\_count**

Number of projectors to use

**Type** int in [1, 10], default 0

**projectors**

**Type**  [bpy\\_prop\\_collection](#) of [UVProjector](#), (readonly)

**scale\_x**

**Type** float in [0, inf], default 0.0

**scale\_y**

**Type** float in [0, inf], default 0.0

**use\_image\_override**

Override faces' current images with the given image

**Type** boolean, default False

**uv\_layer**

UV layer name

**Type** string, default “”

## Inherited Properties

- [bpy\\_struct.id\\_data](#)
- [Modifier.name](#)
- [Modifier.use\\_apply\\_on\\_spline](#)
- [Modifier.show\\_in\\_editmode](#)
- [Modifier.show\\_expanded](#)
- [Modifier.show\\_on\\_cage](#)
- [Modifier.show\\_viewport](#)
- [Modifier.show\\_render](#)
- [Modifier.type](#)

## Inherited Functions

- [bpy\\_struct.as\\_pointer](#)
- [bpy\\_struct.callback\\_add](#)
- [bpy\\_struct.callback\\_remove](#)
- [bpy\\_struct.driver\\_add](#)
- [bpy\\_struct.driver\\_remove](#)
- [bpy\\_struct.get](#)
- [bpy\\_struct.is\\_property\\_hidden](#)
- [bpy\\_struct.is\\_property\\_set](#)
- [bpy\\_struct.items](#)
- [bpy\\_struct.keyframe\\_delete](#)
- [bpy\\_struct.keyframe\\_insert](#)
- [bpy\\_struct.keys](#)

- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.593 UVProjector(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.UVProjector` (`bpy_struct`)  
UV projector used by the UV project modifier  
**object**  
Object to use as projector transform  
**Type** `Object`

### Inherited Properties

- `bpy_struct.id_data`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

### References

- `UVProjectModifier.projectors`

## 2.4.594 UVTextures(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.UVTextures` (`bpy_struct`)  
Collection of uv textures

**active**

Active UV texture

**Type** `MeshTextureFaceLayer`

**active\_index**

Active UV texture index

**Type** `int` in `[0, inf]`, default 0

**new(name="UVTex")**

Add a UV texture layer to Mesh.

**Parameters** `name (string, (optional))` – UV Texture name.

**Returns** The newly created layer.

**Return type** `MeshTextureFaceLayer`

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `Mesh.uv_textures`

## 2.4.595 UnitSettings(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.UnitSettings (bpy_struct)`

**scale\_length**

Scale to use when converting between blender units and dimensions

**Type** float in [1e-05, 100000], default 0.0

**system**

The unit system to use for button display

**Type** enum in ['NONE', 'METRIC', 'IMPERIAL'], default 'NONE'

**system\_rotation**

Unit to use for displaying/editing rotation values

**Type** enum in ['DEGREES', 'RADIAN'], default 'DEGREES'

**use\_separate**

Display units in pairs

**Type** boolean, default False

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- Scene.unit\_settings

## 2.4.596 UnknownType(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.UnknownType (*bpy\_struct*)

Stub RNA type used for pointers to unknown or internal data

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- ShapeKey.data
- SpaceSequenceEditor.grease\_pencil

## 2.4.597 UserPreferences(bpy\_struct)

base class — bpy\_struct

**class bpy.types.UserPreferences (bpy\_struct)**

Global user preferences

**active\_section**

Active section of the user preferences shown in the user interface

**Type** enum in ['INTERFACE', 'EDITING', 'INPUT', 'ADDONS', 'THEMES', 'FILES', 'SYSTEM'], default 'INTERFACE'

**addons**

**Type** Addons bpy\_prop\_collection of Addon, (readonly)

**edit**

Settings for interacting with Blender data

**Type** UserPreferencesEdit, (readonly, never None)

**filepaths**

Default paths for external files

**Type** UserPreferencesFilePaths, (readonly, never None)

**inputs**

Settings for input devices

**Type** `UserPreferencesInput`, (readonly, never None)

**system**

Graphics driver and operating system settings

**Type** `UserPreferencesSystem`, (readonly, never None)

**themes**

**Type** `bpy_prop_collection` of `Theme`, (readonly)

**ui\_styles**

**Type** `bpy_prop_collection` of `ThemeStyle`, (readonly)

**view**

Preferences related to viewing data

**Type** `UserPreferencesView`, (readonly, never None)

**Inherited Properties**

- `bpy_struct.id_data`

**Inherited Functions**

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

**References**

- `Context.user_preferences`

## 2.4.598 UserPreferencesEdit(bpy\_struct)

base class — `bpy_struct`

```
class bpy.types.UserPreferencesEdit (bpy_struct)
    Settings for interacting with Blender data

    auto_keying_mode
        Mode of automatic keyframe insertion for Objects and Bones
        Type enum in ['ADD_REPLACE_KEYS', 'REPLACE_KEYS'], default
            'ADD_REPLACE_KEYS'

    grease_pencil_eraser_radius
        Radius of eraser 'brush'
        Type int in [0, 100], default 0

    grease_pencil_euclidean_distance
        Distance moved by mouse when drawing stroke (in pixels) to include
        Type int in [0, 100], default 0

    grease_pencil_manhattan_distance
        Pixels moved by mouse per axis when drawing stroke
        Type int in [0, 100], default 0

    keyframe_new_handle_type
        Type enum in ['FREE', 'AUTO', 'VECTOR', 'ALIGNED'], default 'FREE'

    keyframe_new_interpolation_type
        Type enum in ['CONSTANT', 'LINEAR', 'BEZIER'], default 'CONSTANT'

    material_link
        Toggle whether the material is linked to object data or the object block
        Type enum in ['OBDATA', 'OBJECT'], default 'OBDATA'

    object_align
        When adding objects from a 3D View menu, either align them to that view's direction or the world coordinates
        Type enum in ['WORLD', 'VIEW'], default 'WORLD'

    sculpt_paint_overlay_color
        Color of texture overlay
        Type float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

    undo_memory_limit
        Maximum memory usage in megabytes (0 means unlimited)
        Type int in [0, 32767], default 0

    undo_steps
        Number of undo steps available (smaller values conserve memory)
        Type int in [0, 64], default 0

    use_auto_keying
        Automatic keyframe insertion for Objects and Bones
        Type boolean, default False

    use_drag_immediately
        Moving things with a mouse drag confirms when releasing the button
        Type boolean, default False
```

**use\_duplicate\_action**  
Causes actions to be duplicated with the object

**Type** boolean, default False

**use\_duplicate\_armature**  
Causes armature data to be duplicated with the object

**Type** boolean, default False

**use\_duplicate\_curve**  
Causes curve data to be duplicated with the object

**Type** boolean, default False

**use\_duplicate\_fcurve**  
Causes F-curve data to be duplicated with the object

**Type** boolean, default False

**use\_duplicate\_lamp**  
Causes lamp data to be duplicated with the object

**Type** boolean, default False

**use\_duplicate\_material**  
Causes material data to be duplicated with the object

**Type** boolean, default False

**use\_duplicate\_mesh**  
Causes mesh data to be duplicated with the object

**Type** boolean, default False

**use\_duplicate\_metaball**  
Causes metaball data to be duplicated with the object

**Type** boolean, default False

**use\_duplicate\_particle**  
Causes particle systems to be duplicated with the object

**Type** boolean, default False

**use\_duplicate\_surface**  
Causes surface data to be duplicated with the object

**Type** boolean, default False

**use\_duplicate\_text**  
Causes text data to be duplicated with the object

**Type** boolean, default False

**use\_duplicate\_texture**  
Causes texture data to be duplicated with the object

**Type** boolean, default False

**use\_enter\_edit\_mode**  
Enter Edit Mode automatically after adding a new object

**Type** boolean, default False

**use\_global\_undo**  
Global undo works by keeping a full copy of the file itself in memory, so takes extra memory

**Type** boolean, default False

**use\_grease\_pencil\_simplify\_stroke**  
Simplify the final stroke

**Type** boolean, default False

**use\_grease\_pencil\_smooth\_stroke**  
Smooth the final stroke

**Type** boolean, default False

**use\_insertkey\_xyz\_to\_rgb**  
Color for newly added transformation F-Curves (Location, Rotation, Scale) and also Color is based on the transform axis

**Type** boolean, default False

**use\_keyframe\_insert\_available**  
Automatic keyframe insertion in available curves

**Type** boolean, default False

**use\_keyframe\_insert\_needed**  
Keyframe insertion only when keyframe needed

**Type** boolean, default False

**use\_negative\_frames**  
Current frame number can be manually set to a negative value

**Type** boolean, default False

**use\_visual\_keying**  
Use Visual keying automatically for constrained objects

**Type** boolean, default False

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`

- `bpy_struct.values`

## References

- `UserPreferences.edit`

### 2.4.599 UserPreferencesFilePaths(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.UserPreferencesFilePaths(bpy_struct)`

Default paths for external files

**animation\_player**

Path to a custom animation/frame sequence player

**Type** string, default “”

**animation\_player\_preset**

Preset configs for external animation players

**Type** enum in ['BLENDER24', 'DJV', 'FRAMECYCLER', 'RV', 'MPLAYER', 'CUSTOM'],  
default 'BLENDER24'

**auto\_save\_time**

The time (in minutes) to wait between automatic temporary saves

**Type** int in [1, 60], default 0

**font\_directory**

The default directory to search for loading fonts

**Type** string, default “”

**hide\_recent\_locations**

Hide recent locations in the file selector

**Type** boolean, default False

**image\_editor**

Path to an image editor

**Type** string, default “”

**recent\_files**

Maximum number of recently opened files to remember

**Type** int in [0, 30], default 0

**render\_output\_directory**

The default directory for rendering output, for new scenes

**Type** string, default “”

**save\_version**

The number of old versions to maintain in the current directory, when manually saving

**Type** int in [0, 32], default 0

**script\_directory**

Alternate script path, matching the default layout with subdirs: startup, addons & modules (requires restart)

**Type** string, default “”

**sequence\_plugin\_directory**  
The default directory to search for sequence plugins  
**Type** string, default “”

**show\_hidden\_files\_datablocks**  
Hide files/datablocks that start with a dot(.)  
**Type** boolean, default False

**show\_thumbnails**  
Open in thumbnail view for images and movies  
**Type** boolean, default False

**sound\_directory**  
The default directory to search for sounds  
**Type** string, default “”

**temporary\_directory**  
The directory for storing temporary save files  
**Type** string, default “”

**texture\_directory**  
The default directory to search for textures  
**Type** string, default “”

**texture\_plugin\_directory**  
The default directory to search for texture plugins  
**Type** string, default “”

**use\_auto\_save\_temporary\_files**  
Automatic saving of temporary files in temp directory, uses process ID  
**Type** boolean, default False

**use\_file\_compression**  
Enable file compression when saving .blend files  
**Type** boolean, default False

**use\_filter\_files**  
Display only files with extensions in the image select window  
**Type** boolean, default False

**use\_load\_ui**  
Load user interface setup when loading .blend files  
**Type** boolean, default False

**use\_relative\_paths**  
Default relative path option for the file selector  
**Type** boolean, default False

**use\_save\_preview\_images**  
Enables automatic saving of preview images in the .blend file  
**Type** boolean, default False

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- UserPreferences.filepaths

### 2.4.600 UserPreferencesInput(bpy\_struct)

base class — bpy\_struct

**class bpy.types.UserPreferencesInput (bpy\_struct)**  
Settings for input devices

**active\_keyconfig**  
The name of the active key configuration  
**Type** string, default “”

**drag\_threshold**  
Amount of pixels you have to drag before dragging UI items happens  
**Type** int in [3, 40], default 0

**invert\_mouse\_zoom**  
Invert the axis of mouse movement for zooming  
**Type** boolean, default False

**invert\_zoom\_wheel**  
Swap the Mouse Wheel zoom direction  
**Type** boolean, default False

**mouse\_double\_click\_time**  
The time (in ms) for a double click

**Type** int in [1, 1000], default 0

**ndof\_fly\_helicopter**  
Device up/down directly controls your Z position

**Type** boolean, default False

**ndof\_lock\_horizon**  
Keep horizon level while flying with 3D Mouse

**Type** boolean, default False

**ndof\_orbit\_invert\_axes**  
Toggle between moving the viewpoint or moving the scene being viewed

**Type** boolean, default False

**ndof\_sensitivity**  
Overall sensitivity of the 3D Mouse

**Type** float in [0.25, 4], default 0.0

**ndof\_show\_guide**  
Display the center and axis during rotation

**Type** boolean, default False

**ndof\_zoom\_invert**  
Zoom using opposite direction

**Type** boolean, default False

**ndof\_zoom\_updown**  
Zoom using up/down on the device (otherwise forward/backward)

**Type** boolean, default False

**select\_mouse**  
The mouse button used for selection

**Type** enum in ['LEFT', 'RIGHT'], default 'RIGHT'

**use\_emulate\_numpad**  
Causes the 1 to 0 keys to act as the numpad (useful for laptops)

**Type** boolean, default False

**use\_mouse\_continuous**  
Allow moving the mouse outside the view on some manipulations (transform, ui control drag)

**Type** boolean, default False

**use\_mouse\_emulate\_3\_button**  
Emulates Middle Mouse with Alt+Left Mouse (doesn't work with Left Mouse Select option)

**Type** boolean, default False

**use\_mouse\_mmb\_paste**  
In text window, paste with middle mouse button instead of panning

**Type** boolean, default False

**view\_rotate\_method**  
Rotation style in the viewport

**Type** enum in ['TURNTABLE', 'TRACKBALL'], default 'TURNTABLE'

**view\_zoom\_axis**

Axis of mouse movement to zoom in or out on

**Type** enum in ['VERTICAL', 'HORIZONTAL'], default 'VERTICAL'

**view\_zoom\_method**

Which style to use for viewport scaling

**Type** enum in ['CONTINUE', 'DOLLY', 'SCALE'], default 'CONTINUE'

**wheel\_scroll\_lines**

The number of lines scrolled at a time with the mouse wheel

**Type** int in [0, 32], default 0

**Inherited Properties**

- bpy\_struct.id\_data

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

**References**

- UserPreferences.inputs

## 2.4.601 UserPreferencesSystem(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.**UserPreferencesSystem**(bpy\_struct)

Graphics driver and operating system settings

**anisotropic\_filter**

The quality of the anisotropic filtering (values greater than 1.0 enable anisotropic filtering)

**Type** enum in ['FILTER\_0', 'FILTER\_2', 'FILTER\_4', 'FILTER\_8', 'FILTER\_16'], default 'FILTER\_0'

**audio\_channels**

Sets the audio channel count

**Type** enum in ['MONO', 'STEREO', 'SURROUND4', 'SURROUND51', 'SURROUND71'], default 'MONO'

**audio\_device**

Sets the audio output device

**Type** enum in ['NONE'], default 'NONE'

**audio\_mixing\_buffer**

Sets the number of samples used by the audio mixing buffer

**Type** enum in ['SAMPLES\_256', 'SAMPLES\_512', 'SAMPLES\_1024', 'SAMPLES\_2048', 'SAMPLES\_4096', 'SAMPLES\_8192', 'SAMPLES\_16384', 'SAMPLES\_32768'], default 'SAMPLES\_256'

**audio\_sample\_format**

Sets the audio sample format

**Type** enum in ['U8', 'S16', 'S24', 'S32', 'FLOAT', 'DOUBLE'], default 'U8'

**audio\_sample\_rate**

Sets the audio sample rate

**Type** enum in ['RATE\_44100', 'RATE\_48000', 'RATE\_96000', 'RATE\_192000'], default 'RATE\_44100'

**author**

Name that will be used in exported files when format supports such feature

**Type** string, default ""

**color\_picker\_type**

Different styles of displaying the color picker widget

**Type** enum in ['CIRCLE', 'SQUARE\_SV', 'SQUARE\_HS', 'SQUARE\_HV'], default 'CIRCLE'

**dpi**

Font size and resolution for display

**Type** int in [48, 128], default 0

**frame\_server\_port**

Frameserver Port for Frameserver Rendering

**Type** int in [0, 32727], default 0

**gl\_clip\_alpha**

Clip alpha below this threshold in the 3D textured view

**Type** float in [0, 1], default 0.0

**gl\_texture\_limit**

Limit the texture size to save graphics memory

**Type** enum in ['CLAMP\_OFF', 'CLAMP\_8192', 'CLAMP\_4096', 'CLAMP\_2048', 'CLAMP\_1024', 'CLAMP\_512', 'CLAMP\_256', 'CLAMP\_128'], default 'CLAMP\_OFF'

**language**

Language use for translation

**Type** enum in ['ENGLISH', 'JAPANESE', 'DUTCH', 'ITALIAN', 'GERMAN', 'FINNISH', 'SWEDISH', 'FRENCH', 'SPANISH', 'CATALAN', 'CZECH', 'BRAZILIAN\_PORTUGUESE', 'SIMPLIFIED\_CHINESE', 'RUSSIAN', 'CROATIAN', 'SERBIAN', 'UKRAINIAN', 'POLISH', 'ROMANIAN', 'ARABIC', 'BULGARIAN', 'GREEK', 'KOREAN'], default 'ENGLISH'

**memory\_cache\_limit**

Memory cache limit in sequencer (megabytes)

**Type** int in [0, 16384], default 0

**prefetch\_frames**

Number of frames to render ahead during playback

**Type** int in [0, 500], default 0

**screencast\_fps**

Frame rate for the screencast to be played back

**Type** int in [10, 50], default 0

**screencast\_wait\_time**

Time in milliseconds between each frame recorded for screencast

**Type** int in [50, 1000], default 0

**scrollback**

Maximum number of lines to store for the console buffer

**Type** int in [32, 32768], default 0

**solid\_lights**

Lights user to display objects in solid draw mode

**Type** bpy\_prop\_collection of UserSolidLight, (readonly)

**texture\_collection\_rate**

Number of seconds between each run of the GL texture garbage collector

**Type** int in [1, 3600], default 0

**texture\_time\_out**

Time since last access of a GL texture in seconds after which it is freed. (Set to 0 to keep textures allocated.)

**Type** int in [0, 3600], default 0

**use\_antialiasing**

Use anti-aliasing for the 3D view (may impact redraw performance)

**Type** boolean, default False

**use\_international\_fonts**

Use international fonts

**Type** boolean, default False

**use\_mipmaps**

Scale textures for the 3D View (looks nicer but uses more memory and slows image reloading)

**Type** boolean, default False

**use\_preview\_images**

Enables automatic saving of preview images in the .blend file (Windows only)

**Type** boolean, default False

**use\_scripts\_auto\_execute**

Allow any .blend file to run scripts automatically (unsafe with blend files from an untrusted source)

**Type** boolean, default False

**use\_tabs\_as\_spaces**

Automatically converts all new tabs into spaces for new and loaded text files

**Type** boolean, default False

**use\_text\_antialiasing**

Draw user interface text anti-aliased

**Type** boolean, default False

**use\_textured\_fonts**

Use textures for drawing international fonts

**Type** boolean, default False

**use\_translate\_buttons**

Translate button labels

**Type** boolean, default False

**use\_translate\_toolbox**

Translate toolbox menu

**Type** boolean, default False

**use\_translate\_tooltips**

Translate Tooltips

**Type** boolean, default False

**use\_vertex\_buffer\_objects**

Use Vertex Buffer Objects (or Vertex Arrays, if unsupported) for viewport rendering

**Type** boolean, default False

**use\_weight\_color\_range**

Enable color range used for weight visualization in weight painting mode

**Type** boolean, default False

**weight\_color\_range**

Color range used for weight visualization in weight painting mode

**Type** [ColorRamp](#), (readonly, never None)

**window\_draw\_method**

Drawing method used by the window manager

**Type** enum in ['AUTOMATIC', 'TRIPLE\_BUFFER', 'OVERLAP', 'OVERLAP\_FLIP', 'FULL'], default 'TRIPLE\_BUFFER'

**Inherited Properties**

- [bpy\\_struct.id\\_data](#)

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `UserPreferences.system`

### 2.4.602 UserPreferencesView(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.UserPreferencesView(bpy_struct)`  
Preferences related to viewing data

**manipulator\_handle\_size**  
Size of widget handles as percentage of widget radius  
**Type** int in [2, 40], default 25

**manipulator\_hotspot**  
Pixel distance around the handles to accept mouse clicks  
**Type** int in [4, 40], default 14

**manipulator\_size**  
Diameter of widget, in 10 pixel units  
**Type** int in [2, 40], default 15

**mini\_axis\_brightness**  
The brightness of the icon  
**Type** int in [0, 10], default 0

**mini\_axis\_size**  
The axis icon's size  
**Type** int in [10, 64], default 0

**object\_origin\_size**  
Diameter in Pixels for Object/Lamp origin display

**Type** int in [4, 10], default 0

**open\_left\_mouse\_delay**  
Time in 1/10 seconds to hold the Left Mouse Button before opening the toolbox

**Type** int in [1, 40], default 0

**open\_right\_mouse\_delay**  
Time in 1/10 seconds to hold the Right Mouse Button before opening the toolbox

**Type** int in [1, 40], default 0

**open\_sublevel\_delay**  
Time delay in 1/10 seconds before automatically opening sub level menus

**Type** int in [1, 40], default 0

**open\_toplevel\_delay**  
Time delay in 1/10 seconds before automatically opening top level menus

**Type** int in [1, 40], default 0

**rotation\_angle**  
The rotation step for numerical pad keys (2 4 6 8)

**Type** int in [0, 90], default 0

**show\_column\_layout**  
Use a column layout for toolbox

**Type** boolean, default False

**show\_large\_cursors**  
Use large mouse cursors when available

**Type** boolean, default False

**show\_manipulator**  
Use 3D transform manipulator

**Type** boolean, default False

**show\_mini\_axis**  
Show a small rotating 3D axis in the bottom left corner of the 3D View

**Type** boolean, default False

**show\_object\_info**  
Display objects name and frame number in 3D view

**Type** boolean, default False

**show\_playback\_fps**  
Show the frames per second screen refresh rate, while animation is played back

**Type** boolean, default False

**show\_splash**  
Display splash screen on startup

**Type** boolean, default False

**show\_tooltips**  
Display tooltips

**Type** boolean, default False

**show\_tooltips\_python**  
Show Python references in tooltips  
**Type** boolean, default False

**show\_view\_name**  
Show the name of the view's direction in each 3D View  
**Type** boolean, default False

**smooth\_view**  
The time to animate the view in milliseconds, zero to disable  
**Type** int in [0, 1000], default 0

**timecode\_style**  
Format of Time Codes displayed when not displaying timing in terms of frames  
**Type** enum in ['MINIMAL', 'SMPTE', 'SMPTE\_COMPACT', 'MILLISECONDS', 'SECONDS\_ONLY'], default 'MINIMAL'

**use\_auto\_perspective**  
Automatically switch between orthographic and perspective when changing from top/front/side views  
**Type** boolean, default False

**use\_camera\_lock\_parent**  
When the camera is locked to the view and in fly mode, transform the parent rather than the camera  
**Type** boolean, default False

**use\_directional\_menus**  
Otherwise menus, etc will always be top to bottom, left to right, no matter opening direction  
**Type** boolean, default False

**use\_global\_pivot**  
Lock the same rotation/scaling pivot in all 3D Views  
**Type** boolean, default False

**use\_global\_scene**  
Forces the current Scene to be displayed in all Screens  
**Type** boolean, default False

**use\_mouse\_auto\_depth**  
Use the depth under the mouse to improve view pan/rotate/zoom functionality  
**Type** boolean, default False

**use\_mouse\_over\_open**  
Open menu buttons and pulldowns automatically when the mouse is hovering  
**Type** boolean, default False

**use\_rotate\_around\_active**  
Use selection as the pivot point  
**Type** boolean, default False

**use\_zoom\_to\_mouse**  
Zoom in towards the mouse pointer's position in the 3D view, rather than the 2D window center  
**Type** boolean, default False

**view2d\_grid\_spacing\_min**  
Minimum number of pixels between each gridline in 2D Viewports  
**Type** int in [1, 500], default 0

### Inherited Properties

- bpy\_struct.id\_data

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

### References

- UserPreferences.view

## 2.4.603 UserSolidLight(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.**UserSolidLight** (bpy\_struct)  
Light used for OpenGL lighting in solid draw mode

**diffuse\_color**  
The diffuse color of the OpenGL light  
**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**direction**  
The direction that the OpenGL light is shining  
**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**specular\_color**  
The color of the lights specular highlight  
**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**use**

Enable this OpenGL light in solid draw mode

**Type** boolean, default False

**Inherited Properties**

- bpy\_struct.id\_data

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

**References**

- UserPreferencesSystem.solid\_lights

## 2.4.604 ValueNodeSocket(NodeSocket)

base classes — bpy\_struct, NodeSocket

**class** bpy.types.**ValueNodeSocket** (*NodeSocket*)

Input or output socket of a node

**default\_value**

Default value of the socket when no link is attached

**Type** float array of 1 items in [-inf, inf], default (0.0)

**Inherited Properties**

- bpy\_struct.id\_data
- NodeSocket.name
- NodeSocket.type

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.605 VectorFont(ID)

base classes — `bpy_struct, ID`

`class bpy.types.VectorFont (ID)`

Vector font for Text objects

`filepath`

**Type** `string, default "", (readonly)`

`packed_file`

**Type** `PackedFile, (readonly)`

### Inherited Properties

- `bpy_struct.id_data`
- `ID.name`
- `ID.use_fake_user`
- `ID.library`
- `ID.tag`
- `ID.users`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`

- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- ID.copy
- ID.user\_clear
- ID.animation\_data\_create
- ID.animation\_data\_clear
- ID.update\_tag

## References

- BlendData.fonts
- BlendDataFonts.load
- BlendDataFonts.remove
- TextCurve.font
- TextCurve.font\_bold
- TextCurve.font\_bold\_italic
- TextCurve.font\_italic

## 2.4.606 VectorNodeSocket(NodeSocket)

base classes — bpy\_struct, NodeSocket

**class bpy.types.VectorNodeSocket (NodeSocket)**

Input or output socket of a node

**default\_value**

Default value of the socket when no link is attached

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

## Inherited Properties

- bpy\_struct.id\_data
- NodeSocket.name
- NodeSocket.type

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set

- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.607 VertexColors(bpy\_struct)

base class — bpy\_struct

**class bpy.types.VertexColors (bpy\_struct)**

Collection of vertex colors

**active**

Active vertex color layer

**Type** MeshColorLayer

**active\_index**

Active vertex color index

**Type** int in [0, inf], default 0

**new (name="Col")**

Add a vertex color layer to Mesh.

**Parameters** name (string, (optional)) – Vertex color name.

**Returns** The newly created layer.

**Return type** MeshColorLayer

### Inherited Properties

- bpy\_struct.id\_data

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast

- `bpy_struct.values`

## References

- `Mesh.vertex_colors`

### 2.4.608 VertexGroup(`bpy_struct`)

base class — `bpy_struct`

`class bpy.types.VertexGroup (bpy_struct)`

Group of vertices, used for armature deform and other purposes

#### `index`

Index number of the vertex group

**Type** int in [0, inf], default 0, (readonly)

#### `name`

Vertex group name

**Type** string, default “”

`add (index, weight, type)`

Add vertices to the group.

#### Parameters

- `index` (int array of 1 items in [-inf, inf]) – Index List.
- `weight` (float in [0, 1]) – Vertex weight.
- `type` (enum in ['REPLACE', 'ADD', 'SUBTRACT']) – Vertex assign mode.

`remove (index)`

Remove a vertex from the group.

**Parameters** `index` (int array of 1 items in [-inf, inf]) – Index List.

`weight (index)`

Get a vertex weight from the group.

**Parameters** `index` (int in [0, inf]) – Index, The index of the vertex.

**Returns** Vertex weight.

**Return type** float in [0, 1]

## Inherited Properties

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`

- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- Object.vertex\_groups
- VertexGroups.active
- VertexGroups.new
- VertexGroups.remove

## 2.4.609 VertexGroupElement(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.VertexGroupElement (*bpy\_struct*)

Weight value of a vertex in a vertex group

**group**

**Type** int in [0, inf], default 0, (readonly)

**weight**

Vertex Weight

**Type** float in [0, 1], default 0.0

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert

- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- LatticePoint.groups
- MeshVertex.groups

## 2.4.610 VertexGroups(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.VertexGroups (*bpy\_struct*)  
Collection of vertex groups

**active**  
Vertex groups of the object

**Type** VertexGroup, (readonly)

**active\_index**  
Active index in vertex group array

**Type** int in [-32768, 32767], default 0

**new**(*name*=”Group”)  
Add vertex group to object.

**Parameters** **name** (string, (optional)) – Vertex group name.

**Returns** New vertex group.

**Return type** VertexGroup

**remove**(*group*)  
Delete vertex group from object.

**Parameters** **group** (VertexGroup, (never None)) – Vertex group to remove.

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set

- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- Object.vertex\_groups

### 2.4.611 VertexPaint(Paint)

base classes — bpy\_struct, Paint

**class bpy.types.VertexPaint (Paint)**  
Properties of vertex and weight paint mode

**use\_all\_faces**

Paint on all faces inside brush

**Type** boolean, default False

**use\_normal**

Applies the vertex normal before painting

**Type** boolean, default False

**use\_spray**

Keep applying paint effect while holding mouse

**Type** boolean, default False

## Inherited Properties

- bpy\_struct.id\_data
- Paint.brush
- Paint.show\_low\_resolution
- Paint.show\_brush
- Paint.show\_brush\_on\_surface

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items

- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- ToolSettings.vertex\_paint
- ToolSettings.weight\_paint

## 2.4.612 VisibilityActuator(Actuator)

base classes — bpy\_struct, Actuator

**class bpy.types.VisibilityActuator(Actuator)**

Actuator to set visibility and occlusion of the object

**apply\_to\_children**

Set all the children of this object to the same visibility/occlusion recursively

**Type** boolean, default False

**use\_occlusion**

Set the object to occlude objects behind it. Initialized from the object type in physics button

**Type** boolean, default False

**use\_visible**

Set the objects visible. Initialized from the object render restriction toggle in physics button

**Type** boolean, default False

## Inherited Properties

- bpy\_struct.id\_data
- Actuator.name
- Actuator.show\_expanded
- Actuator.pin
- Actuator.type

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items

- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`
- `Actuator.link`
- `Actuator.unlink`

## 2.4.613 VoronoiTexture(Texture)

base classes — `bpy_struct, ID, Texture`

**class bpy.types.VoronoiTexture (Texture)**

Procedural voronoi texture

**color\_mode**

**Type** enum in ['INTENSITY', 'POSITION', 'POSITION\_OUTLINE', 'POSITION\_OUTLINE\_INTENSITY'], default 'INTENSITY'

**distance\_metric**

**Type** enum in ['DISTANCE', 'DISTANCE\_SQUARED', 'MANHATTAN', 'CHEBYCHEV', 'MINKOVSKY\_HALF', 'MINKOVSKY\_FOUR', 'MINKOVSKY'], default 'DISTANCE'

**minkovsky\_exponent**

Minkovsky exponent

**Type** float in [0.01, 10], default 0.0

**nabla**

Size of derivative offset used for calculating normal

**Type** float in [0.001, 0.1], default 0.0

**noise\_intensity**

Scales the intensity of the noise

**Type** float in [0.01, 10], default 0.0

**noise\_scale**

Sets scaling for noise input

**Type** float in [0.0001, inf], default 0.0

**weight\_1**

Voronoi feature weight 1

**Type** float in [-2, 2], default 0.0

**weight\_2**

Voronoi feature weight 2

**Type** float in [-2, 2], default 0.0

**weight\_3**

Voronoi feature weight 3

**Type** float in [-2, 2], default 0.0

**weight\_4**

Voronoi feature weight 4

**Type** float in [-2, 2], default 0.0

**users\_material**

Materials that use this texture (readonly)

**users\_object\_modifier**

Object modifiers that use this texture (readonly)

## Inherited Properties

- bpy\_struct.id\_data
- ID.name
- ID.use\_fake\_user
- ID.library
- ID.tag
- ID.users
- Texture.animation\_data
- Texture.intensity
- Texture.color\_ramp
- Texture.contrast
- Texture.factor\_blue
- Texture.factor\_green
- Texture.factor\_red
- Texture.node\_tree
- Texture.saturation
- Texture.use\_preview\_alpha
- Texture.type
- Texture.use\_color\_ramp
- Texture.use\_nodes
- Texture.users\_material
- Texture.users\_object\_modifier
- Texture.users\_material
- Texture.users\_object\_modifier

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast

- `bpy_struct.values`
- `ID.copy`
- `ID.user_clear`
- `ID.animation_data_create`
- `ID.animation_data_clear`
- `ID.update_tag`

## 2.4.614 VoxelData(bpy\_struct)

base class — `bpy_struct`

**class** `bpy.types.VoxelData(bpy_struct)`

Voxel data settings

**domain\_object**

Object used as the smoke simulation domain

**Type** `Object`

**extension**

Sets how the texture is extrapolated past its original bounds

**Type** enum in ['EXTEND', 'CLIP', 'REPEAT'], default 'EXTEND'

**file\_format**

Format of the source data set to render

**Type** enum in ['BLENDER\_VOXEL', 'RAW\_8BIT', 'IMAGE\_SEQUENCE', 'SMOKE'], default 'BLENDER\_VOXEL'

**filepath**

The external source data file to use

**Type** string, default ""

**intensity**

Multiplier for intensity values

**Type** float in [0.01, inf], default 0.0

**interpolation**

Method to interpolate/smooth values between voxel cells

**Type** enum in ['NEREASTNEIGHBOR', 'TRILINEAR', 'QUADRATIC', 'TRICUBIC\_CATROM', 'TRICUBIC\_BSPLINE'], default 'NEREASTNEIGHBOR'

**resolution**

Resolution of the voxel grid

**Type** int array of 3 items in [1, 100000], default (0, 0, 0)

**smoke\_data\_type**

Simulation value to be used as a texture

**Type** enum in ['SMOKEDENSITY', 'SMOKEHEAT', 'SMOKEVEL'], default 'SMOKEDENSITY'

**still\_frame**

The frame number to always use

**Type** int in [-300000, 300000], default 0

**use\_still\_frame**

Always render a still frame from the voxel data sequence

**Type** boolean, default False

**Inherited Properties**

- bpy\_struct.id\_data

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

**References**

- VoxelDataTexture.voxel\_data

## 2.4.615 VoxelDataTexture(Texture)

base classes — bpy\_struct, ID, Texture

**class** bpy.types.VoxelDataTexture (*Texture*)

Settings for the Voxel Data texture

**image**

**Type** Image

**image\_user**

Parameters defining which layer, pass and frame of the image is displayed

**Type** ImageUser, (readonly)

**voxel\_data**

The voxel data associated with this texture

**Type** VoxelData, (readonly)

**users\_material**

Materials that use this texture (readonly)

**users\_object\_modifier**

Object modifiers that use this texture (readonly)

**Inherited Properties**

- bpy\_struct.id\_data
- ID.name
- ID.use\_fake\_user
- ID.library
- ID.tag
- ID.users
- Texture.animation\_data
- Texture.intensity
- Texture.color\_ramp
- Texture.contrast
- Texture.factor\_blue
- Texture.factor\_green
- Texture.factor\_red
- Texture.node\_tree
- Texture.saturation
- Texture.use\_preview\_alpha
- Texture.type
- Texture.use\_color\_ramp
- Texture.use\_nodes
- Texture.users\_material
- Texture.users\_object\_modifier
- Texture.users\_material
- Texture.users\_object\_modifier

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- ID.copy
- ID.user\_clear
- ID.animation\_data\_create
- ID.animation\_data\_clear
- ID.update\_tag

## 2.4.616 WarpModifier(Modifier)

base classes — `bpy_struct, Modifier`

**class bpy.types.WarpModifier (Modifier)**  
Warp modifier

**falloff\_curve**  
Custom Lamp Falloff Curve  
**Type** `CurveMapping`, (readonly)

**falloff\_radius**  
Radius to apply  
**Type** float in [0, inf], default 0.0

**falloff\_type**  
**Type** enum in ['NONE', 'CURVE', 'SMOOTH', 'SPHERE', 'ROOT', 'SHARP', 'LINEAR', 'CONSTANT'], default 'NONE'

**object\_from**  
Object to transform from  
**Type** `Object`

**object\_to**  
Object to transform to  
**Type** `Object`

**strength**  
**Type** float in [-inf, inf], default 0.0

**texture**  
**Type** `Texture`

**texture\_coords**  
**Type** enum in ['LOCAL', 'GLOBAL', 'OBJECT', 'UV'], default 'LOCAL'

**texture\_coords\_object**  
Object to set the texture coordinates  
**Type** `Object`

**use\_volume\_preserve**  
Preserve volume when rotations are used  
**Type** boolean, default False

**uv\_layer**  
UV layer name  
**Type** string, default ""

**vertex\_group**  
Vertex group name for modulating the deform  
**Type** string, default ""

## Inherited Properties

- bpy\_struct.id\_data
- Modifier.name
- Modifier.use\_apply\_on\_spline
- Modifier.show\_in\_editmode
- Modifier.show\_expanded
- Modifier.show\_on\_cage
- Modifier.show\_viewport
- Modifier.show\_render
- Modifier.type

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## 2.4.617 WaveModifier(Modifier)

base classes — bpy\_struct, Modifier

**class bpy.types.WaveModifier (Modifier)**  
Wave effect modifier

**damping\_time**

Number of frames in which the waves damps out after it dies

**Type** float in [-300000, 300000], default 0.0

**falloff\_radius**

Distance after which it fades out

**Type** float in [0, inf], default 0.0

**height**

Height of the wave

**Type** float in [-inf, inf], default 0.0

**lifetime**

Lifetime of the wave in frames, zero means infinite

**Type** float in [-300000, 300000], default 0.0

**narrowness**

Distance between the top and the base of a wave, the higher the value, the more narrow the wave

**Type** float in [0, inf], default 0.0

**speed**

Speed of the wave, towards the starting point when negative

**Type** float in [-inf, inf], default 0.0

**start\_position\_object**

Object which defines the wave center

**Type** [Object](#)

**start\_position\_x**

X coordinate of the start position

**Type** float in [-inf, inf], default 0.0

**start\_position\_y**

Z coordinate of the start position

**Type** float in [-inf, inf], default 0.0

**texture**

Texture for modulating the wave

**Type** [Texture](#)

**texture\_coords**

Texture coordinates used for modulating input

**Type** enum in ['LOCAL', 'GLOBAL', 'OBJECT', 'MAP\_UV'], default 'LOCAL'

**texture\_coords\_object**

**Type** [Object](#)

**time\_offset**

Either the starting frame (for positive speed) or ending frame (for negative speed.)

**Type** float in [-300000, 300000], default 0.0

**use\_cyclic**

Cyclic wave effect

**Type** boolean, default False

**use\_normal**

Displace along normals

**Type** boolean, default False

**use\_normal\_x**

Enable displacement along the X normal

**Type** boolean, default False

**use\_normal\_y**

Enable displacement along the Y normal

**Type** boolean, default False

**use\_normal\_z**

Enable displacement along the Z normal

**Type** boolean, default False

**use\_x**

X axis motion

**Type** boolean, default False

**use\_y**

Y axis motion

**Type** boolean, default False

**uv\_layer**

UV layer name

**Type** string, default “”

**vertex\_group**

Vertex group name for modulating the wave

**Type** string, default “”

**width**

Distance between the waves

**Type** float in [0, inf], default 0.0

**Inherited Properties**

- `bpy_struct.id_data`
- `Modifier.name`
- `Modifier.use_apply_on_spline`
- `Modifier.show_in_editmode`
- `Modifier.show_expanded`
- `Modifier.show_on_cage`
- `Modifier.show_viewport`
- `Modifier.show_render`
- `Modifier.type`

**Inherited Functions**

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`

- `bpy_struct.type_recast`
- `bpy_struct.values`

## 2.4.618 Window(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.Window` (`bpy_struct`)

Open window

**screen**

Active screen showing in the window

**Type** `Screen`, (never None)

### Inherited Properties

- `bpy_struct.id_data`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

### References

- `Context.window`
- `WindowManager.event_timer_add`
- `WindowManager.windows`

## 2.4.619 WindowManager(`ID`)

base classes — `bpy_struct`, `ID`

**class** `bpy.types.WindowManager` (`ID`)

Window manager datablock defining open windows and other user interface data

**addon\_filter**

Filter add-ons by category

**Type** enum in [], default “”

**addon\_search**

Search within the selected filter

**Type** string, default “”

**addon\_support**

Display support level

**Type** enum set in {‘OFFICIAL’, ‘COMMUNITY’}, default {‘OFFICIAL’, ‘COMMUNITY’}

**clipboard**

**Type** string, default “”

**keyconfigs**

Registered key configurations

**Type** bpy\_prop\_collection of KeyConfig, (readonly)

**operators**

Operator registry

**Type** bpy\_prop\_collection of Operator, (readonly)

**windows**

Open windows

**Type** bpy\_prop\_collection of Window, (readonly)

**classmethod fileselect\_add(operator)**

Show up the file selector.

**Parameters** operator (Operator) – Operator to call.

**classmethod modal\_handler\_add(operator)**

modal\_handler\_add

**Parameters** operator (Operator) – Operator to call.

**Return type** boolean

**event\_timer\_add(time\_step, window=None)**

event\_timer\_add

**Parameters**

- **time\_step** (float in [0, inf]) – Time Step, Interval in seconds between timer events
- **window** (Window, (optional)) – Window to attach the timer to or None.

**Return type** Timer

**event\_timer\_remove(timer)**

event\_timer\_remove

**classmethod invoke\_props\_popup(operator, event)**

Operator popup invoke.

**Parameters**

- **operator** (Operator) – Operator to call.

- **event** ([Event](#)) – Event.

**Returns** result

**Return type** enum set in {‘RUNNING\_MODAL’, ‘CANCELLED’, ‘FINISHED’, ‘PASS\_THROUGH’}

**classmethod invoke\_props\_dialog**(operator, width=300, height=20)

Operator dialog (non-autoexec popup) invoke.

**Parameters**

- **operator** ([Operator](#)) – Operator to call.
- **width** (*int in [0, inf], (optional)*) – Width of the popup.
- **height** (*int in [0, inf], (optional)*) – Height of the popup.

**Returns** result

**Return type** enum set in {‘RUNNING\_MODAL’, ‘CANCELLED’, ‘FINISHED’, ‘PASS\_THROUGH’}

**classmethod invoke\_search\_popup**(operator)

invoke\_search\_popup

**Parameters** operator ([Operator](#)) – Operator to call.

**classmethod invoke\_popup**(operator, width=300, height=20)

Operator popup invoke.

**Parameters**

- **operator** ([Operator](#)) – Operator to call.
- **width** (*int in [0, inf], (optional)*) – Width of the popup.
- **height** (*int in [0, inf], (optional)*) – Height of the popup.

**Returns** result

**Return type** enum set in {‘RUNNING\_MODAL’, ‘CANCELLED’, ‘FINISHED’, ‘PASS\_THROUGH’}

**classmethod invoke\_confirm**(operator, event)

Operator confirmation.

**Parameters**

- **operator** ([Operator](#)) – Operator to call.
- **event** ([Event](#)) – Event.

**Returns** result

**Return type** enum set in {‘RUNNING\_MODAL’, ‘CANCELLED’, ‘FINISHED’, ‘PASS\_THROUGH’}

## Inherited Properties

- `bpy_struct.id_data`
- `ID.name`
- `ID.use_fake_user`
- `ID.library`
- `ID.tag`

- `ID.users`

### Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`
- `ID.copy`
- `ID.user_clear`
- `ID.animation_data_create`
- `ID.animation_data_clear`
- `ID.update_tag`

### References

- `BlendData.window_managers`
- `Context.window_manager`

## 2.4.620 WipeSequence(*EffectSequence*)

base classes — `bpy_struct, Sequence, EffectSequence`

**class bpy.types.WipeSequence (*EffectSequence*)**

Sequence strip creating a wipe transition

**angle**

Edge angle

**Type** float in [-1.5708, 1.5708], default 0.0

**blur\_width**

Width of the blur edge, in percentage relative to the image size

**Type** float in [0, 1], default 0.0

**direction**

Wipe direction

**Type** enum in ['OUT', 'IN'], default 'OUT'

**transition\_type**

**Type** enum in ['SINGLE', 'DOUBLE', 'IRIS', 'CLOCK'], default 'SINGLE'

## Inherited Properties

- bpy\_struct.id\_data
- Sequence.name
- Sequence.blend\_type
- Sequence.blend\_alpha
- Sequence.channel
- Sequence.effect\_fader
- Sequence.frame\_final\_end
- Sequence.frame\_offset\_end
- Sequence.frame\_still\_end
- Sequence.input\_1
- Sequence.input\_2
- Sequence.input\_3
- Sequence.select\_left\_handle
- Sequence.frame\_final\_duration
- Sequence.frame\_duration
- Sequence.lock
- Sequence.mute
- Sequence.select\_right\_handle
- Sequence.select
- Sequence.speed\_factor
- Sequence.frame\_start
- Sequence.frame\_final\_start
- Sequence.frame\_offset\_start
- Sequence.frame\_still\_start
- Sequence.type
- Sequence.use\_default\_fade
- Sequence.input\_count
- EffectSequence.color\_balance
- EffectSequence.use\_float
- EffectSequence.crop
- EffectSequence.use\_deinterlace
- EffectSequence.use\_reverse\_frames
- EffectSequence.use\_flip\_x
- EffectSequence.use\_flip\_y
- EffectSequence.color\_multiply
- EffectSequence.use\_premultiply
- EffectSequence.proxy
- EffectSequence.use\_proxy\_custom\_directory
- EffectSequence.use\_proxy\_custom\_file
- EffectSequence.color\_saturation
- EffectSequence.strobe
- EffectSequence.transform
- EffectSequence.use\_color\_balance
- EffectSequence.use\_crop
- EffectSequence.use\_proxy
- EffectSequence.use\_translation

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add

- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- Sequence.getStripElem
- Sequence.swap

## 2.4.621 WoodTexture(Texture)

base classes — bpy\_struct, ID, Texture

**class** bpy.types.WoodTexture (*Texture*)

Procedural noise texture

**nabla**

Size of derivative offset used for calculating normal

**Type** float in [0.001, 0.1], default 0.0

**noise\_basis**

Sets the noise basis used for turbulence

**Type** enum in ['BLENDER\_ORIGINAL', 'ORIGINAL\_PERLIN', 'IMPROVED\_PERLIN', 'VORONOI\_F1', 'VORONOI\_F2', 'VORONOI\_F3', 'VORONOI\_F4', 'VORONOI\_F2\_F1', 'VORONOI\_CRACKLE', 'CELL\_NOISE'], default 'BLENDER\_ORIGINAL'

**noise\_basis\_2**

**Type** enum in ['SIN', 'SAW', 'TRI'], default 'SIN'

**noise\_scale**

Sets scaling for noise input

**Type** float in [0.0001, inf], default 0.0

**noise\_type**

**Type** enum in ['SOFT\_NOISE', 'HARD\_NOISE'], default 'SOFT\_NOISE'

**turbulence**

Sets the turbulence of the bandnoise and ringnoise types

**Type** float in [0.0001, inf], default 0.0

**wood\_type**

**Type** enum in ['BANDS', 'RINGS', 'BANDNOISE', 'RINGNOISE'], default 'BANDS'

**users\_material**

Materials that use this texture (readonly)

**users\_object\_modifier**

Object modifiers that use this texture (readonly)

**Inherited Properties**

- bpy\_struct.id\_data
- ID.name
- ID.use\_fake\_user
- ID.library
- ID.tag
- ID.users
- Texture.animation\_data
- Texture.intensity
- Texture.color\_ramp
- Texture.contrast
- Texture.factor\_blue
- Texture.factor\_green
- Texture.factor\_red
- Texture.node\_tree
- Texture.saturation
- Texture.use\_preview\_alpha
- Texture.type
- Texture.use\_color\_ramp
- Texture.use\_nodes
- Texture.users\_material
- Texture.users\_object\_modifier
- Texture.users\_material
- Texture.users\_object\_modifier

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- ID.copy
- ID.user\_clear
- ID.animation\_data\_create
- ID.animation\_data\_clear
- ID.update\_tag

## 2.4.622 World(ID)

base classes — `bpy_struct`, `ID`

**class bpy.types.World(ID)**

World datablock describing the environment and ambient lighting of a scene

**active\_texture**

Active texture slot being displayed

**Type** `Texture`

**active\_texture\_index**

Index of active texture slot

**Type** int in [0, 17], default 0

**ambient\_color**

Ambient color of the world

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**animation\_data**

Animation data for this datablock

**Type** `AnimData`, (readonly)

**color\_range**

The color range that will be mapped to 0-1

**Type** float in [0.2, 5], default 0.0

**exposure**

Amount of exponential color correction for light

**Type** float in [0, 1], default 0.0

**horizon\_color**

Color at the horizon

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

**light\_settings**

World lighting settings

**Type** `WorldLighting`, (readonly, never None)

**mist\_settings**

World mist settings

**Type** `WorldMistSettings`, (readonly, never None)

**star\_settings**

World stars settings

**Type** `WorldStarsSettings`, (readonly, never None)

**texture\_slots**

Texture slots defining the mapping and influence of textures

**Type** `WorldTextureSlots` `bpy_prop_collection` of `WorldTextureSlot`, (read-only)

**use\_sky\_blend**

Render background with natural progression from horizon to zenith

**Type** boolean, default False

**use\_sky\_paper**  
Flatten blend or texture coordinates

**Type** boolean, default False

**use\_sky\_real**  
Render background with a real horizon, relative to the camera angle

**Type** boolean, default False

**zenith\_color**  
Color at the zenith

**Type** float array of 3 items in [-inf, inf], default (0.0, 0.0, 0.0)

## Inherited Properties

- bpy\_struct.id\_data
- ID.name
- ID.use\_fake\_user
- ID.library
- ID.tag
- ID.users

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- ID.copy
- ID.user\_clear
- ID.animation\_data\_create
- ID.animation\_data\_clear
- ID.update\_tag

## References

- BlendData.worlds
- BlendDataWorlds.new

- BlendDataWorlds.remove
- Scene.world

## 2.4.623 WorldLighting(bpy\_struct)

base class — `bpy_struct`

**class** `bpy.types.WorldLighting(bpy_struct)`

Lighting for a World datablock

### **adapt\_to\_speed**

Use the speed vector pass to reduce AO samples in fast moving pixels. Higher values result in more aggressive sample reduction. Requires Vec pass enabled (for Raytrace Adaptive QMC)

**Type** float in [0, 1], default 0.0

### **ao\_blend\_type**

Defines how AO mixes with material shading

**Type** enum in ['MULTIPLY', 'ADD'], default 'ADD'

### **ao\_factor**

Factor for ambient occlusion blending

**Type** float in [0, inf], default 0.0

### **bias**

Bias (in radians) to prevent smoothed faces from showing banding (for Raytrace Constant Jittered)

**Type** float in [0, 0.5], default 0.0

### **correction**

Ad-hoc correction for over-occlusion due to the approximation

**Type** float in [0, 1], default 0.0

### **distance**

Length of rays, defines how far away other faces give occlusion effect

**Type** float in [-inf, inf], default 0.0

### **environment\_color**

Defines where the color of the environment light comes from

**Type** enum in ['PLAIN', 'SKY\_COLOR', 'SKY\_TEXTURE'], default 'PLAIN'

### **environment\_energy**

Defines the strength of environment light

**Type** float in [-inf, inf], default 0.0

### **error\_threshold**

Low values are slower and higher quality

**Type** float in [0.0001, 10], default 0.0

### **falloff\_strength**

Attenuation falloff strength, the higher, the less influence distant objects have

**Type** float in [-inf, inf], default 0.0

### **gather\_method**

**Type** enum in ['RAYTRACE', 'APPROXIMATE'], default 'RAYTRACE'

**indirect\_bounces**

Number of indirect diffuse light bounces

**Type** int in [1, 32767], default 0

**indirect\_factor**

Factor for how much surrounding objects contribute to light

**Type** float in [0, inf], default 0.0

**passes**

Number of preprocessing passes to reduce overocclusion

**Type** int in [0, 10], default 0

**sample\_method**

Method for generating shadow samples (for Raytrace)

**Type** enum in ['CONSTANT\_JITTERED', 'ADAPTIVE\_QMC', 'CONSTANT\_QMC'], default 'CONSTANT\_JITTERED'

**samples**

Amount of ray samples. Higher values give smoother results and longer rendering times

**Type** int in [1, 32], default 0

**threshold**

Samples below this threshold will be considered fully shadowed/unshadowed and skipped (for Raytrace Adaptive QMC)

**Type** float in [0, 1], default 0.0

**use\_ambient\_occlusion**

Use Ambient Occlusion to add shadowing based on distance between objects

**Type** boolean, default False

**use\_cache**

Cache AO results in pixels and interpolate over neighbouring pixels for speedup

**Type** boolean, default False

**use\_environment\_light**

Add light coming from the environment

**Type** boolean, default False

**use\_falloff**

Distance will be used to attenuate shadows

**Type** boolean, default False

**use\_indirect\_light**

Add indirect light bouncing of surrounding objects

**Type** boolean, default False

**Inherited Properties**

- `bpy_struct.id_data`

## Inherited Functions

- `bpy_struct.as_pointer`
- `bpy_struct.callback_add`
- `bpy_struct.callback_remove`
- `bpy_struct.driver_add`
- `bpy_struct.driver_remove`
- `bpy_struct.get`
- `bpy_struct.is_property_hidden`
- `bpy_struct.is_property_set`
- `bpy_struct.items`
- `bpy_struct.keyframe_delete`
- `bpy_struct.keyframe_insert`
- `bpy_struct.keys`
- `bpy_struct.path_from_id`
- `bpy_struct.path_resolve`
- `bpy_struct.type_recast`
- `bpy_struct.values`

## References

- `World.light_settings`

### 2.4.624 WorldMistSettings(`bpy_struct`)

base class — `bpy_struct`

**class** `bpy.types.WorldMistSettings` (`bpy_struct`)  
Mist settings for a World data-block

**depth**

The distance over which the mist effect fades in

**Type** float in [0, inf], default 0.0

**falloff**

Type of transition used to fade mist

**Type** enum in ['QUADRATIC', 'LINEAR', 'INVERSE\_QUADRATIC'], default  
'QUADRATIC'

**height**

Control how much mist density decreases with height

**Type** float in [0, 100], default 0.0

**intensity**

Intensity of the mist effect

**Type** float in [0, 1], default 0.0

**start**

Starting distance of the mist, measured from the camera

**Type** float in [0, inf], default 0.0

**use\_mist**

Occlude objects with the environment color as they are further away

**Type** boolean, default False

### Inherited Properties

- bpy\_struct.id\_data

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

### References

- World.mist\_settings

## 2.4.625 WorldStarsSettings(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.WorldStarsSettings (*bpy\_struct*)

Stars setting for a World data-block

**average\_separation**

Average distance between any two stars

**Type** float in [2, 1000], default 0.0

**color\_random**

Randomize star colors

**Type** float in [0, 1], default 0.0

**distance\_min**

Minimum distance to the camera for stars

**Type** float in [0, 1000], default 0.0

**size**

Average screen dimension of stars

**Type** float in [0, 10], default 0.0

**use\_stars**

Enable starfield generation

**Type** boolean, default False

**Inherited Properties**

- bpy\_struct.id\_data

**Inherited Functions**

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

**References**

- World.star\_settings

## 2.4.626 WorldTextureSlot(TextureSlot)

base classes — bpy\_struct, TextureSlot

**class bpy.types.WorldTextureSlot (TextureSlot)**

Texture slot for textures in a World datablock

**blend\_factor**

Amount texture affects color progression of the background

**Type** float in [-inf, inf], default 0.0

**horizon\_factor**

Amount texture affects color of the horizon

**Type** float in [-inf, inf], default 0.0

**object**

Object to use for mapping with Object texture coordinates

**Type** Object

**texture\_coords**

Texture coordinates used to map the texture onto the background

**Type** enum in ['VIEW', 'GLOBAL', 'ANGMAP', 'SPHERE', 'TUBE', 'OBJECT'], default 'VIEW'

**use\_map\_blend**

Affect the color progression of the background

**Type** boolean, default False

**use\_map\_horizon**

Affect the color of the horizon

**Type** boolean, default False

**use\_map\_zenith\_down**

Affect the color of the zenith below

**Type** boolean, default False

**use\_map\_zenith\_up**

Affect the color of the zenith above

**Type** boolean, default False

**zenith\_down\_factor**

Amount texture affects color of the zenith below

**Type** float in [-inf, inf], default 0.0

**zenith\_up\_factor**

Amount texture affects color of the zenith above

**Type** float in [-inf, inf], default 0.0

## Inherited Properties

- bpy\_struct.id\_data
- TextureSlot.name
- TextureSlot.blend\_type
- TextureSlot.color
- TextureSlot.default\_value
- TextureSlot.invert
- TextureSlot.offset
- TextureSlot.output\_node
- TextureSlot.use\_rgb\_to\_intensity
- TextureSlot.scale
- TextureSlot.use\_stencil
- TextureSlot.texture

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get

- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- World.texture\_slots
- WorldTextureSlots.add
- WorldTextureSlots.create

## 2.4.627 WorldTextureSlots(bpy\_struct)

base class — bpy\_struct

**class** bpy.types.**WorldTextureSlots** (*bpy\_struct*)  
Collection of texture slots

**classmethod add()**

add

**Returns** The newly initialized mtex.

**Return type** WorldTextureSlot

**classmethod create(index)**

create

**Parameters** index (int in [0, inf]) – Index, Slot index to initialize.

**Returns** The newly initialized mtex.

**Return type** WorldTextureSlot

**classmethod clear(index)**

clear

**Parameters** index (int in [0, inf]) – Index, Slot index to clear.

## Inherited Properties

- bpy\_struct.id\_data

## Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add

- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

## References

- World.texture\_slots

## 2.4.628 XnorController(Controller)

base classes — bpy\_struct, Controller

**class bpy.types.XnorController(Controller)**  
Controller passing on events based on a logical XNOR operation

### Inherited Properties

- bpy\_struct.id\_data
- Controller.name
- Controller.states
- Controller.show\_expanded
- Controller.use\_priority
- Controller.type

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values

- Controller.link
- Controller.unlink

## 2.4.629 XorController(Controller)

base classes — bpy\_struct, Controller

**class bpy.types.XorController(Controller)**

Controller passing on events based on a logical XOR operation

### Inherited Properties

- bpy\_struct.id\_data
- Controller.name
- Controller.states
- Controller.show\_expanded
- Controller.use\_priority
- Controller.type

### Inherited Functions

- bpy\_struct.as\_pointer
- bpy\_struct.callback\_add
- bpy\_struct.callback\_remove
- bpy\_struct.driver\_add
- bpy\_struct.driver\_remove
- bpy\_struct.get
- bpy\_struct.is\_property\_hidden
- bpy\_struct.is\_property\_set
- bpy\_struct.items
- bpy\_struct.keyframe\_delete
- bpy\_struct.keyframe\_insert
- bpy\_struct.keys
- bpy\_struct.path\_from\_id
- bpy\_struct.path\_resolve
- bpy\_struct.type\_recast
- bpy\_struct.values
- Controller.link
- Controller.unlink

## 2.4.630 bpy\_prop\_collection

**class bpy.types.bpy\_prop\_collection**

built-in class used for all collections.

---

**Note:** Note that bpy.types.bpy\_prop\_collection is not actually available from within blender, it only exists for the purpose of documentation.

---

**foreach\_get (attr, seq)**

This is a function to give fast access to attributes within a collection.

```
collection.foreach_get(someseq, attr)

# Python equivalent
for i in range(len(seq)): someseq[i] = getattr(collection, attr)

foreach_set(attr, seq)
This is a function to give fast access to attributes within a collection.

collection.foreach_set(seq, attr)

# Python equivalent
for i in range(len(seq)): setattr(collection[i], attr, seq[i])

get(key, default=None)
Returns the value of the item assigned to key or default when not found (matches pythons dictionary function of the same name).

Parameters

- key (string) – The identifier for the collection member.
- default (Undefined) – Optional argument for the value to return if key is not found.

items()
Return the identifiers of collection members (matching pythons dict.items() functionality).

Returns (key, value) pairs for each member of this collection.

Return type list of tuples

keysReturns the identifiers for each member of this collection.

Return type list of strings

valuesReturns the members of this collection.

Return type list
```

## 2.4.631 bpy\_struct

```
subclasses — ActionFCurves, ActionGroup, ActionGroups, ActionPoseMarkers, Actuator, Addon, Addons, AnimData, AnimDataDrivers, AnimViz, AnimVizMotionPaths, AnimVizOnionSkinning, AnyType, Area, AreaSpaces, ArmatureBones, ArmatureEditBones, BackgroundImage, BezierSplinePoint, BlendData, BlendDataActions, BlendDataArmatures, BlendDataBrushes, BlendDataCameras, BlendDataCurves, BlendDataFonts, BlendDataGreasePencils, BlendDataGroups, BlendDataImages, BlendDataLamps, BlendDataLattices, BlendDataLibraries, BlendDataMaterials, BlendDataMeshes, BlendDataMetaBalls, BlendDataNodeTrees, BlendDataObjects, BlendDataParticles, BlendDataScenes, BlendDataScreens, BlendDataSounds, BlendDataTexts, BlendDataTextures, BlendDataWindowManagers, BlendDataWorlds, BlenderRNA, BoidRule, BoidSettings, BoidState, Bone, BoneGroup, BoneGroups, ChannelDriverVariables, ChildParticle, ClothCollisionSettings, ClothSettings, CollisionSettings, ColorRamp, ColorRampElement, ColorRampElements, CompositorNodes, ConsoleLine, Constraint, ConstraintTarget, Context, Controller, CurveMap,
```

CurveMapPoint, CurveMapping, CurveSplines, DopeSheet, Driver, DriverTarget, DriverVariable, DupliObject, EditBone, EffectorWeights, EnumPropertyItem, EnvironmentMap, Event, FCurve, FCurveKeyframePoints, FCurveModifiers, FCurveSample, FModifier, FModifierEnvelopeControlPoint, FieldSettings, FileSelectParams, FluidMeshVertex, FluidSettings, Function, GPencilFrame, GPencilLayer, GPencilStroke, GPencilStrokePoint, GameObjectSettings, GameProperty, GameSoftBodySettings, GreasePencilLayers, GroupInputs, GroupObjects, GroupOutputs, Header, Histogram, ID, IDMMaterials, IKParam, ImageUser, KeyConfig, KeyConfigurations, KeyMap, KeyMapItem, KeyMapItems, KeyMaps, Keyframe, KeyingSet, KeyingSetInfo, KeyingSetPath, KeyingSetPaths, KeyingSets, KeyingSetsAll, LampSkySettings, LampTextureSlots, LatticePoint, Macro, MaterialHalo, MaterialPhysics, MaterialRaytraceMirror, MaterialRaytraceTransparency, MaterialSlot, MaterialStrand, MaterialSubsurfaceScattering, MaterialTextureSlots, MaterialVolume, Menu, MeshColor, MeshColorLayer, MeshEdge, MeshEdges, MeshFace, MeshFaces, MeshFloatProperty, MeshFloatPropertyLayer, MeshIntProperty, MeshIntPropertyLayer, MeshSticky, MeshStringProperty, MeshStringPropertyLayer, MeshTextureFace, MeshTextureFaceLayer, MeshVertex, MeshVertices, MetaBallElements, MetaElement, Modifier, MotionPath, MotionPathVert, NlaStrip, NlaStrips, NlaTrack, NlaTracks, Node, NodeLink, NodeLinks, NodeSocket, ObjectBase, ObjectConstraints, ObjectModifiers, Operator, OperatorProperties, OperatorTypeMacro, PackedFile, Paint, Panel, Particle, ParticleBrush, ParticleDupliWeight, ParticleEdit, ParticleHairKey, ParticleKey, ParticleSettingsTextureSlots, ParticleSystem, ParticleSystems, ParticleTarget, PointCache, PointCaches, PointDensity, Pose, PoseBone, PoseBoneConstraints, Property, PropertyGroup, PropertyGroupItem, Region, RegionView3D, RenderEngine, RenderLayer, RenderLayers, RenderPass, RenderResult, RenderSettings, SPHFluidSettings, SceneBases, SceneGameData, SceneObjects, SceneRenderLayer, Scopes, Sensor, Sequence, SequenceColorBalance, SequenceCrop, SequenceEditor, SequenceElement, SequenceProxy, SequenceTransform, ShaderNodes, ShapeKey, ShapeKeyBezierPoint, ShapeKeyCurvePoint, ShapeKeyPoint, SmokeCollSettings, SmokeDomainSettings, SmokeFlowSettings, SoftBodySettings, Space, SpaceUVEditor, Spline, SplineBezierPoints, SplinePoint, SplinePoints, Struct, TexMapping, TextBox, TextCharacterFormat, TextLine, TextMarker, TextureNodes, TextureSlot, Theme, ThemeAudioWindow, ThemeBoneColorSet, ThemeConsole, ThemeDopeSheet, ThemeFileDialog, ThemeFontStyle, ThemeGraphEditor, ThemeImageEditor, ThemeInfo, ThemeLogicEditor, ThemeNLAEditor, ThemeNodeEditor, ThemeOutliner, ThemeProperties, ThemeSequenceEditor, ThemeStyle, ThemeTextEditor, ThemeTimeline, ThemeUserInterface, ThemeUserPreferences, ThemeView3D, ThemeWidgetColors, ThemeWidgetStateColors, TimelineMarker, TimelineMarkers, Timer, ToolSettings, TransformOrientation, UILayout, UVProjector, UVTextures, UnitSettings, UnknownType, UserPreferences, UserPreferencesEdit, UserPreferencesFilePaths, UserPreferencesInput, UserPreferencesSystem, UserPreferencesView, UserSolidLight, VertexColors, VertexGroup, VertexGroupElement, VertexGroups, VoxelData, Window, WorldLighting, WorldMistSettings, WorldStarsSettings, WorldTextureSlots

**class bpy.types.bpy\_struct**

built-in base class for all classes in bpy.types.

---

**Note:** Note that bpy.types.bpy\_struct is not actually available from within blender, it only exists for the purpose of documentation.

---

**as\_pointer()**

Returns the memory address which holds a pointer to blenders internal data

**Returns** int (memory address).

**Return type** int

---

**Note:** This is intended only for advanced script writers who need to pass blender data to their own C/Python modules.

---

Undocumented ([contribute](#))

Undocumented ([contribute](#))

**driver\_add** (path, index=-1)

Adds driver(s) to the given property

**Parameters**

- **path** (string) – path to the property to drive, analogous to the fcurve's data path.
- **index** (int) – array index of the property drive. Defaults to -1 for all indices or a single channel if the property is not an array.

**Returns** The driver(s) added.

**Return type** [FCurve](#) or list if index is -1 with an array property.

**driver\_remove** (path, index=-1)

Remove driver(s) from the given property

**Parameters**

- **path** (string) – path to the property to drive, analogous to the fcurve's data path.
- **index** (int) – array index of the property drive. Defaults to -1 for all indices or a single channel if the property is not an array.

**Returns** Success of driver removal.

**Return type** boolean

**get** (key, default=None)

Returns the value of the custom property assigned to key or default when not found (matches pythons dictionary function of the same name).

**Parameters**

- **key** (string) – The key assosiated with the custom property.
- **default** (Undefined) – Optional argument for the value to return if *key* is not found.

---

**Note:** Only [ID](#), [Bone](#) and [PoseBone](#) classes support custom properties.

---

**is\_property\_hidden** (property)

Check if a property is hidden.

**Returns** True when the property is hidden.

**Return type** boolean

**is\_property\_set** (property)

Check if a property is set, use for testing operator properties.

**Returns** True when the property has been set.

**Return type** boolean

**items()**

Returns the items of this objects custom properties (matches pythons dictionary function of the same name).

**Returns** custom property key, value pairs.

**Return type** list of key, value tuples

---

**Note:** Only [ID](#), [Bone](#) and [PoseBone](#) classes support custom properties.

---

**keyframe\_delete (data\_path, index=-1, frame=bpy.context.scene.frame\_current, group="")**

Remove a keyframe from this properties fcurve.

**Parameters**

- **data\_path** (*string*) – path to the property to remove a key, analogous to the fcurve's data path.
- **index** (*int*) – array index of the property to remove a key. Defaults to -1 removing all indices or a single channel if the property is not an array.
- **frame** (*float*) – The frame on which the keyframe is deleted, defaulting to the current frame.
- **group** (*str*) – The name of the group the F-Curve should be added to if it doesn't exist yet.

**Returns** Success of keyframe deletion.

**Return type** boolean

**keyframe\_insert (data\_path, index=-1, frame=bpy.context.scene.frame\_current, group="")**

Insert a keyframe on the property given, adding fcurves and animation data when necessary.

**Parameters**

- **data\_path** (*string*) – path to the property to key, analogous to the fcurve's data path.
- **index** (*int*) – array index of the property to key. Defaults to -1 which will key all indices or a single channel if the property is not an array.
- **frame** (*float*) – The frame on which the keyframe is inserted, defaulting to the current frame.
- **group** (*str*) – The name of the group the F-Curve should be added to if it doesn't exist yet.

**Returns** Success of keyframe insertion.

**Return type** boolean

This is the most simple example of inserting a keyframe from python.

```
import bpy

obj = bpy.context.object

# set the keyframe at frame 1
obj.location = 3.0, 4.0, 10.0
obj.keyframe_insert(data_path="location", frame=1)
```

Note that when keying data paths which contain nested properties this must be done from the [ID](#) subclass, in this case the [Armature](#) rather then the bone.

```
import bpy
from bpy.props import PointerProperty

# define a nested property
class MyPropGroup(bpy.types.PropertyGroup):
    nested = bpy.props.FloatProperty(name="Nested", default=0.0)

# register it so its available for all bones
bpy.utils.register_class(MyPropGroup)
bpy.types.Bone.my_prop = PointerProperty(type=MyPropGroup,
   name="MyProp")

# get a bone
obj = bpy.data.objects["Armature"]
arm = obj.data

# set the keyframe at frame 1
arm.bones["Bone"].my_prop_group.nested = 10
arm.keyframe_insert(data_path='bones["Bone"].my_prop.nested',
                     frame=1,
                     group="Nested Group")
```

**keys()**

Returns the keys of this objects custom properties (matches pythons dictionary function of the same name).

**Returns** custom property keys.

**Return type** list of strings

---

**Note:** Only `ID`, `Bone` and `PoseBone` classes support custom properties.

---

**path\_from\_id(property="")**

Returns the data path from the ID to this object (string).

**Parameters** `property (string)` – Optional property name which can be used if the path is to a property of this object.

**Returns** The path from `bpy_struct.id_data` to this struct and property (when given).

**Return type** str

**path\_resolve(path, coerce=True)**

Returns the property from the path, raise an exception when not found.

**Parameters**

- `path (string)` – path which this property resolves.
- `coerce (boolean)` – optional argument, when True, the property will be converted into its python representation.

**type\_recast()**

Return a new instance, this is needed because types such as textures can be changed at runtime.

**Returns** a new instance of this object with the type initialized again.

**Return type** subclass of `bpy_struct`

**values()**

Returns the values of this objects custom properties (matches pythons dictionary function of the same name).

**Returns** custom property values.

**Return type** list

---

**Note:** Only `ID`, `Bone` and `PoseBone` classes support custom properties.

---

**id\_data**

The `ID` object this datablock is from or None, (not available for all data types)

## 2.5 Utilities (bpy.utils)

This module contains utility functions specific to blender but not assosiated with blenders internal data.

`bpy.utils.blend_paths (absolute=False)`

Returns a list of paths to external files referenced by the loaded .blend file.

**Parameters** `absolute (boolean)` – When true the paths returned are made absolute.

**Returns** path list.

**Return type** list of strings

`bpy.utils.keyconfig_set (filepath)`

`bpy.utils.load_scripts (reload_scripts=False, refresh_scripts=False)`

Load scripts and run each modules register function.

**Parameters**

- `reload_scripts (bool)` – Causes all scripts to have their unregister method called before loading.
- `refresh_scripts (bool)` – only load scripts which are not already loaded as modules.

`bpy.utils.modules_from_path (path, loaded_modules)`

Load all modules in a path and return them as a list.

**Parameters**

- `path (string)` – this path is scanned for scripts and packages.
- `loaded_modules (set)` – already loaded module names, files matching these names will be ignored.

**Returns** all loaded modules.

**Return type** list

`bpy.utils.preset_find (name, preset_path, display_name=False)`

`bpy.utils.preset_paths (subdir)`

Returns a list of paths for a specific preset.

**Parameters** `subdir (string)` – preset subdirectory (must not be an absolute path).

**Returns** script paths.

**Return type** list

```
bpy.utils.refresh_script_paths()
```

Run this after creating new script paths to update sys.path

```
bpy.utils.register_class(cls)
```

Register a subclass of a blender type in (`bpy.types.Panel`, `bpy.types.Menu`, `bpy.types.Header`, `bpy.types.Operator`, `bpy.types.KeyingSetInfo`, `bpy.types.RenderEngine`).

If the class has a `register` class method it will be called before registration.

---

**Note:** `ValueError` exception is raised if the class is not a subclass of a registerable blender class.

---

```
bpy.utils.register_module(module, verbose=False)
```

```
bpy.utils.resource_path(type, major=2, minor=57)
```

Return the base path for storing system files.

#### Parameters

- **type** (*string*) – string in [‘USER’, ‘LOCAL’, ‘SYSTEM’].
- **major** (*int*) – major version, defaults to current.
- **minor** (*string*) – minor version, defaults to current.

**Returns** the resource path (not necessarily existing).

#### Return type

```
bpy.utils.script_paths(subdir=None, user_pref=True, all=False)
```

Returns a list of valid script paths.

#### Parameters

- **subdir** (*string*) – Optional subdir.
- **user\_pref** (*bool*) – Include the user preference script path.
- **all** (*bool*) – Include local, user and system paths rather just the paths blender uses.

**Returns** script paths.

#### Return type

```
bpy.utils.smpte_from_frame(frame, fps=None, fps_base=None)
```

Returns an SMPTE formatted string from the frame: “HH:MM:SS:FF”.

If *fps* and *fps\_base* are not given the current scene is used.

```
bpy.utils.smpte_from_seconds(time, fps=None)
```

Returns an SMPTE formatted string from the time in seconds: “HH:MM:SS:FF”.

If the *fps* is not given the current scene is used.

```
bpy.utils.unregister_class(cls)
```

Unload the python class from blender.

If the class has an `unregister` class method it will be called before unregistering.

```
bpy.utils.unregister_module(module, verbose=False)
```

```
bpy.utils.user_resource(type, path='', create=False)
```

Return a user resource path (normally from the users home directory).

#### Parameters

- **type** (*string*) – Resource type in [‘DATAFILES’, ‘CONFIG’, ‘SCRIPTS’, ‘AUTOSAVE’].

- **subdir** (*string*) – Optional subdirectory.
- **create** (*boolean*) – Treat the path as a directory and create it if its not existing.

**Returns** a path.

**Return type** string

```
bpy.utils.user_script_path()
```

## 2.6 Path Utilities (bpy.path)

This module has a similar scope to os.path, containing utility functions for dealing with paths in Blender.

```
bpy.path.abspath(path, start=None)
```

Returns the absolute path relative to the current blend file using the “//” prefix.

**Parameters** **start** (*string*) – Relative to this path, when not set the current filename is used.

```
bpy.path.basename(path)
```

Equivalent to os.path.basename, but skips a “//” suffix.

Use for Windows compatibility.

```
bpy.path.clean_name(name, replace='_')
```

**Returns a name with characters replaced that** may cause problems under various circumstances, such as writing to a file. All characters besides A-Z/a-z, 0-9 are replaced with “\_” or the replace argument if defined.

```
bpy.path.display_name(name)
```

Creates a display string from name to be used menus and the user interface. Capitalize the first letter in all lowercase names, mixed case names are kept as is. Intended for use with filenames and module names.

```
bpy.path.display_name_from_filepath(name)
```

Returns the path stripped of directory and extension, ensured to be utf8 compatible.

```
bpy.path.ensure_ext(filepath, ext, case_sensitive=False)
```

Return the path with the extension added if it is not already set.

**Parameters**

- **ext** (*string*) – The extension to check for.
- **case\_sensitive** (*bool*) – Check for matching case when comparing extensions.

```
bpy.path.is_subdir(path, directory)
```

Returns true if *path* in a subdirectory of *directory*. Both paths must be absolute.

```
bpy.path.module_names(path, recursive=False)
```

Return a list of modules which can be imported from *path*.

**Parameters**

- **path** (*string*) – a directory to scan.
- **recursive** (*bool*) – Also return submodule names for packages.

**Returns** a list of string pairs (module\_name, module\_file).

**Return type** list

```
bpy.path.relpwd(path, start=None)
```

Returns the path relative to the current blend file using the “//” prefix.

**Parameters** `start` (*string*) – Relative to this path, when not set the current filename is used.

`bpy.path.resolve_ncase` (*path*)

Resolve a case insensitive path on a case sensitive system, returning a string with the path if found else return the original path.

## 2.7 Application Data (bpy.app)

This module contains application values that remain unchanged during runtime.

`bpy.app.debug`

Boolean, set when blender is running in debug mode (started with -d)

`bpy.app.debug_value`

Int, number which can be set to non-zero values for testing purposes.

`bpy.app.driver_namespace`

Dictionary for drivers namespace, editable in-place, reset on file load (read-only)

`bpy.app.tempdir`

String, the temp directory used by blender (read-only)

`bpy.app.background`

Boolean, True when blender is running without a user interface (started with -b)

`bpy.app.binary_path`

The location of blenders executable, useful for utilities that spawn new instances

`bpy.app.build_cflags`

C compiler flags

`bpy.app.build_cxxflags`

C++ compiler flags

`bpy.app.build_date`

The date this blender instance was built

`bpy.app.build_linkflags`

Binary linking flags

`bpy.app.build_platform`

The platform this blender instance was built for

`bpy.app.build_revision`

The subversion revision this blender instance was built with

`bpy.app.build_system`

Build system used

`bpy.app.build_time`

The time this blender instance was built

`bpy.app.build_type`

The type of build (Release, Debug)

`bpy.app.handlers`

Application handler callbacks

`bpy.app.version`

The Blender version as a tuple of 3 numbers. eg. (2, 50, 11)

bpy.app.version\_char

The Blender version character (for minor releases)

bpy.app.version\_cycle

The release status of this build alpha/beta/rc/release

bpy.app.version\_string

The Blender version formatted as a string

T.count(value) -> integer – return number of occurrences of value

T.index(value, [start, [stop]]) -> integer – return first index of value. Raises ValueError if the value is not present.

## 2.8 Property Definitions (bpy.props)

This module defines properties to extend blenders internal data, the result of these functions is used to assign properties to classes registered with blender and can't be used directly.

### 2.8.1 Assigning to Existing Classes

Custom properties can be added to any subclass of an ID, Bone and PoseBone.

These properties can be animated, accessed by the user interface and python like blenders existing properties.

```
import bpy

# Assign a custom property to an existing type.
bpy.types.Material.custom_float = bpy.props.FloatProperty(name="Test Prob")

# Test the property is there.
bpy.data.materials[0].custom_float = 5.0
```

### 2.8.2 Operator Example

A common use of custom properties is for python based Operator classes.

```
import bpy

class DialogOperator(bpy.types.Operator):
    bl_idname = "object.dialog_operator"
    bl_label = "Property Example"

    my_float = bpy.props.FloatProperty(name="Some Floating Point")
    my_bool = bpy.props.BoolProperty(name="Toggle Option")
    my_string = bpy.props.StringProperty(name="String Value")

    def execute(self, context):
        print("Dialog Runs")
        return {'FINISHED'}

    def invoke(self, context, event):
        wm = context.window_manager
        return wm.invoke_props_dialog(self)
```

```
bpy.utils.register_class(DialogOperator)

# test call
bpy.ops.object.dialog_operator('INVOKE_DEFAULT')
```

### 2.8.3 PropertyGroup Example

PropertyGroups can be used for collecting custom settings into one value to avoid many individual settings mixed in together.

```
import bpy

class MaterialSettings(bpy.types.PropertyGroup):
    my_int = bpy.props.IntProperty()
    my_float = bpy.props.FloatProperty()
    my_string = bpy.props.StringProperty()

bpy.utils.register_class(MaterialSettings)

bpy.types.Material.my_settings = \
    bpy.props.PointerProperty(type=MaterialSettings)

# test the new settings work
material = bpy.data.materials[0]

material.my_settings.my_int = 5
material.my_settings.my_float = 3.0
material.my_settings.my_string = "Foo"
```

### 2.8.4 Collection Example

Custom properties can be added to any subclass of an ID, Bone and PoseBone.

```
import bpy

# Assign a collection
class SceneSettingItem(bpy.types.PropertyGroup):
    name = bpy.props.StringProperty(name="Test Prop", default="Unknown")
    value = bpy.props.IntProperty(name="Test Prop", default=22)

bpy.utils.register_class(SceneSettingItem)

bpy.types.Scene.my_settings = \
    bpy.props.CollectionProperty(type=SceneSettingItem)

# Assume an armature object selected
print("Adding 3 values!")

my_item = bpy.context.scene.my_settings.add()
my_item.name = "Spam"
my_item.value = 1000

my_item = bpy.context.scene.my_settings.add()
```

```
my_item.name = "Eggs"
my_item.value = 30

for my_item in bpy.context.scene.my_settings:
    print(my_item.name, my_item.value)
```

## 2.8.5 Update Example

It can be useful to perform an action when a property is changed and can be used to update other properties or synchronize with external data.

All properties define update functions except for CollectionProperty.

```
import bpy
```

```
def update_func(self, context):
    print("my test function", self)

bpy.types.Scene.testprop = bpy.props.FloatProperty(update=update_func)

bpy.context.scene.testprop = 11.0

# >>> my test function <bpy_struct, Scene("Scene")>

bpy.props.BoolProperty(name="", description="", default=False, options={'ANIMATABLE'}, subtype='NONE', update=None)
>Returns a new boolean property definition.
```

### Parameters

- **name** (*string*) – Name used in the user interface.
- **description** (*string*) – Text used for the tooltip and api documentation.
- **options** (*set*) – Enumerator in [‘HIDDEN’, ‘SKIP\_SAVE’, ‘ANIMATABLE’].
- **subtype** (*string*) – Enumerator in [‘UNSIGNED’, ‘PERCENTAGE’, ‘FACTOR’, ‘ANGLE’, ‘TIME’, ‘DISTANCE’, ‘NONE’].
- **update** (*function*) – function to be called when this value is modified, This function must take 2 values (self, context) and return None.

```
bpy.props.BoolVectorProperty(name="", description="", default=(False, False, False),
                             options={'ANIMATABLE'}, subtype='NONE', size=3, update=None)
>Returns a new vector boolean property definition.
```

### Parameters

- **name** (*string*) – Name used in the user interface.
- **description** (*string*) – Text used for the tooltip and api documentation.
- **default** (*sequence*) – sequence of booleans the length of *size*.
- **options** (*set*) – Enumerator in [‘HIDDEN’, ‘SKIP\_SAVE’, ‘ANIMATABLE’].
- **subtype** (*string*) – Enumerator in [‘COLOR’, ‘TRANSLATION’, ‘DIRECTION’, ‘VELOCITY’, ‘ACCELERATION’, ‘MATRIX’, ‘EULER’, ‘QUATERNION’, ‘AXISANGLE’, ‘XYZ’, ‘COLOR\_GAMMA’, ‘LAYER’, ‘NONE’].

- **size** (*int*) – Vector dimensions in [1, and 32].
- **update** (*function*) – function to be called when this value is modified, This function must take 2 values (self, context) and return None.

```
bpy.props.CollectionProperty(items, type=""", description=""""", default=""""", op-  
tions={'ANIMTABLE'})
```

Returns a new collection property definition.

#### Parameters

- **type** (*class*) – A subclass of `bpy.types.PropertyGroup`.
- **name** (*string*) – Name used in the user interface.
- **description** (*string*) – Text used for the tooltip and api documentation.
- **options** (*set*) – Enumerator in ['HIDDEN', 'SKIP\_SAVE', 'ANIMTABLE'].

```
bpy.props.EnumProperty(items, name=""""", description=""""", default=""""", options={'ANIMTABLE'},  
update=None)
```

Returns a new enumerator property definition.

#### Parameters

- **name** (*string*) – Name used in the user interface.
- **description** (*string*) – Text used for the tooltip and api documentation.
- **default** (*string or set*) – The default value for this enum, A string when *ENUM\_FLAG* is disabled otherwise a set which may only contain string identifiers used in *items*.
- **options** (*set*) – Enumerator in ['HIDDEN', 'SKIP\_SAVE', 'ANIMTABLE', 'ENUM\_FLAG'].
- **items** (*sequence of string triplets or a function*) – sequence of enum items formatted: [(identifier, name, description), ...] where the identifier is used for python access and other values are used for the interface. For dynamic values a callback can be passed which returns a list in the same format as the static list. This function must take 2 arguments (self, context)
- **update** (*function*) – function to be called when this value is modified, This function must take 2 values (self, context) and return None.

```
bpy.props.FloatProperty(name=""""", description=""""", default=0.0, min=sys.float_info.min,  
max=sys.float_info.max, soft_min=sys.float_info.min,  
soft_max=sys.float_info.max, step=3, precision=2, op-  
tions={'ANIMTABLE'}, subtype='NONE', unit='NONE', update=None)
```

Returns a new float property definition.

#### Parameters

- **name** (*string*) – Name used in the user interface.
- **description** (*string*) – Text used for the tooltip and api documentation.
- **options** (*set*) – Enumerator in ['HIDDEN', 'SKIP\_SAVE', 'ANIMTABLE'].
- **subtype** (*string*) – Enumerator in ['UNSIGNED', 'PERCENTAGE', 'FACTOR', 'ANGLE', 'TIME', 'DISTANCE', 'NONE'].
- **unit** (*string*) – Enumerator in ['NONE', 'LENGTH', 'AREA', 'VOLUME', 'ROTATION', 'TIME', 'VELOCITY', 'ACCELERATION'].
- **update** (*function*) – function to be called when this value is modified, This function must take 2 values (self, context) and return None.

```
bpy.props.FloatVectorProperty(name="", description="", default=(0.0, 0.0, 0.0),
                               min=sys.float_info.min, max=sys.float_info.max,
                               soft_min=sys.float_info.min, soft_max=sys.float_info.max,
                               step=3, precision=2, options={'ANIMATABLE'}, subtype='NONE', size=3, update=None)
```

Returns a new vector float property definition.

#### Parameters

- **name** (*string*) – Name used in the user interface.
- **description** (*string*) – Text used for the tooltip and api documentation.
- **default** (*sequence*) – sequence of floats the length of *size*.
- **options** (*set*) – Enumerator in ['HIDDEN', 'SKIP\_SAVE', 'ANIMATABLE'].
- **subtype** (*string*) – Enumerator in ['COLOR', 'TRANSLATION', 'DIRECTION', 'VELOCITY', 'ACCELERATION', 'MATRIX', 'EULER', 'QUATERNION', 'AXISANGLE', 'XYZ', 'COLOR\_GAMMA', 'LAYER', 'NONE'].
- **unit** (*string*) – Enumerator in ['NONE', 'LENGTH', 'AREA', 'VOLUME', 'ROTATION', 'TIME', 'VELOCITY', 'ACCELERATION'].
- **size** (*int*) – Vector dimensions in [1, and 32].
- **update** (*function*) – function to be called when this value is modified, This function must take 2 values (self, context) and return None.

```
bpy.props.IntProperty(name="", description="", default=0, min=-sys.maxint, max=sys.maxint,
                      soft_min=-sys.maxint, soft_max=sys.maxint, step=1, options={'ANIMATABLE'}, subtype='NONE', update=None)
```

Returns a new int property definition.

#### Parameters

- **name** (*string*) – Name used in the user interface.
- **description** (*string*) – Text used for the tooltip and api documentation.
- **options** (*set*) – Enumerator in ['HIDDEN', 'SKIP\_SAVE', 'ANIMATABLE'].
- **subtype** (*string*) – Enumerator in ['UNSIGNED', 'PERCENTAGE', 'FACTOR', 'ANGLE', 'TIME', 'DISTANCE', 'NONE'].
- **update** (*function*) – function to be called when this value is modified, This function must take 2 values (self, context) and return None.

```
bpy.props.IntVectorProperty(name="", description="", default=(0, 0, 0), min=-sys.maxint,
                             max=sys.maxint, soft_min=-sys.maxint, soft_max=sys.maxint, options={'ANIMATABLE'}, subtype='NONE', size=3, update=None)
```

Returns a new vector int property definition.

#### Parameters

- **name** (*string*) – Name used in the user interface.
- **description** (*string*) – Text used for the tooltip and api documentation.
- **default** (*sequence*) – sequence of ints the length of *size*.
- **options** (*set*) – Enumerator in ['HIDDEN', 'SKIP\_SAVE', 'ANIMATABLE'].
- **subtype** (*string*) – Enumerator in ['COLOR', 'TRANSLATION', 'DIRECTION', 'VELOCITY', 'ACCELERATION', 'MATRIX', 'EULER', 'QUATERNION', 'AXISANGLE', 'XYZ', 'COLOR\_GAMMA', 'LAYER', 'NONE'].

- **size** (*int*) – Vector dimensions in [1, and 32].
- **update** (*function*) – function to be called when this value is modified, This function must take 2 values (self, context) and return None.

`bpy.props.PointerProperty(type=""", description=""", options={'ANIMTABLE'}, update=None)`  
Returns a new pointer property definition.

#### Parameters

- **type** (*class*) – A subclass of `bpy.types.PropertyGroup`.
- **name** (*string*) – Name used in the user interface.
- **description** (*string*) – Text used for the tooltip and api documentation.
- **options** (*set*) – Enumerator in ['HIDDEN', 'SKIP\_SAVE', 'ANIMTABLE'].
- **update** (*function*) – function to be called when this value is modified, This function must take 2 values (self, context) and return None.

`bpy.props.RemoveProperty(attr)`  
Removes a dynamically defined property.

#### Parameters **attr** (*string*) – Property name.

`bpy.props.StringProperty(name=""", description=""", default=""", maxlen=0, options={'ANIMTABLE'}, subtype='NONE', update=None)`  
Returns a new string property definition.

#### Parameters

- **name** (*string*) – Name used in the user interface.
- **description** (*string*) – Text used for the tooltip and api documentation.
- **options** (*set*) – Enumerator in ['HIDDEN', 'SKIP\_SAVE', 'ANIMTABLE'].
- **subtype** (*string*) – Enumerator in ['FILE\_PATH', 'DIR\_PATH', 'FILENAME', 'NONE'].
- **update** (*function*) – function to be called when this value is modified, This function must take 2 values (self, context) and return None.



# STANDALONE MODULES

## 3.1 Math Types & Utilities (mathutils)

This module provides access to matrices, eulers, quaternions and vectors.

```
import mathutils
from math import radians

vec = mathutils.Vector((1.0, 2.0, 3.0))

mat_rot = mathutils.Matrix.Rotation(radians(90.0), 4, 'X')
mat_trans = mathutils.Matrix.Translation(vec)

mat = mat_trans * mat_rot
mat.invert()

mat3 = mat.to_3x3()
quat1 = mat.to_quaternion()
quat2 = mat3.to_quaternion()

quat_diff = quat1.rotation_difference(quat2)

print(quat_diff.angle)
```

### class mathutils.Color

This object gives access to Colors in Blender.

#### copy()

Returns a copy of this color.

**Returns** A copy of the color.

**Return type** Color

---

**Note:** use this to get a copy of a wrapped color with no reference to the original data.

---

#### b

Blue color channel.

**Type** float

#### g

Green color channel.

**Type** float

**h**  
HSV Hue component in [0, 1].

**Type** float

**hsv**  
HSV Values in [0, 1].

**Type** float triplet

**is\_wrapped**  
True when this object wraps external data (readonly).

**Type** boolean

**owner**  
The item this is wrapping or None (readonly).

**r**  
Red color channel.

**Type** float

**s**  
HSV Saturation component in [0, 1].

**Type** float

**v**  
HSV Value component in [0, 1].

**Type** float

---

**class** `mathutils.Euler`

This object gives access to Eulers in Blender.

```
import mathutils

# todo
```

**copy()**  
Returns a copy of this euler.

**Returns** A copy of the euler.

**Return type** `Euler`

---

**Note:** use this to get a copy of a wrapped euler with no reference to the original data.

---

**make\_compatible(other)**  
Make this euler compatible with another, so interpolating between them works as intended.

---

**Note:** the rotation order is not taken into account for this function.

---

**rotate(other)**  
Rotates the euler a by another mathutils value.

**Parameters** `other` (`Euler`, `Quaternion` or `Matrix`) – rotation component of mathutils value

**rotate\_axis**(axis, angle)

Rotates the euler a certain amount and returning a unique euler rotation (no 720 degree pitches).

**Parameters**

- **axis** (*string*) – single character in [‘X’, ‘Y’, ‘Z’].
- **angle** (*float*) – angle in radians.

**to\_matrix()**

Return a matrix representation of the euler.

**Returns** A 3x3 roation matrix representation of the euler.

**Return type** `Matrix`

**to\_quaternion()**

Return a quaternion representation of the euler.

**Returns** Quaternion representation of the euler.

**Return type** `Quaternion`

**zero()**

Set all values to zero.

**is\_wrapped**

True when this object wraps external data (readonly).

**Type** boolean

**order**

Euler rotation order.

**Type** string in [‘XYZ’, ‘XZY’, ‘YXZ’, ‘YZX’, ‘ZXY’, ‘ZYX’]

**owner**

The item this is wrapping or None (readonly).

**x**

Euler X axis in radians.

**Type** float

**y**

Euler Y axis in radians.

**Type** float

**z**

Euler Z axis in radians.

**Type** float

**class** `mathutils.Matrix`

This object gives access to Matrices in Blender.

```
import mathutils
```

```
# todo
```

**classmethod OrthoProjection**(axis, size)

Create a matrix to represent an orthographic projection.

**Parameters**

- **axis** (string or `Vector`) – Can be any of the following: ['X', 'Y', 'XY', 'XZ', 'YZ'], where a single axis is for a 2D matrix. Or a vector for an arbitrary axis
- **size** (*int*) – The size of the projection matrix to construct [2, 4].

**Returns** A new projection matrix.

**Return type** `Matrix`

**classmethod Rotation** (*angle, size, axis*)

Create a matrix representing a rotation.

**Parameters**

- **angle** (*float*) – The angle of rotation desired, in radians.
- **size** (*int*) – The size of the rotation matrix to construct [2, 4].
- **axis** (string or `Vector`) – a string in ['X', 'Y', 'Z'] or a 3D Vector Object (optional when size is 2).

**Returns** A new rotation matrix.

**Return type** `Matrix`

**classmethod Scale** (*factor, size, axis*)

Create a matrix representing a scaling.

**Parameters**

- **factor** (*float*) – The factor of scaling to apply.
- **size** (*int*) – The size of the scale matrix to construct [2, 4].
- **axis** (`Vector`) – Direction to influence scale. (optional).

**Returns** A new scale matrix.

**Return type** `Matrix`

**classmethod Shear** (*plane, size, factor*)

Create a matrix to represent an shear transformation.

**Parameters**

- **plane** (string) – Can be any of the following: ['X', 'Y', 'XY', 'XZ', 'YZ'], where a single axis is for a 2D matrix only.
- **size** (*int*) – The size of the shear matrix to construct [2, 4].
- **factor** (*float or float pair*) – The factor of shear to apply. For a 3 or 4 *size* matrix pass a pair of floats corrasponding with the *plane* axis.

**Returns** A new shear matrix.

**Return type** `Matrix`

**classmethod Translation** (*vector*)

Create a matrix representing a translation.

**Parameters** **vector** (`Vector`) – The translation vector.

**Returns** An identity matrix with a translation.

**Return type** `Matrix`

**copy** ()

Returns a copy of this matrix.

**Returns** an instance of itself

**Return type** `Matrix`

**decompose()**

Return the location, rotation and scale components of this matrix.

**Returns** loc, rot, scale triple.

**Return type** (`Vector`, `Quaternion`, `Vector`)

**determinant()**

Return the determinant of a matrix.

**Returns** Return a the determinant of a matrix.

**Return type** float

**See Also:**

<<http://en.wikipedia.org/wiki/Determinant>>

**identity()**

Set the matrix to the identity matrix.

---

**Note:** An object with zero location and rotation, a scale of one, will have an identity matrix.

---

**See Also:**

<[http://en.wikipedia.org/wiki/Identity\\_matrix](http://en.wikipedia.org/wiki/Identity_matrix)>

**invert()**

Set the matrix to its inverse.

**See Also:**

<[http://en.wikipedia.org/wiki/Inverse\\_matrix](http://en.wikipedia.org/wiki/Inverse_matrix)>

**inverted()**

Return an inverted copy of the matrix.

**Returns** the inverted matrix.

**Return type** `Matrix`

**lerp(other, factor)**

Returns the interpolation of two matrices.

**Parameters**

- **other** (`Matrix`) – value to interpolate with.
- **factor** (`float`) – The interpolation value in [0.0, 1.0].

**Returns** The interpolated rotation.

**Return type** `Matrix`

**resize\_4x4()**

Resize the matrix to 4x4.

**rotate(other)**

Rotates the matrix a by another mathutils value.

**Parameters** **other** (`Euler`, `Quaternion` or `Matrix`) – rotation component of mathutils value

---

**Note:** If any of the columns are not unit length this may not have desired results.

---

**to\_3x3()**

Return a 3x3 copy of this matrix.

**Returns** a new matrix.

**Return type** `Matrix`

**to\_4x4()**

Return a 4x4 copy of this matrix.

**Returns** a new matrix.

**Return type** `Matrix`

**to\_euler(*order*, *euler\_compat*)**

Return an Euler representation of the rotation matrix (3x3 or 4x4 matrix only).

**Parameters**

- **order** (`string`) – Optional rotation order argument in ['XYZ', 'XZY', 'YXZ', 'YZX', 'ZXY', 'ZYX'].
- **euler\_compat** (`Euler`) – Optional euler argument the new euler will be made compatible with (no axis flipping between them). Useful for converting a series of matrices to animation curves.

**Returns** Euler representation of the matrix.

**Return type** `Euler`

**to\_quaternion()**

Return a quaternion representation of the rotation matrix.

**Returns** Quaternion representation of the rotation matrix.

**Return type** `Quaternion`

**to\_scale()**

Return a the scale part of a 3x3 or 4x4 matrix.

**Returns** Return a the scale of a matrix.

**Return type** `Vector`

---

**Note:** This method does not return negative a scale on any axis because it is not possible to obtain this data from the matrix alone.

---

**to\_translation()**

Return a the translation part of a 4 row matrix.

**Returns** Return a the translation of a matrix.

**Return type** `Vector`

**transpose()**

Set the matrix to its transpose.

**See Also:**

[<http://en.wikipedia.org/wiki/Transpose>](http://en.wikipedia.org/wiki/Transpose)

**transposed()**

Return a new, transposed matrix.

**Returns** a transposed matrix

**Return type** `Matrix`

**zero()**

Set all the matrix values to zero.

**Returns** an instance of itself

**Return type** `Matrix`

**col\_size**

The column size of the matrix (readonly).

**Type** int

**is\_negative**

True if this matrix results in a negative scale, 3x3 and 4x4 only, (readonly).

**Type** bool

**is\_orthogonal**

True if this matrix is orthogonal, 3x3 and 4x4 only, (readonly).

**Type** bool

**is\_wrapped**

True when this object wraps external data (readonly).

**Type** boolean

**median\_scale**

The average scale applied to each axis (readonly).

**Type** float

**owner**

The item this is wrapping or None (readonly).

**row\_size**

The row size of the matrix (readonly).

**Type** int

**class mathutils.Quaternion**

This object gives access to Quaternions in Blender.

```
import mathutils
```

```
# todo
```

**conjugate()**

Set the quaternion to its conjugate (negate x, y, z).

**conjugated()**

Return a new conjugated quaternion.

**Returns** a new quaternion.

**Return type** `Quaternion`

**copy()**

Returns a copy of this quaternion.

**Returns** A copy of the quaternion.

**Return type** [Quaternion](#)

---

**Note:** use this to get a copy of a wrapped quaternion with no reference to the original data.

---

**cross (other)**

Return the cross product of this quaternion and another.

**Parameters** **other** ([Quaternion](#)) – The other quaternion to perform the cross product with.

**Returns** The cross product.

**Return type** [Quaternion](#)

**dot (other)**

Return the dot product of this quaternion and another.

**Parameters** **other** ([Quaternion](#)) – The other quaternion to perform the dot product with.

**Returns** The dot product.

**Return type** [Quaternion](#)

**identity ()**

Set the quaternion to an identity quaternion.

**Returns** an instance of itself.

**Return type** [Quaternion](#)

**invert ()**

Set the quaternion to its inverse.

**inverted ()**

Return a new, inverted quaternion.

**Returns** the inverted value.

**Return type** [Quaternion](#)

**negate ()**

Set the quaternion to its negative.

**Returns** an instance of itself.

**Return type** [Quaternion](#)

**normalize ()**

Normalize the quaternion.

**normalized ()**

Return a new normalized quaternion.

**Returns** a normalized copy.

**Return type** [Quaternion](#)

**rotate (other)**

Rotates the quaternion a by another mathutils value.

**Parameters** **other** ([Euler](#), [Quaternion](#) or [Matrix](#)) – rotation component of mathutils value

**difference (other)**

Returns a quaternion representing the rotational difference.

**Parameters** `other` (`Quaternion`) – second quaternion.

**Returns** the rotational difference between the two quat rotations.

**Return type** `Quaternion`

**slerp** (`other, factor`)

Returns the interpolation of two quaternions.

**Parameters**

- `other` (`Quaternion`) – value to interpolate with.
- `factor` (`float`) – The interpolation value in [0.0, 1.0].

**Returns** The interpolated rotation.

**Return type** `Quaternion`

**to\_euler** (`order, euler_compat`)

Return Euler representation of the quaternion.

**Parameters**

- `order` (`string`) – Optional rotation order argument in ['XYZ', 'XZY', 'YXZ', 'YZX', 'ZXY', 'ZYX'].
- `euler_compat` (`Euler`) – Optional euler argument the new euler will be made compatible with (no axis flipping between them). Useful for converting a series of matrices to animation curves.

**Returns** Euler representation of the quaternion.

**Return type** `Euler`

**to\_matrix()**

Return a matrix representation of the quaternion.

**Returns** A 3x3 rotation matrix representation of the quaternion.

**Return type** `Matrix`

**angle**

angle of the quaternion.

**Type** `float`

**axis**

quaternion axis as a vector.

**Type** `Vector`

**is\_wrapped**

True when this object wraps external data (readonly).

**Type** `boolean`

**magnitude**

Size of the quaternion (readonly).

**Type** `float`

**owner**

The item this is wrapping or None (readonly).

**w**

Quaternion W value.

**Type** float

**x**

Quaternion X axis.

**Type** float

**y**

Quaternion Y axis.

**Type** float

**z**

Quaternion Z axis.

**Type** float

**class mathutils.Vector**

This object gives access to Vectors in Blender.

```
import mathutils

# zero length vector
vec = mathutils.Vector((0.0, 0.0, 1.0))

# unit length vector
vec_a = vec.copy().normalize()

vec_b = mathutils.Vector((0.0, 1.0, 2.0))

vec2d = mathutils.Vector((1.0, 2.0))
vec3d = mathutils.Vector((1.0, 0.0, 0.0))
vec4d = vec_a.to_4d()

# other mathutils types
quat = mathutils.Quaternion()
matrix = mathutils.Matrix()

# Comparison operators can be done on Vector classes:

# greater and less then test vector length.
vec_a > vec_b
vec_a >= vec_b
vec_a < vec_b
vec_a <= vec_b

# ==, != test vector values e.g. 1,2,3 != 3,2,1 even if they are the same length
vec_a == vec_b
vec_a != vec_b

# Math can be performed on Vector classes
vec_a + vec_b
vec_a - vec_b
vec_a * vec_b
vec_a * 10.0
matrix * vec_a
quat * vec_a
vec_a * vec_b
-vec_a
```

```
# You can access a vector object like a sequence
x = vec_a[0]
len(vec)
vec_a[:] = vec_b
vec_a[:] = 1.0, 2.0, 3.0
vec2d[:] = vec3d[:2]

# Vectors support 'swizzle' operations
# See http://en.wikipedia.org/wiki/Swizzling_(computer_graphics)
vec.xyz = vec.zyx
vec.xy = vec4d.zw
vec.xyz = vec4d.wzz
vec4d.wxyz = vec.yxyx
```

**angle (other, fallback)**

Return the angle between two vectors.

**Parameters**

- **other** ([Vector](#)) – another vector to compare the angle with
- **fallback** (*any*) – return this value when the angle cant be calculated (zero length vector)

**Returns** angle in radians or fallback when given

**Return type** float

---

**Note:** Zero length vectors raise an `AttributeError`.

---

**copy()**

Returns a copy of this vector.

**Returns** A copy of the vector.

**Return type** [Vector](#)

---

**Note:** use this to get a copy of a wrapped vector with no reference to the original data.

---

**cross (other)**

Return the cross product of this vector and another.

**Parameters** **other** ([Vector](#)) – The other vector to perform the cross product with.

**Returns** The cross product.

**Return type** [Vector](#)

---

**Note:** both vectors must be 3D

---

**dot (other)**

Return the dot product of this vector and another.

**Parameters** **other** ([Vector](#)) – The other vector to perform the dot product with.

**Returns** The dot product.

**Return type** [Vector](#)

---

**lerp (other, factor)**

Returns the interpolation of two vectors.

**Parameters**

- **other** ([Vector](#)) – value to interpolate with.
- **factor** ([float](#)) – The interpolation value in [0.0, 1.0].

**Returns** The interpolated rotation.

**Return type** [Vector](#)

**negate ()**

Set all values to their negative.

**Returns** an instance of itself

**Return type** [Vector](#)

**normalize ()**

Normalize the vector, making the length of the vector always 1.0.

**Warning:** Normalizing a vector where all values are zero results in all axis having a nan value (not a number).

---

**Note:** Normalize works for vectors of all sizes, however 4D Vectors w axis is left untouched.

---

**normalized ()**

Return a new, normalized vector.

**Returns** a normalized copy of the vector

**Return type** [Vector](#)

**project (other)**

Return the projection of this vector onto the *other*.

**Parameters** **other** ([Vector](#)) – second vector.

**Returns** the parallel projection vector

**Return type** [Vector](#)

**reflect (mirror)**

Return the reflection vector from the *mirror* argument.

**Parameters** **mirror** ([Vector](#)) – This vector could be a normal from the reflecting surface.

**Returns** The reflected vector matching the size of this vector.

**Return type** [Vector](#)

**resize\_2d ()**

Resize the vector to 2D (x, y).

**Returns** an instance of itself

**Return type** [Vector](#)

**resize\_3d ()**

Resize the vector to 3D (x, y, z).

**Returns** an instance of itself

**Return type** [Vector](#)

**resize\_4d()**

Resize the vector to 4D (x, y, z, w).

**Returns** an instance of itself

**Return type** [Vector](#)

**rotate(*other*)**

Return vector by a rotation value.

**Parameters** *other* ([Euler](#), [Quaternion](#) or [Matrix](#)) – rotation component of `mathutils` value

**difference(*other*)**

Returns a quaternion representing the rotational difference between this vector and another.

**Parameters** *other* ([Vector](#)) – second vector.

**Returns** the rotational difference between the two vectors.

**Return type** [Quaternion](#)

---

**Note:** 2D vectors raise an `AttributeError`.

---

**to\_2d()**

Return a 2d copy of the vector.

**Returns** a new vector

**Return type** [Vector](#)

**to\_3d()**

Return a 3d copy of the vector.

**Returns** a new vector

**Return type** [Vector](#)

**to\_4d()**

Return a 4d copy of the vector.

**Returns** a new vector

**Return type** [Vector](#)

**to\_track\_quat(*track, up*)**

Return a quaternion rotation from the vector and the track and up axis.

**Parameters**

- **track** (*string*) – Track axis in ['X', 'Y', 'Z', '-X', '-Y', '-Z'].
- **up** (*string*) – Up axis in ['X', 'Y', 'Z'].

**Returns** rotation from the vector and the track and up axis.

**Return type** [Quaternion](#)

**to\_tuple(*precision=-1*)**

Return this vector as a tuple with.

**Parameters** *precision* (*int*) – The number to round the value to in [-1, 21].

**Returns** the values of the vector rounded by *precision*

**Return type** tuple

**zero()**

Set all values to zero.

**is\_wrapped**

True when this object wraps external data (readonly).

**Type** boolean

**length**

Vector Length.

**Type** float

**length\_squared**

Vector length squared ( $v \cdot v$ ).

**Type** float

**magnitude**

Vector Length.

**Type** float

**owner**

The item this is wrapping or None (readonly).

**w**

Vector W axis (4D Vectors only).

**Type** float

**ww**

Undocumented ([contribute](#))

**www**

Undocumented ([contribute](#))

**wwww**

Undocumented ([contribute](#))

**wwwx**

Undocumented ([contribute](#))

**wwwy**

Undocumented ([contribute](#))

**wwwz**

Undocumented ([contribute](#))

**wwx**

Undocumented ([contribute](#))

**wwxw**

Undocumented ([contribute](#))

**wwxx**

Undocumented ([contribute](#))

**wwxy**

Undocumented ([contribute](#))

**wwxz**

Undocumented ([contribute](#))

**wwy**  
Undocumented ([contribute](#))

**wwyw**  
Undocumented ([contribute](#))

**wwyx**  
Undocumented ([contribute](#))

**wwyy**  
Undocumented ([contribute](#))

**wwyz**  
Undocumented ([contribute](#))

**wwz**  
Undocumented ([contribute](#))

**wwzw**  
Undocumented ([contribute](#))

**wwzx**  
Undocumented ([contribute](#))

**wwzy**  
Undocumented ([contribute](#))

**wwzz**  
Undocumented ([contribute](#))

**wx**  
Undocumented ([contribute](#))

**wxw**  
Undocumented ([contribute](#))

**wxww**  
Undocumented ([contribute](#))

**wxwx**  
Undocumented ([contribute](#))

**wxwy**  
Undocumented ([contribute](#))

**wxwz**  
Undocumented ([contribute](#))

**wxx**  
Undocumented ([contribute](#))

**wxxw**  
Undocumented ([contribute](#))

**wxxx**  
Undocumented ([contribute](#))

**wxxy**  
Undocumented ([contribute](#))

**wxxz**  
Undocumented ([contribute](#))

**wxy**  
Undocumented ([contribute](#))

**wxyw**  
Undocumented ([contribute](#))

**wxyx**  
Undocumented ([contribute](#))

**wxyy**  
Undocumented ([contribute](#))

**wxyz**  
Undocumented ([contribute](#))

**wxz**  
Undocumented ([contribute](#))

**wxzw**  
Undocumented ([contribute](#))

**wxzx**  
Undocumented ([contribute](#))

**wxzy**  
Undocumented ([contribute](#))

**wxzz**  
Undocumented ([contribute](#))

**wy**  
Undocumented ([contribute](#))

**wyw**  
Undocumented ([contribute](#))

**wyww**  
Undocumented ([contribute](#))

**wywx**  
Undocumented ([contribute](#))

**wwyw**  
Undocumented ([contribute](#))

**wywz**  
Undocumented ([contribute](#))

**wyx**  
Undocumented ([contribute](#))

**wyxw**  
Undocumented ([contribute](#))

**wyxx**  
Undocumented ([contribute](#))

**wyxy**  
Undocumented ([contribute](#))

**wyxz**  
Undocumented ([contribute](#))

**wyy**  
Undocumented ([contribute](#))

**wyyw**  
Undocumented ([contribute](#))

**wyyx**  
Undocumented ([contribute](#))

**wyyy**  
Undocumented ([contribute](#))

**wyyz**  
Undocumented ([contribute](#))

**wyz**  
Undocumented ([contribute](#))

**wyzw**  
Undocumented ([contribute](#))

**wyzz**  
Undocumented ([contribute](#))

**wyzy**  
Undocumented ([contribute](#))

**wyzz**  
Undocumented ([contribute](#))

**wz**  
Undocumented ([contribute](#))

**wzw**  
Undocumented ([contribute](#))

**wzww**  
Undocumented ([contribute](#))

**wzwx**  
Undocumented ([contribute](#))

**wzwy**  
Undocumented ([contribute](#))

**wzwz**  
Undocumented ([contribute](#))

**wzx**  
Undocumented ([contribute](#))

**wzxw**  
Undocumented ([contribute](#))

**wzxx**  
Undocumented ([contribute](#))

**wzxy**  
Undocumented ([contribute](#))

**wzxz**  
Undocumented ([contribute](#))

**wzy**  
Undocumented ([contribute](#))

**wzyw**  
Undocumented ([contribute](#))

**wzyx**  
Undocumented ([contribute](#))

**wzyy**  
Undocumented ([contribute](#))

**wzyz**  
Undocumented ([contribute](#))

**wzz**  
Undocumented ([contribute](#))

**wzzw**  
Undocumented ([contribute](#))

**wzzx**  
Undocumented ([contribute](#))

**wzzy**  
Undocumented ([contribute](#))

**wzzz**  
Undocumented ([contribute](#))

**x**  
Vector X axis.

**Type** float

**xw**  
Undocumented ([contribute](#))

**xww**  
Undocumented ([contribute](#))

**xwww**  
Undocumented ([contribute](#))

**xwwx**  
Undocumented ([contribute](#))

**xwwy**  
Undocumented ([contribute](#))

**xwwz**  
Undocumented ([contribute](#))

**xwx**  
Undocumented ([contribute](#))

**xwxw**  
Undocumented ([contribute](#))

**xwxz**  
Undocumented ([contribute](#))

**xwxy**  
Undocumented ([contribute](#))

**xwxz**  
Undocumented ([contribute](#))

**xwy**  
Undocumented ([contribute](#))

**xwyw**  
Undocumented ([contribute](#))

**xwyx**  
Undocumented ([contribute](#))

**xwyy**  
Undocumented ([contribute](#))

**xwyz**  
Undocumented ([contribute](#))

**xwz**  
Undocumented ([contribute](#))

**xwzw**  
Undocumented ([contribute](#))

**xwzx**  
Undocumented ([contribute](#))

**xwzy**  
Undocumented ([contribute](#))

**xwzz**  
Undocumented ([contribute](#))

**xx**  
Undocumented ([contribute](#))

**xxw**  
Undocumented ([contribute](#))

**xxww**  
Undocumented ([contribute](#))

**xxwx**  
Undocumented ([contribute](#))

**xxwy**  
Undocumented ([contribute](#))

**xxwz**  
Undocumented ([contribute](#))

**xxx**  
Undocumented ([contribute](#))

**xxxw**  
Undocumented ([contribute](#))

**xxxx**  
Undocumented ([contribute](#))

**xxxxy**  
Undocumented ([contribute](#))

**xxxxz**  
Undocumented ([contribute](#))

**xxxy**  
Undocumented ([contribute](#))

**xxyw**  
Undocumented ([contribute](#))

**xxyx**  
Undocumented ([contribute](#))

**xxyy**  
Undocumented ([contribute](#))

**xxyz**  
Undocumented ([contribute](#))

**xxz**  
Undocumented ([contribute](#))

**xxzw**  
Undocumented ([contribute](#))

**xxxxx**  
Undocumented ([contribute](#))

**xxzy**  
Undocumented ([contribute](#))

**xxzz**  
Undocumented ([contribute](#))

**xy**  
Undocumented ([contribute](#))

**xyw**  
Undocumented ([contribute](#))

**xyww**  
Undocumented ([contribute](#))

**xywx**  
Undocumented ([contribute](#))

**xywy**  
Undocumented ([contribute](#))

**xywz**  
Undocumented ([contribute](#))

**xyx**  
Undocumented ([contribute](#))

**xyxw**  
Undocumented ([contribute](#))

**xyxx**  
Undocumented ([contribute](#))

**xyxy**  
Undocumented ([contribute](#))

**$\mathbf{x}\mathbf{y}\mathbf{x}\mathbf{z}$**   
Undocumented ([contribute](#))

**$\mathbf{x}\mathbf{y}\mathbf{y}$**   
Undocumented ([contribute](#))

**$\mathbf{x}\mathbf{y}\mathbf{y}\mathbf{w}$**   
Undocumented ([contribute](#))

**$\mathbf{x}\mathbf{y}\mathbf{y}\mathbf{x}$**   
Undocumented ([contribute](#))

**$\mathbf{x}\mathbf{y}\mathbf{y}\mathbf{y}$**   
Undocumented ([contribute](#))

**$\mathbf{x}\mathbf{y}\mathbf{y}\mathbf{z}$**   
Undocumented ([contribute](#))

**$\mathbf{x}\mathbf{y}\mathbf{z}$**   
Undocumented ([contribute](#))

**$\mathbf{x}\mathbf{y}\mathbf{z}\mathbf{w}$**   
Undocumented ([contribute](#))

**$\mathbf{x}\mathbf{y}\mathbf{z}\mathbf{x}$**   
Undocumented ([contribute](#))

**$\mathbf{x}\mathbf{y}\mathbf{z}\mathbf{y}$**   
Undocumented ([contribute](#))

**$\mathbf{x}\mathbf{y}\mathbf{z}\mathbf{z}$**   
Undocumented ([contribute](#))

**$\mathbf{x}\mathbf{z}$**   
Undocumented ([contribute](#))

**$\mathbf{x}\mathbf{z}\mathbf{w}$**   
Undocumented ([contribute](#))

**$\mathbf{x}\mathbf{z}\mathbf{w}\mathbf{w}$**   
Undocumented ([contribute](#))

**$\mathbf{x}\mathbf{z}\mathbf{w}\mathbf{x}$**   
Undocumented ([contribute](#))

**$\mathbf{x}\mathbf{z}\mathbf{w}\mathbf{y}$**   
Undocumented ([contribute](#))

**$\mathbf{x}\mathbf{z}\mathbf{w}\mathbf{z}$**   
Undocumented ([contribute](#))

**$\mathbf{x}\mathbf{z}\mathbf{x}$**   
Undocumented ([contribute](#))

**$\mathbf{x}\mathbf{z}\mathbf{x}\mathbf{w}$**   
Undocumented ([contribute](#))

**$\mathbf{x}\mathbf{z}\mathbf{x}\mathbf{x}$**   
Undocumented ([contribute](#))

**$\mathbf{x}\mathbf{z}\mathbf{x}\mathbf{y}$**   
Undocumented ([contribute](#))

**xzxz**  
Undocumented ([contribute](#))

**xzy**  
Undocumented ([contribute](#))

**xzyw**  
Undocumented ([contribute](#))

**xzyx**  
Undocumented ([contribute](#))

**xzyy**  
Undocumented ([contribute](#))

**xzyz**  
Undocumented ([contribute](#))

**xzz**  
Undocumented ([contribute](#))

**xzzw**  
Undocumented ([contribute](#))

**xzxx**  
Undocumented ([contribute](#))

**xzzy**  
Undocumented ([contribute](#))

**xzzz**  
Undocumented ([contribute](#))

**y**  
Vector Y axis.

**Type** float

**yw**  
Undocumented ([contribute](#))

**yww**  
Undocumented ([contribute](#))

**ywww**  
Undocumented ([contribute](#))

**ywwx**  
Undocumented ([contribute](#))

**ywwy**  
Undocumented ([contribute](#))

**ywwz**  
Undocumented ([contribute](#))

**ywx**  
Undocumented ([contribute](#))

**ywxw**  
Undocumented ([contribute](#))

**ywxz**  
Undocumented ([contribute](#))

**ywx<sub>y</sub>**  
Undocumented ([contribute](#))

**ywx<sub>z</sub>**  
Undocumented ([contribute](#))

**ywy<sub>y</sub>**  
Undocumented ([contribute](#))

**ywy<sub>w</sub>**  
Undocumented ([contribute](#))

**ywy<sub>x</sub>**  
Undocumented ([contribute](#))

**ywy<sub>yy</sub>**  
Undocumented ([contribute](#))

**ywy<sub>yz</sub>**  
Undocumented ([contribute](#))

**ywz<sub>z</sub>**  
Undocumented ([contribute](#))

**ywzw<sub>w</sub>**  
Undocumented ([contribute](#))

**ywzx<sub>x</sub>**  
Undocumented ([contribute](#))

**ywzy<sub>y</sub>**  
Undocumented ([contribute](#))

**ywzz<sub>z</sub>**  
Undocumented ([contribute](#))

**yx<sub>x</sub>**  
Undocumented ([contribute](#))

**yxw<sub>w</sub>**  
Undocumented ([contribute](#))

**yxww<sub>w</sub>**  
Undocumented ([contribute](#))

**yxwx<sub>x</sub>**  
Undocumented ([contribute](#))

**yxwy<sub>y</sub>**  
Undocumented ([contribute](#))

**yxwz<sub>z</sub>**  
Undocumented ([contribute](#))

**yxx<sub>x</sub>**  
Undocumented ([contribute](#))

**yxxx<sub>w</sub>**  
Undocumented ([contribute](#))

**yxxx<sub>x</sub>**  
Undocumented ([contribute](#))

**yxxx**  
Undocumented ([contribute](#))

**yxxxz**  
Undocumented ([contribute](#))

**yxxy**  
Undocumented ([contribute](#))

**yxxyw**  
Undocumented ([contribute](#))

**yxyx**  
Undocumented ([contribute](#))

**yxyy**  
Undocumented ([contribute](#))

**yxyz**  
Undocumented ([contribute](#))

**yxz**  
Undocumented ([contribute](#))

**yxzw**  
Undocumented ([contribute](#))

**yxzx**  
Undocumented ([contribute](#))

**yxzy**  
Undocumented ([contribute](#))

**yxzz**  
Undocumented ([contribute](#))

**yy**  
Undocumented ([contribute](#))

**yyw**  
Undocumented ([contribute](#))

**yyww**  
Undocumented ([contribute](#))

**yywx**  
Undocumented ([contribute](#))

**yywy**  
Undocumented ([contribute](#))

**yywz**  
Undocumented ([contribute](#))

**yyx**  
Undocumented ([contribute](#))

**yyxw**  
Undocumented ([contribute](#))

**yyxx**  
Undocumented ([contribute](#))

**yyxy**  
Undocumented ([contribute](#))

**yyxz**  
Undocumented ([contribute](#))

**yyy**  
Undocumented ([contribute](#))

**yyyw**  
Undocumented ([contribute](#))

**yyyx**  
Undocumented ([contribute](#))

**yyyy**  
Undocumented ([contribute](#))

**yyyz**  
Undocumented ([contribute](#))

**yyz**  
Undocumented ([contribute](#))

**yyzw**  
Undocumented ([contribute](#))

**yyzx**  
Undocumented ([contribute](#))

**yyzy**  
Undocumented ([contribute](#))

**yyzz**  
Undocumented ([contribute](#))

**yz**  
Undocumented ([contribute](#))

**yzw**  
Undocumented ([contribute](#))

**yzww**  
Undocumented ([contribute](#))

**yzwx**  
Undocumented ([contribute](#))

**yzwy**  
Undocumented ([contribute](#))

**yzwz**  
Undocumented ([contribute](#))

**yzx**  
Undocumented ([contribute](#))

**yzxw**  
Undocumented ([contribute](#))

**yzxx**  
Undocumented ([contribute](#))

**y<sub>zxy</sub>**  
Undocumented ([contribute](#))

**y<sub>zxz</sub>**  
Undocumented ([contribute](#))

**y<sub>zy</sub>**  
Undocumented ([contribute](#))

**y<sub>zyw</sub>**  
Undocumented ([contribute](#))

**y<sub>zyx</sub>**  
Undocumented ([contribute](#))

**y<sub>zyy</sub>**  
Undocumented ([contribute](#))

**y<sub>zyz</sub>**  
Undocumented ([contribute](#))

**y<sub>zz</sub>**  
Undocumented ([contribute](#))

**y<sub>zzw</sub>**  
Undocumented ([contribute](#))

**y<sub>zzx</sub>**  
Undocumented ([contribute](#))

**y<sub>zzy</sub>**  
Undocumented ([contribute](#))

**y<sub>zzz</sub>**  
Undocumented ([contribute](#))

**z**  
Vector Z axis (3D Vectors only).

**Type** float

**zw**  
Undocumented ([contribute](#))

**zww**  
Undocumented ([contribute](#))

**zwww**  
Undocumented ([contribute](#))

**zwwx**  
Undocumented ([contribute](#))

**zwwy**  
Undocumented ([contribute](#))

**zwwz**  
Undocumented ([contribute](#))

**zwx**  
Undocumented ([contribute](#))

**zwxw**  
Undocumented ([contribute](#))

**`zwxx`**  
Undocumented ([contribute](#))

**`zwxy`**  
Undocumented ([contribute](#))

**`zwxz`**  
Undocumented ([contribute](#))

**`zwy`**  
Undocumented ([contribute](#))

**`zwyw`**  
Undocumented ([contribute](#))

**`zwyx`**  
Undocumented ([contribute](#))

**`zwyy`**  
Undocumented ([contribute](#))

**`zwyz`**  
Undocumented ([contribute](#))

**`zwz`**  
Undocumented ([contribute](#))

**`zwzw`**  
Undocumented ([contribute](#))

**`zwzx`**  
Undocumented ([contribute](#))

**`zwzy`**  
Undocumented ([contribute](#))

**`zwzz`**  
Undocumented ([contribute](#))

**`zx`**  
Undocumented ([contribute](#))

**`zxw`**  
Undocumented ([contribute](#))

**`zxww`**  
Undocumented ([contribute](#))

**`zxwx`**  
Undocumented ([contribute](#))

**`zxwy`**  
Undocumented ([contribute](#))

**`zxwz`**  
Undocumented ([contribute](#))

**`zxx`**  
Undocumented ([contribute](#))

**`xxxw`**  
Undocumented ([contribute](#))

**xxxx**  
Undocumented ([contribute](#))

**xxxy**  
Undocumented ([contribute](#))

**xxxz**  
Undocumented ([contribute](#))

**zxy**  
Undocumented ([contribute](#))

**zxyw**  
Undocumented ([contribute](#))

**zxyx**  
Undocumented ([contribute](#))

**zxyy**  
Undocumented ([contribute](#))

**zxyz**  
Undocumented ([contribute](#))

**zxz**  
Undocumented ([contribute](#))

**zxzw**  
Undocumented ([contribute](#))

**zxzx**  
Undocumented ([contribute](#))

**zxzy**  
Undocumented ([contribute](#))

**zxzz**  
Undocumented ([contribute](#))

**zy**  
Undocumented ([contribute](#))

**zyw**  
Undocumented ([contribute](#))

**zyww**  
Undocumented ([contribute](#))

**zywx**  
Undocumented ([contribute](#))

**zywy**  
Undocumented ([contribute](#))

**zywz**  
Undocumented ([contribute](#))

**zyx**  
Undocumented ([contribute](#))

**zyxw**  
Undocumented ([contribute](#))

**zyxx**  
Undocumented ([contribute](#))

**zyxy**  
Undocumented ([contribute](#))

**zyxz**  
Undocumented ([contribute](#))

**zyy**  
Undocumented ([contribute](#))

**zyyw**  
Undocumented ([contribute](#))

**zyyx**  
Undocumented ([contribute](#))

**zyyy**  
Undocumented ([contribute](#))

**zyyz**  
Undocumented ([contribute](#))

**zyz**  
Undocumented ([contribute](#))

**zyzw**  
Undocumented ([contribute](#))

**zyzx**  
Undocumented ([contribute](#))

**zyzy**  
Undocumented ([contribute](#))

**zyzz**  
Undocumented ([contribute](#))

**zz**  
Undocumented ([contribute](#))

**zzw**  
Undocumented ([contribute](#))

**zzww**  
Undocumented ([contribute](#))

**zzwx**  
Undocumented ([contribute](#))

**zzwy**  
Undocumented ([contribute](#))

**zzwz**  
Undocumented ([contribute](#))

**zzx**  
Undocumented ([contribute](#))

**zzxw**  
Undocumented ([contribute](#))

**zzxx**Undocumented ([contribute](#))**zzxy**Undocumented ([contribute](#))**zzxz**Undocumented ([contribute](#))**zzy**Undocumented ([contribute](#))**zzyw**Undocumented ([contribute](#))**zzyx**Undocumented ([contribute](#))**zzyy**Undocumented ([contribute](#))**zzyz**Undocumented ([contribute](#))**zzz**Undocumented ([contribute](#))**zzzw**Undocumented ([contribute](#))**zzzx**Undocumented ([contribute](#))**zzzy**Undocumented ([contribute](#))**zzzz**Undocumented ([contribute](#))

## 3.2 Geometry Utilities (mathutils.geometry)

The Blender geometry module

`mathutils.geometry.area_tri(v1, v2, v3)`

Returns the area size of the 2D or 3D triangle defined.

### Parameters

- `v1` (`mathutils.Vector`) – Point1
- `v2` (`mathutils.Vector`) – Point2
- `v3` (`mathutils.Vector`) – Point3

### Return type

`float`

`mathutils.geometry.barycentric_transform(point, tri_a1, tri_a2, tri_a3, tri_b1, tri_b2, tri_b3)`

Return a transformed point, the transformation is defined by 2 triangles.

### Parameters

- `point` (`mathutils.Vector`) – The point to transform.

- **tri\_a1** (`mathutils.Vector`) – source triangle vertex.
- **tri\_a2** (`mathutils.Vector`) – source triangle vertex.
- **tri\_a3** (`mathutils.Vector`) – source triangle vertex.
- **tri\_a1** – target triangle vertex.
- **tri\_a2** – target triangle vertex.
- **tri\_a3** – target triangle vertex.

**Returns** The transformed point

**Return type** `mathutils.Vector`'s

`mathutils.geometry.box_pack_2d(boxes)`

Returns the normal of the 3D tri or quad.

**Parameters** `boxes` (*list*) – list of boxes, each box is a list where the first 4 items are [x, y, width, height, ...] other items are ignored.

**Returns** the width and height of the packed bounding box

**Return type** tuple, pair of floats

`mathutils.geometry.interpolate_bezier(knot1, handle1, handle2, knot2, resolution)`

Interpolate a bezier spline segment.

**Parameters**

- **knot1** (`mathutils.Vector`) – First bezier spline point.
- **handle1** (`mathutils.Vector`) – First bezier spline handle.
- **handle2** (`mathutils.Vector`) – Second bezier spline handle.
- **knot2** (`mathutils.Vector`) – Second bezier spline point.
- **resolution** (*int*) – Number of points to return.

**Returns** The interpolated points

**Return type** list of `mathutils.Vector`'s

`mathutils.geometry.intersect_line_line(v1, v2, v3, v4)`

Returns a tuple with the points on each line respectively closest to the other.

**Parameters**

- **v1** (`mathutils.Vector`) – First point of the first line
- **v2** (`mathutils.Vector`) – Second point of the first line
- **v3** (`mathutils.Vector`) – First point of the second line
- **v4** (`mathutils.Vector`) – Second point of the second line

**Return type** tuple of `mathutils.Vector`'s

`mathutils.geometry.intersect_line_line_2d(lineA_p1, lineA_p2, lineB_p1, lineB_p2)`

Takes 2 lines (as 4 vectors) and returns a vector for their point of intersection or None.

**Parameters**

- **lineA\_p1** (`mathutils.Vector`) – First point of the first line
- **lineA\_p2** (`mathutils.Vector`) – Second point of the first line
- **lineB\_p1** (`mathutils.Vector`) – First point of the second line

- **lineB\_p2** (`mathutils.Vector`) – Second point of the second line

**Returns** The point of intersection or None when not found

**Return type** `mathutils.Vector` or None

`mathutils.geometry.intersect_line_plane(line_a, line_b, plane_co, plane_no, no_flip=False)`

Takes 2 lines (as 4 vectors) and returns a vector for their point of intersection or None.

#### Parameters

- **line\_a** (`mathutils.Vector`) – First point of the first line
- **line\_b** (`mathutils.Vector`) – Second point of the first line
- **plane\_co** (`mathutils.Vector`) – A point on the plane
- **plane\_no** (`mathutils.Vector`) – The direction the plane is facing
- **no\_flip** (:`boolean`) – Always return an intersection on the directon defined bt line\_a -> line\_b

**Returns** The point of intersection or None when not found

**Return type** `mathutils.Vector` or None

`mathutils.geometry.intersect_line_sphere(line_a, line_b, sphere_co, sphere_radius, clip=True)`

Takes a lines (as 2 vectors), a sphere as a point and a radius and returns the intersection

#### Parameters

- **line\_a** (`mathutils.Vector`) – First point of the first line
- **line\_b** (`mathutils.Vector`) – Second point of the first line
- **sphere\_co** (`mathutils.Vector`) – The center of the sphere
- **sphere\_radius** (`sphere_radius`) – Radius of the sphere

**Returns** The intersection points as a pair of vectors or None when there is no intersection

**Return type** A tuple pair containing `mathutils.Vector` or None

`mathutils.geometry.intersect_line_sphere_2d(line_a, line_b, sphere_co, sphere_radius, clip=True)`

Takes a lines (as 2 vectors), a sphere as a point and a radius and returns the intersection

#### Parameters

- **line\_a** (`mathutils.Vector`) – First point of the first line
- **line\_b** (`mathutils.Vector`) – Second point of the first line
- **sphere\_co** (`mathutils.Vector`) – The center of the sphere
- **sphere\_radius** (`sphere_radius`) – Radius of the sphere

**Returns** The intersection points as a pair of vectors or None when there is no intersection

**Return type** A tuple pair containing `mathutils.Vector` or None

`mathutils.geometry.intersect_point_line(pt, line_p1, line_p2)`

Takes a point and a line and returns a tuple with the closest point on the line and its distance from the first point of the line as a percentage of the length of the line.

#### Parameters

- **pt** (`mathutils.Vector`) – Point
- **line\_p1** (`mathutils.Vector`) – First point of the line

- **line\_p1** – Second point of the line

**Return type** (`mathutils.Vector`, float)

`mathutils.geometry.intersect_point_quad_2d(pt, quad_p1, quad_p2, quad_p3, quad_p4)`

Takes 5 vectors (using only the x and y coordinates): one is the point and the next 4 define the quad, only the x and y are used from the vectors. Returns 1 if the point is within the quad, otherwise 0.

#### Parameters

- **pt** – Point
- **quad\_p1** (`mathutils.Vector`) – First point of the quad
- **quad\_p2** (`mathutils.Vector`) – Second point of the quad
- **quad\_p3** (`mathutils.Vector`) – Third point of the quad
- **quad\_p4** (`mathutils.Vector`) – Forth point of the quad

**Return type** int

`mathutils.geometry.intersect_point_tri_2d(pt, tri_p1, tri_p2, tri_p3)`

Takes 4 vectors (using only the x and y coordinates): one is the point and the next 3 define the triangle. Returns 1 if the point is within the triangle, otherwise 0.

#### Parameters

- **pt** – Point
- **tri\_p1** (`mathutils.Vector`) – First point of the triangle
- **tri\_p2** (`mathutils.Vector`) – Second point of the triangle
- **tri\_p3** (`mathutils.Vector`) – Third point of the triangle

**Return type** int

`mathutils.geometry.intersect_ray_tri(v1, v2, v3, ray, orig, clip=True)`

Returns the intersection between a ray and a triangle, if possible, returns None otherwise.

#### Parameters

- **v1** (`mathutils.Vector`) – Point1
- **v2** (`mathutils.Vector`) – Point2
- **v3** (`mathutils.Vector`) – Point3
- **ray** (`mathutils.Vector`) – Direction of the projection
- **orig** (`mathutils.Vector`) – Origin
- **clip** (boolean) – When False, don't restrict the intersection to the area of the triangle, use the infinite plane defined by the triangle.

**Returns** The point of intersection or None if no intersection is found

**Return type** `mathutils.Vector` or None

`mathutils.geometry.normal(v1, v2, v3, v4=None)`

Returns the normal of the 3D tri or quad.

#### Parameters

- **v1** (`mathutils.Vector`) – Point1
- **v2** (`mathutils.Vector`) – Point2

- **v3** (`mathutils.Vector`) – Point3
- **v4** (`mathutils.Vector`) – Point4 (optional)

**Return type** `mathutils.Vector`

`mathutils.geometry.tesselate_polygon(veclist_list)`

Takes a list of polylines (each point a vector) and returns the point indices for a polyline filled with triangles.

**Parameters** `veclist_list` – list of polylines

**Return type** list

### 3.3 OpenGL Wrapper (bgl)

This module wraps OpenGL constants and functions, making them available from within Blender Python.

The complete list can be retrieved from the module itself, by listing its contents: `dir(bgl)`. A simple search on the net can point to more than enough material to teach OpenGL programming, from books to many collections of tutorials.

The “red book”: “*I{OpenGL Programming Guide: The Official Guide to Learning OpenGL}*” and the online NeHe tutorials are two of the best resources.

---

**Note:** You can use the `Image` type to load and set textures. See `Image.gl_load` and `Image.image_load`, for example. [OpenGL.org NeHe GameDev](#)

---

**glAccum(op, value):**

Operate on the accumulation buffer.

**See Also:**

[OpenGL Docs](#)

**Parameters**

- `op` (*Enumerated constant*) – The accumulation buffer operation.
- `value` (*float*) – a value used in the accumulation buffer operation.

**glAlphaFunc(func, ref):**

Specify the alpha test function.

**See Also:**

[OpenGL Docs](#)

**Parameters**

- `func` (*Enumerated constant*) – Specifies the alpha comparison function.
- `ref` (*float*) – The reference value that incoming alpha values are compared to. Clamped between 0 and 1.

**glAreTexturesResident(n, textures, residences):**

Determine if textures are loaded in texture memory

**See Also:**

[OpenGL Docs](#)

**Parameters**

- **n** (*int*) – Specifies the number of textures to be queried.
- **textures** (Buffer object I{type GL\_INT}) – Specifies an array containing the names of the textures to be queried
- **residences** (Buffer object I{type GL\_INT}(boolean)) – An array in which the texture residence status is returned. The residence status of a texture named by an element of textures is returned in the corresponding element of residences.

**glBegin(mode) :**

Delimit the vertices of a primitive or a group of like primitives

See Also:

[OpenGL Docs](#)

**Parameters mode** (*Enumerated constant*) – Specifies the primitive that will be created from vertices between glBegin and glEnd.

**glBindTexture(target, texture) :**

Bind a named texture to a texturing target

See Also:

[OpenGL Docs](#)

**Parameters**

- **target** (*Enumerated constant*) – Specifies the target to which the texture is bound.
- **texture** (*unsigned int*) – Specifies the name of a texture.

**glBitmap(width, height, xorig, yorig, xmove, ymove, bitmap) :**

Draw a bitmap

See Also:

[OpenGL Docs](#)

**Parameters**

- **height** (*width*,) – Specify the pixel width and height of the bitmap image.
- **yorig** (*xorig*,) – Specify the location of the origin in the bitmap image. The origin is measured from the lower left corner of the bitmap, with right and up being the positive axes.
- **ymove** (*xmove*,) – Specify the x and y offsets to be added to the current raster position after the bitmap is drawn.
- **bitmap** (Buffer object I{type GL\_BYTE}) – Specifies the address of the bitmap image.

**glBlendFunc(sfactor, dfactor) :**

Specify pixel arithmetic

See Also:

[OpenGL Docs](#)

**Parameters**

- **sfactor** (*Enumerated constant*) – Specifies how the red, green, blue, and alpha source blending factors are computed.
- **dfactor** (*Enumerated constant*) – Specifies how the red, green, blue, and alpha destination blending factors are computed.

**glCallList(list) :**

Execute a display list

**See Also:**

[OpenGL Docs](#)

**Parameters** **list** (*unsigned int*) – Specifies the integer name of the display list to be executed.

**glCallLists(n, type, lists) :**

Execute a list of display lists

**See Also:**

[OpenGL Docs](#)

**Parameters**

- **n** (*int*) – Specifies the number of display lists to be executed.
- **type** (*Enumerated constant*) – Specifies the type of values in lists.
- **lists** (*Buffer object*) – Specifies the address of an array of name offsets in the display list. The pointer type is void because the offsets can be bytes, shorts, ints, or floats, depending on the value of type.

**glClear(mask) :**

Clear buffers to preset values

**See Also:**

[OpenGL Docs](#)

**Parameters** **mask** (*Enumerated constant(s)*) – Bitwise OR of masks that indicate the buffers to be cleared.

**glClearAccum(red, green, blue, alpha) :**

Specify clear values for the accumulation buffer

**See Also:**

[OpenGL Docs](#)

**Parameters** **green, blue, alpha** (*red,*) – Specify the red, green, blue, and alpha values used when the accumulation buffer is cleared. The initial values are all 0.

**glClearColor(red, green, blue, alpha) :**

Specify clear values for the color buffers

**See Also:**

[OpenGL Docs](#)

**Parameters** **green, blue, alpha** (*red,*) – Specify the red, green, blue, and alpha values used when the color buffers are cleared. The initial values are all 0.

**glClearDepth(depth) :**

Specify the clear value for the depth buffer

**See Also:**

[OpenGL Docs](#)

**Parameters** **depth** (*int*) – Specifies the depth value used when the depth buffer is cleared. The initial value is 1.

**glClearIndex(c) :**

Specify the clear value for the color index buffers

**See Also:**

[OpenGL Docs](#)

**Parameters** **c** (*float*) – Specifies the index used when the color index buffers are cleared. The initial value is 0.

**glClearStencil(s) :**

Specify the clear value for the stencil buffer

**See Also:**

[OpenGL Docs](#)

**Parameters** **s** (*int*) – Specifies the index used when the stencil buffer is cleared. The initial value is 0.

**glClipPlane (plane, equation) :**

Specify a plane against which all geometry is clipped

**See Also:**

[OpenGL Docs](#)

**Parameters**

- **plane** (*Enumerated constant*) – Specifies which clipping plane is being positioned.
- **equation** (*Buffer object I{type GL\_FLOAT}(double)*) – Specifies the address of an array of four double-precision floating-point values. These values are interpreted as a plane equation.

**glColor (red, green, blue, alpha) :**

B{glColor3b, glColor3d, glColor3f, glColor3i, glColor3s, glColor3ub, glColor3ui, glColor3us, glColor4b, glColor4d, glColor4f, glColor4i, glColor4s, glColor4ub, glColor4ui, glColor4us, glColor3bv, glColor3dv, glColor3fv, glColor3iv, glColor3sv, glColor3ubv, glColor3uiv, glColor3usv, glColor4bv, glColor4dv, glColor4fv, glColor4iv, glColor4sv, glColor4ubv, glColor4uiv, glColor4usv}

Set a new color.

**See Also:**

[OpenGL Docs](#)

**Parameters**

- **green, blue** (*red*,) – Specify new red, green, and blue values for the current color.
- **alpha** – Specifies a new alpha value for the current color. Included only in the four-argument glColor4 commands. (With ‘4’ colors only)

**glColorMask(red, green, blue, alpha) :**

Enable and disable writing of frame buffer color components

**See Also:**

[OpenGL Docs](#)

**Parameters** **green, blue, alpha (red,)** – Specify whether red, green, blue, and alpha can or cannot be written into the frame buffer. The initial values are all GL\_TRUE, indicating that the color components can be written.

**glColorMaterial(face, mode) :**

Cause a material color to track the current color

**See Also:**

[OpenGL Docs](#)

**Parameters**

- **face (Enumerated constant)** – Specifies whether front, back, or both front and back material parameters should track the current color.
- **mode (Enumerated constant)** – Specifies which of several material parameters track the current color.

**glCopyPixels(x, y, width, height, type) :**

Copy pixels in the frame buffer

**See Also:**

[OpenGL Docs](#)

**Parameters**

- **y (x,)** – Specify the window coordinates of the lower left corner of the rectangular region of pixels to be copied.
- **width,height** – Specify the dimensions of the rectangular region of pixels to be copied. Both must be non-negative.
- **type (Enumerated constant)** – Specifies whether color values, depth values, or stencil values are to be copied.

def glCopyTexImage2D(target, level, internalformat, x, y, width, height, border):

Copy pixels into a 2D texture image

**See Also:**

[OpenGL Docs](#)

**Parameters**

- **target (Enumerated constant)** – Specifies the target texture.
- **level (int)** – Specifies the level-of-detail number. Level 0 is the base image level. Level n is the nth mipmap reduction image.
- **internalformat (int)** – Specifies the number of color components in the texture.
- **y (x,)** – Specify the window coordinates of the first pixel that is copied from the frame buffer. This location is the lower left corner of a rectangular block of pixels.
- **width (int)** – Specifies the width of the texture image. Must be  $2n+2(\text{border})$  for some integer n. All implementations support texture images that are at least 64 texels wide.
- **height (int)** – Specifies the height of the texture image. Must be  $2m+2(\text{border})$  for some integer m. All implementations support texture images that are at least 64 texels high.
- **border (int)** – Specifies the width of the border. Must be either 0 or 1.

**glCullFace (mode) :**

Specify whether front- or back-facing facets can be culled

**See Also:**

[OpenGL Docs](#)

**Parameters mode** (*Enumerated constant*) – Specifies whether front- or back-facing facets are candidates for culling.

**glDeleteLists (list, range) :**

Delete a contiguous group of display lists

**See Also:**

[OpenGL Docs](#)

**Parameters**

- **list** (*unsigned int*) – Specifies the integer name of the first display list to delete
- **range** (*int*) – Specifies the number of display lists to delete

**glDeleteTextures (n, textures) :**

Delete named textures

**See Also:**

[OpenGL Docs](#)

**Parameters**

- **n** (*int*) – Specifies the number of textures to be deleted
- **textures** (*Buffer I{GL\_INT}*) – Specifies an array of textures to be deleted

**glDepthFunc (func) :**

Specify the value used for depth buffer comparisons

**See Also:**

[OpenGL Docs](#)

**Parameters func** (*Enumerated constant*) – Specifies the depth comparison function.

**glDepthMask (flag) :**

Enable or disable writing into the depth buffer

**See Also:**

[OpenGL Docs](#)

**Parameters flag** (*int (boolean)*) – Specifies whether the depth buffer is enabled for writing. If flag is GL\_FALSE, depth buffer writing is disabled. Otherwise, it is enabled. Initially, depth buffer writing is enabled.

**glDepthRange (zNear, zFar) :**

Specify mapping of depth values from normalized device coordinates to window coordinates

**See Also:**

[OpenGL Docs](#)

**Parameters**

- **zNear** (*int*) – Specifies the mapping of the near clipping plane to window coordinates. The initial value is 0.
- **zFar** (*int*) – Specifies the mapping of the far clipping plane to window coordinates. The initial value is 1.

**glDisable (cap) :**

Disable server-side GL capabilities

**See Also:**

[OpenGL Docs](#)

**Parameters cap** (*Enumerated constant*) – Specifies a symbolic constant indicating a GL capability.

**glDrawBuffer (mode) :**

Specify which color buffers are to be drawn into

**See Also:**

[OpenGL Docs](#)

**Parameters mode** (*Enumerated constant*) – Specifies up to four color buffers to be drawn into.

**glDrawPixels (width, height, format, type, pixels) :**

Write a block of pixels to the frame buffer

**See Also:**

[OpenGL Docs](#)

**Parameters**

- **height** (*width*,) – Specify the dimensions of the pixel rectangle to be written into the frame buffer.
- **format** (*Enumerated constant*) – Specifies the format of the pixel data.
- **type** (*Enumerated constant*) – Specifies the data type for pixels.
- **pixels** (*Buffer object*) – Specifies a pointer to the pixel data.

**glEdgeFlag (flag) :**

B{glEdgeFlag, glEdgeFlagv}

Flag edges as either boundary or non-boundary

**See Also:**

[OpenGL Docs](#)

**Parameters flag** (*Depends of function prototype*) – Specifies the current edge flag value. The initial value is GL\_TRUE.

**glEnable (cap) :**

Enable server-side GL capabilities

**See Also:**

[OpenGL Docs](#)

**Parameters cap** (*Enumerated constant*) – Specifies a symbolic constant indicating a GL capability.

**glEnd()**:

Delimit the vertices of a primitive or group of like primitives

**See Also:**

[OpenGL Docs](#)

**glEndList()**:

Create or replace a display list

**See Also:**

[OpenGL Docs](#)

**glEvalCoord (u, v)**:

B{glEvalCoord1d, glEvalCoord1f, glEvalCoord2d, glEvalCoord2f, glEvalCoord1dv, glEvalCoord1fv, glEvalCoord2dv, glEvalCoord2fv}

Evaluate enabled one- and two-dimensional maps

**See Also:**

[OpenGL Docs](#)

**Parameters**

- **u** (*Depends on function prototype.*) – Specifies a value that is the domain coordinate u to the basis function defined in a previous glMap1 or glMap2 command. If the function prototype ends in ‘v’ then u specifies a pointer to an array containing either one or two domain coordinates. The first coordinate is u. The second coordinate is v, which is present only in glEvalCoord2 versions.
- **v** (*Depends on function prototype. (only with ‘2’ prototypes)*) – Specifies a value that is the domain coordinate v to the basis function defined in a previous glMap2 command. This argument is not present in a glEvalCoord1 command.

**glEvalMesh (mode, i1, i2)**:

B{glEvalMesh1 or glEvalMesh2}

Compute a one- or two-dimensional grid of points or lines

**See Also:**

[OpenGL Docs](#)

**Parameters**

- **mode** (*Enumerated constant*) – In glEvalMesh1, specifies whether to compute a one-dimensional mesh of points or lines.
- **i2** (*i1*) – Specify the first and last integer values for the grid domain variable i.

**glEvalPoint (i, j)**:

B{glEvalPoint1 and glEvalPoint2}

Generate and evaluate a single point in a mesh

**See Also:**

[OpenGL Docs](#)

**Parameters**

- **i** (*int*) – Specifies the integer value for grid domain variable i.

- **j** (*int (only with ‘2’ prototypes)*) – Specifies the integer value for grid domain variable j (glEvalPoint2 only).

**glFeedbackBuffer (size, type, buffer) :**

Controls feedback mode

**See Also:**

[OpenGL Docs](#)

**Parameters**

- **size** (*int*) – Specifies the maximum number of values that can be written into buffer.
- **type** (*Enumerated constant*) – Specifies a symbolic constant that describes the information that will be returned for each vertex.
- **buffer** (*Buffer object* I{GL\_FLOAT}) – Returns the feedback data.

**glFinish () :**

Block until all GL execution is complete

**See Also:**

[OpenGL Docs](#)

**glFlush () :**

Force Execution of GL commands in finite time

**See Also:**

[OpenGL Docs](#)

**glFog (pname, param) :**

B{glFogf, glFogi, glFogfv, glFogiv}

Specify fog parameters

**See Also:**

[OpenGL Docs](#)

**Parameters**

- **pname** (*Enumerated constant*) – Specifies a single-valued fog parameter. If the function prototype ends in ‘v’ specifies a fog parameter.
- **param** (*Depends on function prototype.*) – Specifies the value or values to be assigned to pname. GL\_FOG\_COLOR requires an array of four values. All other parameters accept an array containing only a single value.

**glFrontFace (mode) :**

Define front- and back-facing polygons

**See Also:**

[OpenGL Docs](#)

**Parameters mode** (*Enumerated constant*) – Specifies the orientation of front-facing polygons.

**glFrustum(left, right, bottom, top, zNear, zFar) :**

Multiply the current matrix by a perspective matrix

**See Also:**

[OpenGL Docs](#)

**Parameters**

- **right** (*left*,) – Specify the coordinates for the left and right vertical clipping planes.
- **bottom** (*top*,) – Specify the coordinates for the bottom and top horizontal clipping planes.
- **zFar** (*zNear*,) – Specify the distances to the near and far depth clipping planes. Both distances must be positive.

**glGenLists (range) :**

Generate a contiguous set of empty display lists

**See Also:**

[OpenGL Docs](#)

**Parameters** **range** (*int*) – Specifies the number of contiguous empty display lists to be generated.

**glGenTextures (n, textures) :**

Generate texture names

**See Also:**

[OpenGL Docs](#)

**Parameters**

- **n** (*int*) – Specifies the number of textures name to be generated.
- **textures** (*Buffer object I{type GL\_INT}*) – Specifies an array in which the generated textures names are stored.

**glGet (pname, param) :**

B{glGetBooleanv, glGetfloatv, glGetFloatv, glGetIntegerv}

Return the value or values of a selected parameter

**See Also:**

[OpenGL Docs](#)

**Parameters**

- **pname** (*Enumerated constant*) – Specifies the parameter value to be returned.
- **param** (*Depends on function prototype.*) – Returns the value or values of the specified parameter.

**glGetClipPlane (plane, equation) :**

Return the coefficients of the specified clipping plane

**See Also:**

[OpenGL Docs](#)

**Parameters**

- **plane** (*Enumerated constant*) – Specifies a clipping plane. The number of clipping planes depends on the implementation, but at least six clipping planes are supported. They are identified by symbolic names of the form GL\_CLIP\_PLANE*i* where 0 < i < GL\_MAX\_CLIP\_PLANES.
- **equation** (*Buffer object I{type GL\_FLOAT}*) – Returns four float (double)-precision values that are the coefficients of the plane equation of plane in eye coordinates. The initial value is (0, 0, 0, 0).

**glGetError()**:

Return error information

**See Also:**

[OpenGL Docs](#)

**glGetLight (light, pname, params)**:

B{glGetLightfv and glGetLightiv}

Return light source parameter values

**See Also:**

[OpenGL Docs](#)

**Parameters**

- **light** (*Enumerated constant*) – Specifies a light source. The number of possible lights depends on the implementation, but at least eight lights are supported. They are identified by symbolic names of the form GL\_LIGHT*i* where 0 < i < GL\_MAX\_LIGHTS.
- **pname** (*Enumerated constant*) – Specifies a light source parameter for light.
- **params** (Buffer object. Depends on function prototype.) – Returns the requested data.

**glGetMap (target, query, v)**:

B{glGetMapdv, glGetMapfv, glGetMapiv}

Return evaluator parameters

**See Also:**

[OpenGL Docs](#)

**Parameters**

- **target** (*Enumerated constant*) – Specifies the symbolic name of a map.
- **query** (*Enumerated constant*) – Specifies which parameter to return.
- **v** (Buffer object. Depends on function prototype.) – Returns the requested data.

**glGetMaterial (face, pname, params)**:

B{glGetMaterialfv, glGetMaterialiv}

Return material parameters

**See Also:**

[OpenGL Docs](#)

**Parameters**

- **face** (*Enumerated constant*) – Specifies which of the two materials is being queried. representing the front and back materials, respectively.
- **pname** (*Enumerated constant*) – Specifies the material parameter to return.
- **params** (Buffer object. Depends on function prototype.) – Returns the requested data.

**glGetPixelMap (map, values)**:

B{glGetPixelMapfv, glGetPixelMapuiv, glGetPixelMapusv}

Return the specified pixel map

**See Also:**

[OpenGL Docs](#)

#### Parameters

- **map** (*Enumerated constant*) – Specifies the name of the pixel map to return.
- **values** (*Buffer object*. Depends on function prototype.) – Returns the pixel map contents.

**glGetPolygonStipple (mask) :**

Return the polygon stipple pattern

**See Also:**

[OpenGL Docs](#)

**Parameters** **mask** (*Buffer object* I{type GL\_BYTE}) – Returns the stipple pattern. The initial value is all 1's.

**glGetString (name) :**

Return a string describing the current GL connection

**See Also:**

[OpenGL Docs](#)

**Parameters** **name** (*Enumerated constant*) – Specifies a symbolic constant.

**glGetTexEnv (target, pname, params) :**

B{glGetTexEnvfv, glGetTexEnviv}

Return texture environment parameters

**See Also:**

[OpenGL Docs](#)

#### Parameters

- **target** (*Enumerated constant*) – Specifies a texture environment. Must be GL\_TEXTURE\_ENV.
- **pname** (*Enumerated constant*) – Specifies the symbolic name of a texture environment parameter.
- **params** (*Buffer object*. Depends on function prototype.) – Returns the requested data.

**glGetTexGen (coord, pname, params) :**

B{glGetTexGendv, glGetTexGenfv, glGetTexGeniv}

Return texture coordinate generation parameters

**See Also:**

[OpenGL Docs](#)

#### Parameters

- **coord** (*Enumerated constant*) – Specifies a texture coordinate.
- **pname** (*Enumerated constant*) – Specifies the symbolic name of the value(s) to be returned.
- **params** (*Buffer object*. Depends on function prototype.) – Returns the requested data.

**glGetTexImage (target, level, format, type, pixels) :**

Return a texture image

See Also:

[OpenGL Docs](#)

#### Parameters

- **target** (*Enumerated constant*) – Specifies which texture is to be obtained.
- **level** (*int*) – Specifies the level-of-detail number of the desired image. Level 0 is the base image level. Level n is the nth mipmap reduction image.
- **format** (*Enumerated constant*) – Specifies a pixel format for the returned data.
- **type** (*Enumerated constant*) – Specifies a pixel type for the returned data.
- **pixels** (*Buffer object*.) – Returns the texture image. Should be a pointer to an array of the type specified by type

**glGetTexLevelParameter (target, level, pname, params) :**

B{glGetTexLevelParameterfv, glGetTexLevelParameteriv}

return texture parameter values for a specific level of detail

See Also:

[U{opengl.org/developers/documentation/man\\_pages/hardcopy/GL/html/gl/gettexlevelparameter.html}](http://opengl.org/developers/documentation/man_pages/hardcopy/GL/html/gl/gettexlevelparameter.html) \_

#### Parameters

- **target** (*Enumerated constant*) – Specifies the symbolic name of the target texture.
- **level** (*int*) – Specifies the level-of-detail number of the desired image. Level 0 is the base image level. Level n is the nth mipmap reduction image.
- **pname** (*Enumerated constant*) – Specifies the symbolic name of a texture parameter.
- **params** (*Buffer object*. Depends on function prototype.) – Returns the requested data.

**glGetTexParameter (target, pname, params) :**

B{glGetTexParameterfv, glGetTexParameteriv}

Return texture parameter values

See Also:

[OpenGL Docs](#)

#### Parameters

- **target** (*Enumerated constant*) – Specifies the symbolic name of the target texture.
- **pname** (*Enumerated constant*) – Specifies the symbolic name the target texture.
- **params** (*Buffer object*. Depends on function prototype.) – Returns the texture parameters.

**glHint (target, mode) :**

Specify implementation-specific hints

See Also:

[OpenGL Docs](#)

**Parameters**

- **target** (*Enumerated constant*) – Specifies a symbolic constant indicating the behavior to be controlled.
- **mode** (*Enumerated constant*) – Specifies a symbolic constant indicating the desired behavior.

**glIndex(c) :**

B{glIndexd, glIndexf, glIndexi, glIndexes, glIndexdv, glIndexfv, glIndexiv, glIndexsv}

Set the current color index

**See Also:**[OpenGL Docs](#)

**Parameters** **c** (*Buffer object*. Depends on function prototype.) – Specifies a pointer to a one element array that contains the new value for the current color index.

**glInitNames() :**

Initialize the name stack

**See Also:**[OpenGL Docs](#)**glIsEnabled(cap) :**

Test whether a capability is enabled

**See Also:**[OpenGL Docs](#)

**Parameters** **cap** (*Enumerated constant*) – Specifies a constant representing a GL capability.

**glIsList(list) :**

Determine if a name corresponds to a display-list

**See Also:**[OpenGL Docs](#)

**Parameters** **list** (*unsigned int*) – Specifies a potential display-list name.

**glIsTexture(texture) :**

Determine if a name corresponds to a texture

**See Also:**[OpenGL Docs](#)

**Parameters** **texture** (*unsigned int*) – Specifies a value that may be the name of a texture.

**glLight (light, pname, param) :**

B{glLightf, glLighti, glLightfv, glLightiv}

Set the light source parameters

**See Also:**[OpenGL Docs](#)**Parameters**

- **light** (*Enumerated constant*) – Specifies a light. The number of lights depends on the implementation, but at least eight lights are supported. They are identified by symbolic names of the form GL\_LIGHT*i* where  $0 < i < \text{GL\_MAX\_LIGHTS}$ .
- **pname** (*Enumerated constant*) – Specifies a single-valued light source parameter for light.
- **param** (*Depends on function prototype.*) – Specifies the value that parameter pname of light source light will be set to. If function prototype ends in ‘v’ specifies a pointer to the value or values that parameter pname of light source light will be set to.

**glLightModel** (*pname, param*) :  
B{glLightModelf, glLightModeli, glLightModelfv, glLightModeliv}

Set the lighting model parameters

**See Also:**

[OpenGL Docs](#)

#### Parameters

- **pname** (*Enumerated constant*) – Specifies a single-value light model parameter.
- **param** (*Depends on function prototype.*) – Specifies the value that param will be set to. If function prototype ends in ‘v’ specifies a pointer to the value or values that param will be set to.

**glLineStipple** (*factor, pattern*) :  
Specify the line stipple pattern

**See Also:**

[OpenGL Docs](#)

#### Parameters

- **factor** (*int*) – Specifies a multiplier for each bit in the line stipple pattern. If factor is 3, for example, each bit in the pattern is used three times before the next bit in the pattern is used. factor is clamped to the range [1, 256] and defaults to 1.
- **pattern** (*unsigned short int*) – Specifies a 16-bit integer whose bit pattern determines which fragments of a line will be drawn when the line is rasterized. Bit zero is used first; the default pattern is all 1’s.

**glLineWidth** (*width*) :  
Specify the width of rasterized lines.

**See Also:**

[OpenGL Docs](#)

**Parameters** **width** (*float*) – Specifies the width of rasterized lines. The initial value is 1.

**glListBase** (*base*) :  
Set the display-list base for glCallLists

**See Also:**

[OpenGL Docs](#)

**Parameters** **base** (*unsigned int*) – Specifies an integer offset that will be added to glCallLists offsets to generate display-list names. The initial value is 0.

**glLoadIdentity()**:

Replace the current matrix with the identity matrix

**See Also:**

[OpenGL Docs](#)

**glLoadMatrix (m)**:

B{glLoadMatrixd, glLoadMatixf}

Replace the current matrix with the specified matrix

**See Also:**

[OpenGL Docs](#)

**Parameters** **m** (*Buffer object*. Depends on function prototype.) – Specifies a pointer to 16 consecutive values, which are used as the elements of a 4x4 column-major matrix.

**glLoadName (name)**:

Load a name onto the name stack.

**See Also:**

[OpenGL Docs](#)

**Parameters** **name** (*unsigned int*) – Specifies a name that will replace the top value on the name stack.

**glLogicOp (opcode)**:

Specify a logical pixel operation for color index rendering

**See Also:**

[OpenGL Docs](#)

**Parameters** **opcode** (*Enumerated constant*) – Specifies a symbolic constant that selects a logical operation.

**glMap1 (target, u1, u2, stride, order, points)**:

B{glMap1d, glMap1f}

Define a one-dimensional evaluator

**See Also:**

[OpenGL Docs](#)

**Parameters**

- **target** (*Enumerated constant*) – Specifies the kind of values that are generated by the evaluator.
- **u1,u2** – Specify a linear mapping of u, as presented to glEvalCoord1, to ^, the variable that is evaluated by the equations specified by this command.
- **stride** (*int*) – Specifies the number of floats or float (double)s between the beginning of one control point and the beginning of the next one in the data structure referenced in points. This allows control points to be embedded in arbitrary data structures. The only constraint is that the values for a particular control point must occupy contiguous memory locations.
- **order** (*int*) – Specifies the number of control points. Must be positive.

- **points** (`Buffer` object. Depends on function prototype.) – Specifies a pointer to the array of control points.

`glMap2 (target, u1, u2, ustride, uorder, v1, v2, vstride, vorder, points):`  
B{`glMap2d`, `glMap2f`}

Define a two-dimensional evaluator

See Also:

[OpenGL Docs](#)

#### Parameters

- **target** (*Enumerated constant*) – Specifies the kind of values that are generated by the evaluator.
- **u1,u2** – Specify a linear mapping of u, as presented to `glEvalCoord2`, to  $^t$ , the variable that is evaluated by the equations specified by this command. Initially  $u1$  is 0 and  $u2$  is 1.
- **ustride** (*int*) – Specifies the number of floats or float (double)s between the beginning of control point R and the beginning of control point R  $ij$ , where i and j are the u and v control point indices, respectively. This allows control points to be embedded in arbitrary data structures. The only constraint is that the values for a particular control point must occupy contiguous memory locations. The initial value of `ustride` is 0.
- **uorder** (*int*) – Specifies the dimension of the control point array in the u axis. Must be positive. The initial value is 1.
- **v2 (v1,)** – Specify a linear mapping of v, as presented to `glEvalCoord2`, to  $^t$ , one of the two variables that are evaluated by the equations specified by this command. Initially,  $v1$  is 0 and  $v2$  is 1.
- **vstride** (*int*) – Specifies the number of floats or float (double)s between the beginning of control point R and the beginning of control point R  $ij$ , where i and j are the u and v control point(indices, respectively. This allows control points to be embedded in arbitrary data structures. The only constraint is that the values for a particular control point must occupy contiguous memory locations. The initial value of `vstride` is 0.
- **vorder** (*int*) – Specifies the dimension of the control point array in the v axis. Must be positive. The initial value is 1.
- **points** (`Buffer` object. Depends on function prototype.) – Specifies a pointer to the array of control points.

`glMapGrid (un, u1,u2 ,vn, v1, v2):`  
B{`glMapGrid1d`, `glMapGrid1f`, `glMapGrid2d`, `glMapGrid2f`}

Define a one- or two-dimensional mesh

See Also:

[OpenGL Docs](#)

#### Parameters

- **un** (*int*) – Specifies the number of partitions in the grid range interval  $[u1, u2]$ . Must be positive.
- **u2 (u1,)** – Specify the mappings for integer grid domain values  $i=0$  and  $i=un$ .
- **vn** (*int*) – Specifies the number of partitions in the grid range interval  $[v1, v2]$  (`glMapGrid2` only).

- **v2** (*vl*) – Specify the mappings for integer grid domain values j=0 and j=vn (glMapGrid2 only).

**glMaterial (face, pname, params) :**

Specify material parameters for the lighting model.

**See Also:**

[OpenGL Docs](#)

**Parameters**

- **face** (*Enumerated constant*) – Specifies which face or faces are being updated. Must be one of:
  - **pname** (*Enumerated constant*) – Specifies the single-valued material parameter of the face or faces that is being updated. Must be GL\_SHININESS.
  - **params** (*int*) – Specifies the value that parameter GL\_SHININESS will be set to. If function prototype ends in ‘v’ specifies a pointer to the value or values that pname will be set to.

**glMatrixMode (mode) :**

Specify which matrix is the current matrix.

**See Also:**

[OpenGL Docs](#)

**Parameters mode** (*Enumerated constant*) – Specifies which matrix stack is the target for subsequent matrix operations.

**glMultMatrix (m) :**

B{glMultMatrixd, glMultMatrixf}

Multiply the current matrix with the specified matrix

**See Also:**

[OpenGL Docs](#)

**Parameters m** (*Buffer object*. Depends on function prototype.) – Points to 16 consecutive values that are used as the elements of a 4x4 column major matrix.

**glNewList (list, mode) :**

Create or replace a display list

**See Also:**

[OpenGL Docs](#)

**Parameters**

- **list** (*unsigned int*) – Specifies the display list name
- **mode** (*Enumerated constant*) – Specifies the compilation mode.

**glNormal3 (nx, ny, nz, v) :**

B{Normal3b, Normal3bv, Normal3d, Normal3dv, Normal3f, Normal3fv, Normal3i, Normal3iv, Normal3s, Normal3sv}

Set the current normal vector

**See Also:**

[OpenGL Docs](#)

**Parameters**

- **ny, nz** (*nx*,) – Specify the x, y, and z coordinates of the new current normal. The initial value of the current normal is the unit vector, (0, 0, 1).
- **v** (Buffer object. Depends on function prototype. ('v' prototypes)) – Specifies a pointer to an array of three elements: the x, y, and z coordinates of the new current normal.

**glOrtho(left, right, bottom, top, zNear, zFar):**

Multiply the current matrix with an orthographic matrix

**See Also:**

[OpenGL Docs](#)

**Parameters**

- **right** (*left*,) – Specify the coordinates for the left and right vertical clipping planes.
- **top** (*bottom*,) – Specify the coordinates for the bottom and top horizontal clipping planes.
- **zFar** (*zNear*,) – Specify the distances to the nearer and farther depth clipping planes. These values are negative if the plane is to be behind the viewer.

**glPassThrough(token):**

Place a marker in the feedback buffer

**See Also:**

[OpenGL Docs](#)

**Parameters** **token** (*float*) – Specifies a marker value to be placed in the feedback buffer following a GL\_PASS\_THROUGH\_TOKEN.

**glPixelMap (map, mapsize, values):**

B{glPixelMapfv, glPixelMapuiv, glPixelMapusv}

Set up pixel transfer maps

**See Also:**

[OpenGL Docs](#)

**Parameters**

- **map** (*Enumerated constant*) – Specifies a symbolic map name.
- **mapsize** (*int*) – Specifies the size of the map being defined.
- **values** (Buffer object. Depends on function prototype.) – Specifies an array of mapsize values.

**glPixelStore (pname, param):**

B{glPixelStoref, glPixelStorei}

Set pixel storage modes

**See Also:**

[OpenGL Docs](#)

**Parameters**

- **pname** (*Enumerated constant*) – Specifies the symbolic name of the parameter to be set. Six values affect the packing of pixel data into memory. Six more affect the unpacking of pixel data from memory.
- **param** (*Depends on function prototype.*) – Specifies the value that pname is set to.

**glPixelTransfer** (**pname**, **param**) :

B{glPixelTransferf, glPixelTransferi}

Set pixel transfer modes

See Also:

[OpenGL Docs](#)

#### Parameters

- **pname** (*Enumerated constant*) – Specifies the symbolic name of the pixel transfer parameter to be set.
- **param** (*Depends on function prototype.*) – Specifies the value that pname is set to.

**glPixelZoom**(**xfactor**, **yfactor**) :

Specify the pixel zoom factors

See Also:

[OpenGL Docs](#)

**Parameters** **yfactor** (*xfactor*) – Specify the x and y zoom factors for pixel write operations.

**glPointSize**(**size**) :

Specify the diameter of rasterized points

See Also:

[OpenGL Docs](#)

**Parameters** **size** (*float*) – Specifies the diameter of rasterized points. The initial value is 1.

**glPolygonMode**(**face**, **mode**) :

Select a polygon rasterization mode

See Also:

[OpenGL Docs](#)

#### Parameters

- **face** (*Enumerated constant*) – Specifies the polygons that mode applies to. Must be GL\_FRONT for front-facing polygons, GL\_BACK for back-facing polygons, or GL\_FRONT\_AND\_BACK for front- and back-facing polygons.
- **mode** (*Enumerated constant*) – Specifies how polygons will be rasterized. The initial value is GL\_FILL for both front- and back-facing polygons.

**glPolygonOffset**(**factor**, **units**) :

Set the scale and units used to calculate depth values

See Also:

[OpenGL Docs](#)

#### Parameters

- **factor** (*float*) – Specifies a scale factor that is used to create a variable depth offset for each polygon. The initial value is 0.
- **units** (*float*) – Is multiplied by an implementation-specific value to create a constant depth offset. The initial value is 0.

**glPolygonStipple(*mask*) :**

Set the polygon stippling pattern

**See Also:**

[OpenGL Docs](#)

**Parameters** **mask** (*Buffer* object I{type GL\_BYTE}) – Specifies a pointer to a 32x32 stipple pattern that will be unpacked from memory in the same way that `glDrawPixels` unpacks pixels.

**glPopAttrib() :**

Pop the server attribute stack

**See Also:**

[OpenGL Docs](#)

**glPopClientAttrib() :**

Pop the client attribute stack

**See Also:**

[OpenGL Docs](#)

**glPopMatrix() :**

Pop the current matrix stack

**See Also:**

[OpenGL Docs](#)

**glPopName() :**

Pop the name stack

**See Also:**

[OpenGL Docs](#)

**glPrioritizeTextures(*n*, *textures*, *priorities*) :**

Set texture residence priority

**See Also:**

[OpenGL Docs](#)

**Parameters**

- **n** (*int*) – Specifies the number of textures to be prioritized.
- **textures** (*Buffer* I{type GL\_INT}) – Specifies an array containing the names of the textures to be prioritized.
- **priorities** (*Buffer* I{type GL\_FLOAT}) – Specifies an array containing the texture priorities. A priority given in an element of priorities applies to the texture named by the corresponding element of textures.

**glPushAttrib(*mask*) :**

Push the server attribute stack

**See Also:**

[OpenGL Docs](#)

**Parameters** **mask** (*Enumerated constant(s)*) – Specifies a mask that indicates which attributes to save.

**glPushClientAttrib (mask) :**

Push the client attribute stack

**See Also:**

[OpenGL Docs](#)

**Parameters** **mask** (*Enumerated constant(s)*) – Specifies a mask that indicates which attributes to save.

**glPushMatrix () :**

Push the current matrix stack

**See Also:**

[OpenGL Docs](#)

**glPushName (name) :**

Push the name stack

**See Also:**

[OpenGL Docs](#)

**Parameters** **name** (*unsigned int*) – Specifies a name that will be pushed onto the name stack.

**glRasterPos (x, y, z, w) :**

B{glRasterPos2d, glRasterPos2f, glRasterPos2i, glRasterPos2s, glRasterPos3d, glRasterPos3f, glRasterPos3i, glRasterPos3s, glRasterPos4d, glRasterPos4f, glRasterPos4i, glRasterPos4s, glRasterPos2dv, glRasterPos2fv, glRasterPos2iv, glRasterPos2sv, glRasterPos3dv, glRasterPos3fv, glRasterPos3iv, glRasterPos3sv, glRasterPos4dv, glRasterPos4fv, glRasterPos4iv, glRasterPos4sv}

Specify the raster position for pixel operations

**See Also:**

[OpenGL Docs](#)

**Parameters** **y, z, w** (*x*) – Specify the x,y,z, and w object coordinates (if present) for the raster position. If function prototype ends in ‘v’ specifies a pointer to an array of two, three, or four elements, specifying x, y, z, and w coordinates, respectively.

---

**Note:** If you are drawing to the 3d view with a Scriptlink of a space handler the zoom level of the panels will scale the glRasterPos by the view matrix. so a X of 10 will not always offset 10 pixels as you would expect.

To work around this get the scale value of the view matrix and use it to scale your pixel values.

```
import bgl
xval, yval= 100, 40
# Get the scale of the view matrix
view_matrix = bgl.Buffer(bgl.GL_FLOAT, 16)
bgl.glGetFloatv(bgl.GL_MODELVIEW_MATRIX, view_matrix)
f = 1.0 / view_matrix[0]

# Instead of the usual glRasterPos2i(xval, yval)
bgl.glRasterPos2f(xval * f, yval * f)
```

---

**glReadBuffer (mode) :**

Select a color buffer source for pixels.

**See Also:**

[OpenGL Docs](#)

**Parameters mode** (*Enumerated constant*) – Specifies a color buffer.

**glReadPixels(x, y, width, height, format, type, pixels) :**

Read a block of pixels from the frame buffer

**See Also:**

[OpenGL Docs](#)

**Parameters**

- **y** (*x<sub>1</sub>*) – Specify the window coordinates of the first pixel that is read from the frame buffer. This location is the lower left corner of a rectangular block of pixels.
- **height** (*width*,) – Specify the dimensions of the pixel rectangle. *width* and *height* of one correspond to a single pixel.
- **format** (*Enumerated constant*) – Specifies the format of the pixel data.
- **type** (*Enumerated constant*) – Specifies the data type of the pixel data.
- **pixels** (*Buffer object*) – Returns the pixel data.

**glRect (x1, y1, x2, y2, v1, v2) :**

B{glRectd, glRectf, glRecti, glRects, glRectdv, glRectfv, glRectiv, glRectsv}

Draw a rectangle

**See Also:**

[OpenGL Docs](#)

**Parameters**

- **y1** (*x<sub>1</sub>*,) – Specify one vertex of a rectangle
- **y2** (*x<sub>2</sub>*,) – Specify the opposite vertex of the rectangle
- **v2** (*v<sub>1</sub>*,) – Specifies a pointer to one vertex of a rectangle and the pointer to the opposite vertex of the rectangle

**glRenderMode (mode) :**

Set rasterization mode

**See Also:**

[OpenGL Docs](#)

**Parameters mode** (*Enumerated constant*) – Specifies the rasterization mode.

**glRotate (angle, x, y, z) :**

B{glRotated, glRotatef}

Multiply the current matrix by a rotation matrix

**See Also:**

[OpenGL Docs](#)

**Parameters**

- **angle** (*Depends on function prototype.*) – Specifies the angle of rotation in degrees.
- **y, z** (*x,*) – Specify the x, y, and z coordinates of a vector respectively.

**glScale (x, y, z) :**

B{glScaled, glScalef}

Multiply the current matrix by a general scaling matrix

**See Also:**[OpenGL Docs](#)**Parameters** **y, z** (*x,*) – Specify scale factors along the x, y, and z axes, respectively.**glScissor(x, y, width, height) :**

Define the scissor box

**See Also:**[OpenGL Docs](#)**Parameters**

- **y** (*x,*) – Specify the lower left corner of the scissor box. Initially (0, 0).
- **height** (*width*) – Specify the width and height of the scissor box. When a GL context is first attached to a window, width and height are set to the dimensions of that window.

**glSelectBuffer(size, buffer) :**

Establish a buffer for selection mode values

**See Also:**[OpenGL Docs](#)**Parameters**

- **size** (*int*) – Specifies the size of buffer
- **buffer** (*Buffer I{type GL\_INT}*) – Returns the selection data

**glShadeModel(mode) :**

Select flat or smooth shading

**See Also:**[OpenGL Docs](#)**Parameters** **mode** (*Enumerated constant*) – Specifies a symbolic value representing a shading technique.**glStencilFunc(func, ref, mask) :**

Set function and reference value for stencil testing

**See Also:**[OpenGL Docs](#)**Parameters**

- **func** (*Enumerated constant*) – Specifies the test function.

- **ref** (*int*) – Specifies the reference value for the stencil test. ref is clamped to the range [0,2n-1], where n is the number of bitplanes in the stencil buffer. The initial value is 0.
- **mask** (*unsigned int*) – Specifies a mask that is ANDed with both the reference value and the stored stencil value when the test is done. The initial value is all 1's.

**glStencilMask (mask) :**

Control the writing of individual bits in the stencil planes

**See Also:**

[OpenGL Docs](#)

**Parameters** **mask** (*unsigned int*) – Specifies a bit mask to enable and disable writing of individual bits in the stencil planes. Initially, the mask is all 1's.

**glStencilOp (fail, zfail, zpass) :**

Set stencil test actions

**See Also:**

[OpenGL Docs](#)

**Parameters**

- **fail** (*Enumerated constant*) – Specifies the action to take when the stencil test fails. The initial value is GL\_KEEP.
- **zfail** (*Enumerated constant*) – Specifies the stencil action when the stencil test passes, but the depth test fails. zfail accepts the same symbolic constants as fail. The initial value is GL\_KEEP.
- **zpass** (*Enumerated constant*) – Specifies the stencil action when both the stencil test and the depth test pass, or when the stencil test passes and either there is no depth buffer or depth testing is not enabled. zpass accepts the same symbolic constants as fail. The initial value is GL\_KEEP.

**glTexCoord (s, t, r, q, v) :**

B{glTexCoord1d, glTexCoord1f, glTexCoord1i, glTexCoord1s, glTexCoord2d, glTexCoord2f, glTexCoord2i, glTexCoord2s, glTexCoord3d, glTexCoord3f, glTexCoord3i, glTexCoord3s, glTexCoord4d, glTexCoord4f, glTexCoord4i, glTexCoord4s, glTexCoord1dv, glTexCoord1fv, glTexCoord1iv, glTexCoord1sv, glTexCoord2dv, glTexCoord2fv, glTexCoord2iv, glTexCoord2sv, glTexCoord3dv, glTexCoord3fv, glTexCoord3iv, glTexCoord3sv, glTexCoord4dv, glTexCoord4fv, glTexCoord4iv, glTexCoord4sv}

Set the current texture coordinates

**See Also:**

[OpenGL Docs](#)

**Parameters**

- **t, r, q** (*s*,) – Specify s, t, r, and q texture coordinates. Not all parameters are present in all forms of the command.
- **v** (*Buffer object*. Depends on function prototype. (for ‘v’ prototypes only)) – Specifies a pointer to an array of one, two, three, or four elements, which in turn specify the s, t, r, and q texture coordinates.

**glTexEnv (target, pname, param) :**

B{glTextEnvf, glTextEnvi, glTextEnvfv, glTextEnviv}

Set texture environment parameters

**See Also:**[OpenGL Docs](#)**Parameters**

- **target** (*Enumerated constant*) – Specifies a texture environment. Must be GL\_TEXTURE\_ENV.
- **pname** (*Enumerated constant*) – Specifies the symbolic name of a single-valued texture environment parameter. Must be GL\_TEXTURE\_ENV\_MODE.
- **param** (*Depends on function prototype.*) – Specifies a single symbolic constant. If function prototype ends in ‘v’ specifies a pointer to a parameter array that contains either a single symbolic constant or an RGBA color

**glTexGen (coord, pname, param):**

B{glTexGend, glTexGenf, glTexGeni, glTexGendv, glTexGenfv, glTexGeniv}

Control the generation of texture coordinates

**See Also:**[OpenGL Docs](#)**Parameters**

- **coord** (*Enumerated constant*) – Specifies a texture coordinate.
- **pname** (*Enumerated constant*) – Specifies the symbolic name of the texture- coordinate generation function.
- **param** (*Depends on function prototype.*) – Specifies a single-valued texture generation parameter. If function prototype ends in ‘v’ specifies a pointer to an array of texture generation parameters. If pname is GL\_TEXTURE\_GEN\_MODE, then the array must contain a single symbolic constant. Otherwise, params holds the coefficients for the texture-coordinate generation function specified by pname.

**glTexImage1D(target, level, internalformat, width, border, format, type, pixels):**

Specify a one-dimensional texture image

**See Also:**[OpenGL Docs](#)**Parameters**

- **target** (*Enumerated constant*) – Specifies the target texture.
- **level** (*int*) – Specifies the level-of-detail number. Level 0 is the base image level. Level n is the nth mipmap reduction image.
- **internalformat** (*int*) – Specifies the number of color components in the texture.
- **width** (*int*) – Specifies the width of the texture image. Must be  $2n+2(\text{border})$  for some integer n. All implementations support texture images that are at least 64 texels wide. The height of the 1D texture image is 1.
- **border** (*int*) – Specifies the width of the border. Must be either 0 or 1.
- **format** (*Enumerated constant*) – Specifies the format of the pixel data.
- **type** (*Enumerated constant*) – Specifies the data type of the pixel data.
- **pixels** (*Buffer object.*) – Specifies a pointer to the image data in memory.

**glTexImage2D(target, level, internalformat, width, height, border, format, type, pixels):**  
Specify a two-dimensional texture image

See Also:

[OpenGL Docs](#)

#### Parameters

- **target** (*Enumerated constant*) – Specifies the target texture.
- **level** (*int*) – Specifies the level-of-detail number. Level 0 is the base image level. Level n is the nth mipmap reduction image.
- **internalformat** (*int*) – Specifies the number of color components in the texture.
- **width** (*int*) – Specifies the width of the texture image. Must be  $2n+2(\text{border})$  for some integer n. All implementations support texture images that are at least 64 texels wide.
- **height** (*int*) – Specifies the height of the texture image. Must be  $2m+2(\text{border})$  for some integer m. All implementations support texture images that are at least 64 texels high.
- **border** (*int*) – Specifies the width of the border. Must be either 0 or 1.
- **format** (*Enumerated constant*) – Specifies the format of the pixel data.
- **type** (*Enumerated constant*) – Specifies the data type of the pixel data.
- **pixels** (Buffer object.) – Specifies a pointer to the image data in memory.

**glTexParameter (target, pname, param):**  
B{glTexParameterf, glTexParameteri, glTexParameterfv, glTexParameteriv}

Set texture parameters

See Also:

[OpenGL Docs](#)

#### Parameters

- **target** (*Enumerated constant*) – Specifies the target texture.
- **pname** (*Enumerated constant*) – Specifies the symbolic name of a single-valued texture parameter.
- **param** (*Depends on function prototype.*) – Specifies the value of pname. If function prototype ends in ‘v’ specifies a pointer to an array where the value or values of pname are stored.

**glTranslate (x, y, z):**  
B{glTranslatef, glTranslated}

Multiply the current matrix by a translation matrix

See Also:

[OpenGL Docs](#)

**Parameters** y, z (x,) – Specify the x, y, and z coordinates of a translation vector.

**glVertex (x, y, z, w, v):**

B{glVertex2d, glVertex2f, glVertex2i, glVertex2s, glVertex3d, glVertex3f, glVertex3i, glVertex3s, glVertex4d, glVertex4f, glVertex4i, glVertex4s, glVertex2dv, glVertex2fv, glVertex2iv, glVertex2sv, glVertex3dv, glVertex3fv, glVertex3iv, glVertex3sv, glVertex4dv, glVertex4fv, glVertex4iv, glVertex4sv}

Specify a vertex

See Also:

[OpenGL Docs](#)

#### Parameters

- **y, z, w (x,)** – Specify x, y, z, and w coordinates of a vertex. Not all parameters are present in all forms of the command.
- **v (Buffer object)**. Depends of function prototype (for ‘v’ prototypes only) – Specifies a pointer to an array of two, three, or four elements. The elements of a two-element array are x and y; of a three-element array, x, y, and z; and of a four-element array, x, y, z, and w.

**glViewport (x, y, width, height) :**

Set the viewport

See Also:

[OpenGL Docs](#)

#### Parameters

- **y (x,)** – Specify the lower left corner of the viewport rectangle, in pixels. The initial value is (0,0).
- **height (width,)** – Specify the width and height of the viewport. When a GL context is first attached to a window, width and height are set to the dimensions of that window.

**gluPerspective (fovY, aspect, zNear, zFar) :**

Set up a perspective projection matrix.

See Also:

[U{http://biology.ncsa.uiuc.edu/cgi-bin/infosrch.cgi?cmd=getdoc&coll=0650&db=bks&fname=/SGI\\_Developer/OpenGL\\_RM/ch}](http://biology.ncsa.uiuc.edu/cgi-bin/infosrch.cgi?cmd=getdoc&coll=0650&db=bks&fname=/SGI_Developer/OpenGL_RM/ch)

#### Parameters

- **fovY (double)** – Specifies the field of view angle, in degrees, in the y direction.
- **aspect (double)** – Specifies the aspect ratio that determines the field of view in the x direction. The aspect ratio is the ratio of x (width) to y (height).
- **zNear (double)** – Specifies the distance from the viewer to the near clipping plane (always positive).
- **zFar (double)** – Specifies the distance from the viewer to the far clipping plane (always positive).

**gluLookAt (eyex, eyeY, eyeZ, centerx, centerY, centerZ, upX, upY, upZ) :**

Define a viewing transformation.

See Also:

[U{http://biology.ncsa.uiuc.edu/cgi-bin/infosrch.cgi?cmd=getdoc&coll=0650&db=bks&fname=/SGI\\_Developer/OpenGL\\_RM/ch}](http://biology.ncsa.uiuc.edu/cgi-bin/infosrch.cgi?cmd=getdoc&coll=0650&db=bks&fname=/SGI_Developer/OpenGL_RM/ch)

#### Parameters

- **eyeY, eyeZ (eyex,)** – Specifies the position of the eye point.
- **centerY, centerZ (centerx,)** – Specifies the position of the reference point.
- **upY, upZ (upX,)** – Specifies the direction of the up vector.

**gluOrtho2D(left, right, bottom, top) :**

Define a 2-D orthographic projection matrix.

**See Also:**

U{[http://biology.ncsa.uiuc.edu/cgi-bin/infosrch.cgi?cmd=getdoc&coll=0650&db=bks&fname=/SGI\\_Developer/OpenGL\\_RM/chapter3.html#gluOrtho2D](http://biology.ncsa.uiuc.edu/cgi-bin/infosrch.cgi?cmd=getdoc&coll=0650&db=bks&fname=/SGI_Developer/OpenGL_RM/chapter3.html#gluOrtho2D)}

**Parameters**

- **right** (*left*,) – Specify the coordinates for the left and right vertical clipping planes.
- **top** (*bottom*,) – Specify the coordinates for the bottom and top horizontal clipping planes.

**gluPickMatrix(x, y, width, height, viewport) :**

Define a picking region.

**See Also:**

U{[http://biology.ncsa.uiuc.edu/cgi-bin/infosrch.cgi?cmd=getdoc&coll=0650&db=bks&fname=/SGI\\_Developer/OpenGL\\_RM/chapter3.html#gluPickMatrix](http://biology.ncsa.uiuc.edu/cgi-bin/infosrch.cgi?cmd=getdoc&coll=0650&db=bks&fname=/SGI_Developer/OpenGL_RM/chapter3.html#gluPickMatrix)}

**Parameters**

- **y** (*x*,) – Specify the center of a picking region in window coordinates.
- **height** (*width*,) – Specify the width and height, respectively, of the picking region in window coordinates.
- **viewport** (Buffer object. [int]) – Specifies the current viewport.

**gluProject(objx, objy, objz, modelMatrix, projMatrix, viewport, winx, winy, winz) :**

Map object coordinates to window coordinates.

**See Also:**

U{[http://biology.ncsa.uiuc.edu/cgi-bin/infosrch.cgi?cmd=getdoc&coll=0650&db=bks&fname=/SGI\\_Developer/OpenGL\\_RM/chapter3.html#gluProject](http://biology.ncsa.uiuc.edu/cgi-bin/infosrch.cgi?cmd=getdoc&coll=0650&db=bks&fname=/SGI_Developer/OpenGL_RM/chapter3.html#gluProject)}

**Parameters**

- **objy, objz** (*objx*,) – Specify the object coordinates.
- **modelMatrix** (Buffer object. [double]) – Specifies the current modelview matrix (as from a glGetDoublev call).
- **projMatrix** (Buffer object. [double]) – Specifies the current projection matrix (as from a glGetDoublev call).
- **viewport** (Buffer object. [int]) – Specifies the current viewport (as from a glGetIntegerv call).
- **winy, winz** (*winx*,) – Return the computed window coordinates.

**gluUnProject(winx, winy, winz, modelMatrix, projMatrix, viewport, objx, objy, objz) :**

Map object coordinates to window coordinates.

**See Also:**

U{[http://biology.ncsa.uiuc.edu/cgi-bin/infosrch.cgi?cmd=getdoc&coll=0650&db=bks&fname=/SGI\\_Developer/OpenGL\\_RM/chapter3.html#gluUnProject](http://biology.ncsa.uiuc.edu/cgi-bin/infosrch.cgi?cmd=getdoc&coll=0650&db=bks&fname=/SGI_Developer/OpenGL_RM/chapter3.html#gluUnProject)}

**Parameters**

- **winy, winz** (*winx*,) – Specify the window coordinates to be mapped.
- **modelMatrix** (Buffer object. [double]) – Specifies the current modelview matrix (as from a glGetDoublev call).

- **projMatrix** (Buffer object. [double]) – Specifies the current projection matrix (as from a glGetDoublev call).
- **viewport** (Buffer object. [int]) – Specifies the current viewport (as from a glGetIntegerv call).
- **objy, objz** (*objx*) – Return the computed object coordinates.

class Buffer:

The Buffer object is simply a block of memory that is delineated and initialized by the user. Many OpenGL functions return data to a C-style pointer, however, because this is not possible in python the Buffer object can be used to this end. Wherever pointer notation is used in the OpenGL functions the Buffer object can be used in its bgl wrapper. In some instances the Buffer object will need to be initialized with the template parameter, while in other instances the user will want to create just a blank buffer which will be zeroed by default.

```
import bgl

myByteBuffer = bgl.Buffer(bgl.GL_BYTE, [32, 32])
bgl.glGetPolygonStipple(myByteBuffer)

print(myByteBuffer.dimensions)
print(myByteBuffer.to_list())

sliceBuffer = myByteBuffer[0:16]
print(sliceBuffer)
```

#### bgl.dimensions

The number of dimensions of the Buffer.

#### bgl.to\_list()

The contents of the Buffer as a python list.

#### \_\_init\_\_(type, dimensions, template = None):

This will create a new Buffer object for use with other bgl OpenGL commands. Only the type of argument to store in the buffer and the dimensions of the buffer are necessary. Buffers are zeroed by default unless a template is supplied, in which case the buffer is initialized to the template.

#### Parameters

- **type** (*int*) – The format to store data in. The type should be one of GL\_BYTE, GL\_SHORT, GL\_INT, or GL\_FLOAT.
- **dimensions** (*An int or sequence object specifying the dimensions of the buffer.*) – If the dimensions are specified as an int a linear array will be created for the buffer. If a sequence is passed for the dimensions, the buffer becomes n-Dimensional, where n is equal to the number of parameters passed in the sequence. Example: [256,2] is a two-dimensional buffer while [256,256,4] creates a three-dimensional buffer. You can think of each additional dimension as a sub-item of the dimension to the left. i.e. [10,2] is a 10 element array each with 2 sub-items. [(0,0), (0,1), (1,0), (1,1), (2,0), ...] etc.
- **template** (*A python sequence object (optional)*) – A sequence of matching dimensions which will be used to initialize the Buffer. If a template is not passed in all fields will be initialized to 0.

**Return type** Buffer object

**Returns** The newly created buffer as a PyObject.

## 3.4 Font Drawing (blf)

This module provides access to blenders text drawing functions.

### 3.4.1 Hello World Text Example

Blender Game Engine example of using the blf module. For this module to work we need to use the OpenGL wrapper `bgl` as well.

```
# import game engine modules
from bge import render
from bge import logic
# import stand alone modules
import bgl
import blf

def init():
    """init function - runs once"""
    # create a new font object, use external ttf file
    font_path = logic.expandPath("//Zeyada.ttf")
    # store the font indice - to use later
    logic.font_id = blf.load(font_path)

    # set the font drawing routine to run every frame
    scene = logic.getCurrentScene()
    scene.post_draw = [write]

def write():
    """write on screen"""
    width = render.getWindowWidth()
    height = render.getWindowHeight()

    # OpenGL setup
    bgl.glMatrixMode(bgl.GL_PROJECTION)
    bgl.glLoadIdentity()
    bgl.gluOrtho2D(0, width, 0, height)
    bgl.glMatrixMode(bgl.GL_MODELVIEW)
    bgl.glLoadIdentity()

    # BLF drawing routine
    font_id = logic.font_id
    blf.position(font_id, (width * 0.2), (height * 0.3), 0)
    blf.size(font_id, 50, 72)
    blf.draw(font_id, "Hello World")

blf.CLIPPING
constant value 2

blf.KERNING_DEFAULT
constant value 8

blf.ROTATION
constant value 1

blf.SHADOW
constant value 4
```

**blf.aspect** (*fontid, aspect*)

Set the aspect for drawing text.

**Parameters**

- **fontid** (*int*) – The id of the typeface as returned by `blf.load()`, for default font use 0.
- **aspect** (*float*) – The aspect ratio for text drawing to use.

**blf.blur** (*fontid, radius*)

Set the blur radius for drawing text.

**Parameters**

- **fontid** (*int*) – The id of the typeface as returned by `blf.load()`, for default font use 0.
- **radius** (*int*) – The radius for blurring text (in pixels).

**blf.clipping** (*fontid, xmin, ymin, xmax, ymax*)

Set the clipping, enable/disable using CLIPPING.

**Parameters**

- **fontid** (*int*) – The id of the typeface as returned by `blf.load()`, for default font use 0.
- **xmin** (*float*) – Clip the drawing area by these bounds.
- **ymin** (*float*) – Clip the drawing area by these bounds.
- **xmax** (*float*) – Clip the drawing area by these bounds.
- **ymax** (*float*) – Clip the drawing area by these bounds.

**blf.dimensions** (*fontid, text*)

Return the width and height of the text.

**Parameters**

- **fontid** (*int*) – The id of the typeface as returned by `blf.load()`, for default font use 0.
- **text** (*string*) – the text to draw.

**Returns** the width and height of the text.

**Return type** tuple of 2 floats

**blf.disable** (*fontid, option*)

Disable option.

**Parameters**

- **fontid** (*int*) – The id of the typeface as returned by `blf.load()`, for default font use 0.
- **option** (*int*) – One of ROTATION, CLIPPING, SHADOW or KERNING\_DEFAULT.

**blf.draw** (*fontid, text*)

Draw text in the current context.

**Parameters**

- **fontid** (*int*) – The id of the typeface as returned by `blf.load()`, for default font use 0.
- **text** (*string*) – the text to draw.

**blf.enable** (*fontid, option*)

Enable option.

**Parameters**

- **fontid** (*int*) – The id of the typeface as returned by `blf.load()`, for default font use 0.
- **option** (*int*) – One of ROTATION, CLIPPING, SHADOW or KERNING\_DEFAULT.

`blf.load(filename)`

Load a new font.

**Parameters** **filename** (*string*) – the filename of the font.

**Returns** the new font's fontid or -1 if there was an error.

**Return type** integer

`blf.position(fontid, x, y, z)`

Set the position for drawing text.

**Parameters**

- **fontid** (*int*) – The id of the typeface as returned by `blf.load()`, for default font use 0.
- **x** (*float*) – X axis position to draw the text.
- **y** (*float*) – Y axis position to draw the text.
- **z** (*float*) – Z axis position to draw the text.

`blf.rotation(fontid, angle)`

Set the text rotation angle, enable/disable using ROTATION.

**Parameters**

- **fontid** (*int*) – The id of the typeface as returned by `blf.load()`, for default font use 0.
- **angle** (*float*) – The angle for text drawing to use.

`blf.shadow(fontid, level, r, g, b, a)`

Shadow options, enable/disable using SHADOW .

**Parameters**

- **fontid** (*int*) – The id of the typeface as returned by `blf.load()`, for default font use 0.
- **level** (*int*) – The blur level, can be 3, 5 or 0.
- **r** (*float*) – Shadow color (red channel 0.0 - 1.0).
- **g** (*float*) – Shadow color (green channel 0.0 - 1.0).
- **b** (*float*) – Shadow color (blue channel 0.0 - 1.0).
- **a** (*float*) – Shadow color (alpha channel 0.0 - 1.0).

`blf.shadow_offset(fontid, x, y)`

Set the offset for shadow text.

**Parameters**

- **fontid** (*int*) – The id of the typeface as returned by `blf.load()`, for default font use 0.
- **x** (*float*) – Vertical shadow offset value in pixels.
- **y** (*float*) – Horizontal shadow offset value in pixels.

`blf.size(fontid, size, dpi)`

Set the size and dpi for drawing text.

**Parameters**

- **fontid** (*int*) – The id of the typeface as returned by `blf.load()`, for default font use 0.

- **size** (*int*) – Point size of the font.
- **dpi** (*int*) – dots per inch value to use for drawing.

## 3.5 Audio System (aud)

This module provides access to the audaspace audio library.

### 3.5.1 Basic Sound Playback

This script shows how to use the classes: `Device`, `Factory` and `Handle`.

```
import aud

device = aud.device()
# load sound file (it can be a video file with audio)
factory = aud.Factory('music.ogg')

# play the audio, this return a handle to control play/pause
handle = device.play(sound)
# if the audio is not too big and will be used often you can buffer it
factory_buffered = aud.Factory.buffer(sound)
handle_buffered = device.play(buffered)

# stop the sounds (otherwise they play until their ends)
handle.stop()
handle_buffered.stop()

aud.AUD_DEVICE_JACK
    constant value 3

aud.AUD_DEVICE_NULL
    constant value 0

aud.AUD_DEVICE_OPENGL
    constant value 1

aud.AUD_DEVICE SDL
    constant value 2

aud.AUD_DISTANCE_MODEL_EXPONENT
    constant value 5

aud.AUD_DISTANCE_MODEL_EXPONENT_CLAMPED
    constant value 6

aud.AUD_DISTANCE_MODEL_INVALID
    constant value 0

aud.AUD_DISTANCE_MODEL_INVERSE
    constant value 1

aud.AUD_DISTANCE_MODEL_INVERSE_CLAMPED
    constant value 2

aud.AUD_DISTANCE_MODEL_LINEAR
    constant value 3
```

`aud.AUD_DISTANCE_MODEL_LINEAR_CLAMPED`  
constant value 4

`aud.AUD_FORMAT_FLOAT32`  
constant value 36

`aud.AUD_FORMAT_FLOAT64`  
constant value 40

`aud.AUD_FORMAT_INVALID`  
constant value 0

`aud.AUD_FORMAT_S16`  
constant value 18

`aud.AUD_FORMAT_S24`  
constant value 19

`aud.AUD_FORMAT_S32`  
constant value 20

`aud.AUD_FORMAT_U8`  
constant value 1

`aud.AUD_STATUS_INVALID`  
constant value 0

`aud.AUD_STATUS_PAUSED`  
constant value 2

`aud.AUD_STATUS_PLAYING`  
constant value 1

`device()`

Returns the application's `Device`.

**return** The application's `Device`.

**rtype** `Device`

**class** `aud.Device`

Device objects represent an audio output backend like OpenAL or SDL, but might also represent a file output or RAM buffer output.

`lock()`

Locks the device so that it's guaranteed, that no samples are read from the streams until `unlock()` is called. This is useful if you want to do start/stop/pause/resume some sounds at the same time.

---

**Note:** The device has to be unlocked as often as locked to be able to continue playback.

---

**Warning:** Make sure the time between locking and unlocking is as short as possible to avoid clicks.

`play(factory, keep=False)`

Plays a factory.

#### Parameters

- **factory** (`Factory`) – The factory to play.
- **keep** (`bool`) – See `Handle.keep`.

**Returns** The playback handle with which playback can be controlled with.

**Return type** Handle

`unlock()`

Unlocks the device after a lock call, see `lock()` for details.

#### channels

The channel count of the device.

#### distance\_model

The distance model of the device.

**See Also:**

[http://connect.creativelabs.com/openal/Documentation/OpenAL%201.1%20Specification.htm#\\_Toc199835864](http://connect.creativelabs.com/openal/Documentation/OpenAL%201.1%20Specification.htm#_Toc199835864)

#### doppler\_factor

The doppler factor of the device. This factor is a scaling factor for the velocity vectors in doppler calculation. So a value bigger than 1 will exaggerate the effect as it raises the velocity.

#### format

The native sample format of the device.

#### listener\_location

The listeners's location in 3D space, a 3D tuple of floats.

#### listener\_orientation

The listener's orientation in 3D space as quaternion, a 4 float tuple.

#### listener\_velocity

The listener's velocity in 3D space, a 3D tuple of floats.

#### rate

The sampling rate of the device in Hz.

#### speed\_of\_sound

The speed of sound of the device. The speed of sound in air is typically 343 m/s.

#### volume

The overall volume of the device.

### class aud.Factory

Factory objects are immutable and represent a sound that can be played simultaneously multiple times. They are called factories because they create reader objects internally that are used for playback.

`file(filename)`

Creates a factory object of a sound file.

**Parameters** `filename (string)` – Path of the file.

**Returns** The created Factory object.

**Return type** Factory

**Warning:** If the file doesn't exist or can't be read you will not get an exception immediately, but when you try to start playback of that factory.

`sine(frequency, rate=44100)`

Creates a sine factory which plays a sine wave.

**Parameters**

- **frequency** (*float*) – The frequency of the sine wave in Hz.
- **rate** (*int*) – The sampling rate in Hz. It's recommended to set this value to the playback device's samling rate to avoid resampling.

**Returns** The created `Factory` object.

**Return type** `Factory`

`buffer()`

Buffers a factory into RAM. This saves CPU usage needed for decoding and file access if the underlying factory reads from a file on the harddisk, but it consumes a lot of memory.

**Returns** The created `Factory` object.

**Return type** `Factory`

---

**Note:** Only known-length factories can be buffered.

**Warning:** Raw PCM data needs a lot of space, only buffer short factories.

`delay(time)`

Delays by playing adding silence in front of the other factory's data.

**Parameters** **time** (*float*) – How many seconds of silence should be added before the factory.

**Returns** The created `Factory` object.

**Return type** `Factory`

`fadein(start, length)`

Fades a factory in by raising the volume linearly in the given time interval.

**Parameters**

- **start** (*float*) – Time in seconds when the fading should start.
- **length** (*float*) – Time in seconds how long the fading should last.

**Returns** The created `Factory` object.

**Return type** `Factory`

---

**Note:** Before the fade starts it plays silence.

`fadeout(start, length)`

Fades a factory in by lowering the volume linearly in the given time interval.

**Parameters**

- **start** (*float*) – Time in seconds when the fading should start.
- **length** (*float*) – Time in seconds how long the fading should last.

**Returns** The created `Factory` object.

**Return type** `Factory`

---

**Note:** After the fade this factory plays silence, so that the length of the factory is not altered.

---

filter(b, a = (1))

Filters a factory with the supplied IIR filter coefficients. Without the second parameter you'll get a FIR filter. If the first value of the a sequence is 0 it will be set to 1 automatically. If the first value of the a sequence is neither 0 nor 1, all filter coefficients will be scaled by this value so that it is 1 in the end, you don't have to scale yourself.

#### Parameters

- **b** (*sequence of float*) – The nominator filter coefficients.
- **a** (*sequence of float*) – The denominator filter coefficients.

**Returns** The created `Factory` object.

#### Return type `Factory`

highpass(frequency, Q=0.5)

Creates a second order highpass filter based on the transfer function  $H(s) = s^2 / (s^2 + s/Q + 1)$

#### Parameters

- **frequency** (*float*) – The cut off frequency of the highpass.
- **Q** (*float*) – Q factor of the lowpass.

**Returns** The created `Factory` object.

#### Return type `Factory`

join(factory)

Plays two factories in sequence.

**Parameters** **factory** (`Factory`) – The factory to play second.

**Returns** The created `Factory` object.

#### Return type `Factory`

---

**Note:** The two factories have to have the same specifications (channels and samplerate).

---

limit(start, end)

Limits a factory within a specific start and end time.

#### Parameters

- **start** (*float*) – Start time in seconds.
- **end** (*float*) – End time in seconds.

**Returns** The created `Factory` object.

#### Return type `Factory`

loop(count)

Loops a factory.

**Parameters** **count** (*integer*) – How often the factory should be looped. Negative values mean endlessly.

**Returns** The created `Factory` object.

**Return type** `Factory`

---

**Note:** This is a filter function, you might consider using `Handle.loop_count` instead.

---

`lowpass(frequency, Q=0.5)`

Creates a second order lowpass filter based on the transfer function  $H(s) = 1 / (s^2 + s/Q + 1)$

**Parameters**

- **frequency** (*float*) – The cut off frequency of the lowpass.
- **Q** (*float*) – Q factor of the lowpass.

**Returns** The created `Factory` object.

**Return type** `Factory`

`mix(factory)`

Mixes two factories.

**Parameters** **factory** (`Factory`) – The factory to mix over the other.

**Returns** The created `Factory` object.

**Return type** `Factory`

---

**Note:** The two factories have to have the same specifications (channels and samplerate).

---

`pingpong()`

Plays a factory forward and then backward. This is like joining a factory with its reverse.

**Returns** The created `Factory` object.

**Return type** `Factory`

`pitch(factor)`

Changes the pitch of a factory with a specific factor.

**Parameters** **factor** (*float*) – The factor to change the pitch with.

**Returns** The created `Factory` object.

**Return type** `Factory`

---

**Note:** This is done by changing the sample rate of the underlying factory, which has to be an integer, so the factor value rounded and the factor may not be 100 % accurate.

---

**Note:** This is a filter function, you might consider using `Handle.pitch` instead.

---

`reverse()`

Plays a factory reversed.

**Returns** The created `Factory` object.

**Return type** `Factory`

---

---

**Note:** The factory has to have a finite length and has to be seekable. It's recommended to use this only with factories with fast and accurate seeking, which is not true for encoded audio files, such ones should be buffered using `buffer()` before being played reversed.

---

**Warning:** If seeking is not accurate in the underlying factory you'll likely hear skips/jumps/cracks.

`square(threshold = 0)`

Makes a square wave out of an audio wave by setting all samples with a amplitude  $\geq$  threshold to 1, all  $\leq$  -threshold to -1 and all between to 0.

**Parameters** `threshold (float)` – Threshold value over which an amplitude counts non-zero.

**Returns** The created `Factory` object.

**Return type** `Factory`

`volume(volume)`

Changes the volume of a factory.

**Parameters** `volume (float)` – The new volume..

**Returns** The created `Factory` object.

**Return type** `Factory`

---

**Note:** Should be in the range [0, 1] to avoid clipping.

---

---

**Note:** This is a filter function, you might consider using `Handle.volume` instead.

---

### `class aud.Handle`

Handle objects are playback handles that can be used to control playback of a sound. If a sound is played back multiple times then there are as many handles.

`pause()`

Pauses playback.

**Returns** Whether the action succeeded.

**Return type** `bool`

`resume()`

Resumes playback.

**Returns** Whether the action succeeded.

**Return type** `bool`

`stop()`

Stops playback.

**Returns** Whether the action succeeded.

**Return type** `bool`

---

**Note:** This makes the handle invalid.

---

**attenuation**

This factor is used for distance based attenuation of the source.

**See Also:**

`Device.distance_model`

**cone\_angle\_inner**

The opening angle of the inner cone of the source. If the cone values of a source are set there are two (audible) cones with the apex at the `location` of the source and with infinite height, heading in the direction of the source's `orientation`. In the inner cone the volume is normal. Outside the outer cone the volume will be `cone_volume_outer` and in the area between the volume will be interpolated linearly.

**cone\_angle\_outer**

The opening angle of the outer cone of the source.

**See Also:**

`cone_angle_inner`

**cone\_volume\_outer**

The volume outside the outer cone of the source.

**See Also:**

`cone_angle_inner`

**distance\_maximum**

The maximum distance of the source. If the listener is further away the source volume will be 0.

**See Also:**

`Device.distance_model`

**distance\_reference**

The reference distance of the source. At this distance the volume will be exactly `volume`.

**See Also:**

`Device.distance_model`

**keep**

Whether the sound should be kept paused in the device when its end is reached. This can be used to seek the sound to some position and start playback again.

**Warning:** If this is set to true and you forget stopping this equals a memory leak as the handle exists until the device is destroyed.

**location**

The source's location in 3D space, a 3D tuple of floats.

**loop\_count**

The (remaining) loop count of the sound. A negative value indicates infinity.

**orientation**

The source's orientation in 3D space as quaternion, a 4 float tuple.

**pitch**

The pitch of the sound.

**position**

The playback position of the sound in seconds.

**relative**

Whether the source's location, velocity and orientation is relative or absolute to the listener.

**status**

Whether the sound is playing, paused or stopped (=invalid).

**velocity**

The source's velocity in 3D space, a 3D tuple of floats.

**volume**

The volume of the sound.

**volume\_maximum**

The maximum volume of the source.

**See Also:**

`Device.distance_model`

**volume\_minimum**

The minimum volume of the source.

**See Also:**

`Device.distance_model`

**class aud.error**

## 3.6 Extra Utilities (bpy\_extras)

Utility modules assosiated with the bpy module.

### 3.6.1 bpy\_extras submodule (bpy\_extras.object\_utils)

`bpy_extras.object_utils.add_object_align_init(context, operator)`

Return a matrix using the operator settings and view context.

**Parameters**

- **context** (`bpy.types.Context`) – The context to use.
- **operator** (`bpy.types.Operator`) – The operator, checked for location and rotation properties.

**Returns** the matrix from the context and settings.

**Return type** `mathutils.Matrix`

`bpy_extras.object_utils.object_data_add(context, obdata, operator=None)`

Add an object using the view context and preference to to initialize the location, rotation and layer.

**Parameters**

- **context** (`bpy.types.Context`) – The context to use.
- **obdata** (*valid object data type or None.*) – the data used for the new object.

- **operator** (`bpy.types.Operator`) – The operator, checked for location and rotation properties.

**Returns** the newly created object in the scene.

**Return type** `bpy.types.ObjectBase`

### 3.6.2 bpy\_extras submodule (`bpy_extras.io_utils`)

```
bpy_extras.io_utils.axis_conversion(from_forward='Y', from_up='Z', to_forward='Y',  
to_up='Z')
```

Each argument us an axis in ['X', 'Y', 'Z', '-X', '-Y', '-Z'] where the first 2 are a source and the second 2 are the target.

```
bpy_extras.io_utils.axis_conversion_ensure(operator, forward_attr, up_attr)
```

Function to ensure an operator has valid axis conversion settings, intended to be used from `bpy.types.Operator.check`.

#### Parameters

- **operator** (`bpy.types.Operator`) – the operator to access axis attributes from.
- **forward\_attr** (`string`) – attribute storing the forward axis
- **up\_attr** (`string`) – attribute storing the up axis

**Returns** True if the value was modified.

**Return type** boolean

```
bpy_extras.io_utils.create_derived_objects(scene, ob)
```

```
bpy_extras.io_utils.free_derived_objects(ob)
```

```
bpy_extras.io_utils.unpack_list(list_of_tuples)
```

```
bpy_extras.io_utils.unpack_face_list(list_of_tuples)
```

```
bpy_extras.io_utils.path_reference(filepath, base_src, base_dst, mode='AUTO',  
copy_subdir='', copy_set=None)
```

Return a filepath relative to a destination directory, for use with exporters.

#### Parameters

- **filepath** (`string`) – the file path to return, supporting blenders relative ‘//’ prefix.
- **base\_src** (`string`) – the directory the `filepath` is relative too (normally the blend file).
- **base\_dst** (`string`) – the directory the `filepath` will be referenced from (normally the export path).
- **mode** (`string`) – the method used get the path in ['AUTO', 'ABSOLUTE', 'RELATIVE', 'MATCH', 'STRIP', 'COPY']
- **copy\_subdir** (`string`) – the subdirectory of `base_dst` to use when mode='COPY'.
- **copy\_set** (`set`) – collect from/to pairs when mode='COPY', pass to `path_reference_copy` when exportign is done.

**Returns** the new filepath.

**Return type** string

```
bpy_extras.io_utils.path_reference_copy(copy_set, report=<built-in function print>)
```

Execute copying files of `path_reference`

### Parameters

- **copy\_set** (*set*) – set of (from, to) pairs to copy.
- **report** (*function*) – function used for reporting warnings, takes a string argument.

`bpy_extras.io_utils.path_reference_mode`

constant value (<built-in function EnumProperty>, {‘default’: ‘AUTO’, ‘items’: ((‘AUTO’, ‘Auto’, ‘Use Relative paths with subdirectories only’), (‘ABSOLUTE’, ‘Absolute’, ‘Always write absolute paths’), (‘RELATIVE’, ‘Relative’, ‘Always write relative path (where possible’)), (‘MATCH’, ‘Match’, ‘Match Absolute/Relative setting with input path’), (‘STRIP’, ‘Strip Path’, ‘Filename only’), (‘COPY’, ‘Copy’, ‘copy the file to the destination path (or subdirectory’))), ‘attr’: ‘path\_mode’, ‘description’: ‘Method used to reference paths’, ‘name’: ‘Path Mode’})}

`bpy_extras.io_utils.unique_name(key, name, name_dict, name_max=-1, clean_func=None, sep=’:’)`

Helper function for storing unique names which may have special characters stripped and restricted to a maximum length.

### Parameters

- **key** (any hashable object assosiated with the *name*.) – unique item this name belongs to, *name\_dict[key]* will be reused when available. This can be the object, mesh, material, etc instance its self.
- **name** (*string*) – The name used to create a unique value in *name\_dict*.
- **name\_dict** (*dict*) – This is used to cache namespace to ensure no collisions occur, this should be an empty dict initially and only modified by this function.
- **clean\_func** (*function*) – Function to call on *name* before creating a unique value.
- **sep** (*string*) – Separator to use when between the name and a number when a duplicate name is found.

`class bpy_extras.io_utils.ExportHelper`

`class bpy_extras.io_utils.ImportHelper`

## 3.6.3 bpy\_extras submodule (bpy\_extras.image\_utils)

`bpy_extras.image_utils.load_image(imagepath, dirname='', place_holder=False, recursive=False, ncase_cmp=True, convert_callback=None, verbose=False)`

Return an image from the file path with options to search multiple paths and return a placeholder if its not found.

### Parameters

- **filepath** (*string*) – The image filename If a path precedes it, this will be searched as well.
- **dirname** (*string*) – is the directory where the image may be located - any file at the end will be ignored.
- **place\_holder** (*bool*) – if True a new place holder image will be created. this is usefull so later you can relink the image to its original data.
- **recursive** (*bool*) – If True, directories will be recursively searched. Be carefull with this if you have files in your root directory because it may take a long time.
- **ncase\_cmp** (*bool*) – on non windows systems, find the correct case for the file.

- **convert\_callback** (*function*) – a function that takes an existing path and returns a new one. Use this when loading image formats blender may not support, the CONVERT\_CALLBACK can take the path for a GIF (for example), convert it to a PNG and return the PNG’s path. For formats blender can read, simply return the path that is given.

**Returns** an image or None

**Return type** bpy.types.Image

### 3.6.4 bpy\_extras submodule (bpy\_extras.mesh\_utils)

bpy\_extras.mesh\_utils.mesh\_linked\_faces (*mesh*)

Splits the mesh into connected faces, use this for separating cubes from other mesh elements within 1 mesh datablock.

**Parameters** **mesh** (bpy.types.Mesh) – the mesh used to group with.

**Returns** lists of lists containing faces.

**Return type** list

bpy\_extras.mesh\_utils.edge\_face\_count\_dict (*mesh*)

**Returns** dict of edge keys with their value set to the number of faces using each edge.

**Return type** dict

bpy\_extras.mesh\_utils.edge\_face\_count (*mesh*)

**Returns** list face users for each item in mesh.edges.

**Return type** list

bpy\_extras.mesh\_utils.edge\_loops\_from\_faces (*mesh, faces=None, seams=()*)

Edge loops defined by faces

Takes me.faces or a list of faces and returns the edge loops These edge loops are the edges that sit between quads, so they dont touch 1 quad, note: not connected will make 2 edge loops, both only containing 2 edges.

return a list of edge key lists [[(0, 1), (4, 8), (3, 8)], ...]

**Parameters**

- **mesh** (bpy.types.Mesh) – the mesh used to get edge loops from.
- **faces** (bpy.types.MeshFaces, sequence or or NoneType) – optional face list to only use some of the meshes faces.

**Returns** return a list of edge vertex index lists.

**Return type** list

bpy\_extras.mesh\_utils.edge\_loops\_from\_edges (*mesh, edges=None*)

Edge loops defined by edges

Takes me.edges or a list of edges and returns the edge loops

return a list of vertex indices. [ [1, 6, 7, 2], ... ]

closed loops have matching start and end values.

bpy\_extras.mesh\_utils.ngon\_tessellate (*from\_data, indices, fix\_loops=True*)

Takes a polyline of indices (fgon) and returns a list of face indicie lists. Designed to be used for importers that need indices for an fgon to create from existing verts.

from\_data: either a mesh, or a list/tuple of vectors. indices: a list of indices to use this list is the ordered closed polyline

to fill, and can be a subset of the data given.

**fix\_loops:** If this is enabled polylines that use loops to make multiple polyloops are dealt with correctly.

bpy\_extras.mesh\_utils.face\_random\_points(*num\_points, faces*)

Generates a list of random points over mesh faces.

#### Parameters

- **num\_points** – the number of random points to generate on each face.
- **faces** (`bpy.types.MeshFaces`, sequence) – list of the faces to generate points on.

**Returns** list of random points over all faces.

**Return type** list

### 3.6.5 bpy\_extras submodule (bpy\_extras.view3d\_utils)

bpy\_extras.view3d\_utils.region\_2d\_to\_vector\_3d(*region, rv3d, coord*)

Return a direction vector from the viewport at the specific 2d region coordinate.

#### Parameters

- **region** (`bpy.types.Region`) – region of the 3D viewport, typically bpy.context.region.
- **rv3d** (`bpy.types.RegionView3D`) – 3D region data, typically bpy.context.space\_data.region\_3d.
- **coord** (2d vector) – 2d coordinates relative to the region: (event.mouse\_region\_x, event.mouse\_region\_y) for example.

**Returns** normalized 3d vector.

**Return type** `mathutils.Vector`

bpy\_extras.view3d\_utils.region\_2d\_to\_location\_3d(*region, rv3d, coord, depth\_location*)

Return a 3d location from the region relative 2d coords, aligned with *depth\_location*.

#### Parameters

- **region** (`bpy.types.Region`) – region of the 3D viewport, typically bpy.context.region.
- **rv3d** (`bpy.types.RegionView3D`) – 3D region data, typically bpy.context.space\_data.region\_3d.
- **coord** (2d vector) – 2d coordinates relative to the region; (event.mouse\_region\_x, event.mouse\_region\_y) for example.
- **depth\_location** (3d vector) – the returned vectors depth is aligned with this since there is no defined depth with a 2d region input.

**Returns** normalized 3d vector.

**Return type** `mathutils.Vector`

bpy\_extras.view3d\_utils.location\_3d\_to\_region\_2d(*region, rv3d, coord*)

Return the *region* relative 2d location of a 3d position.

#### Parameters

- **region** (`bpy.types.Region`) – region of the 3D viewport, typically bpy.context.region.

- **rv3d** (`bpy.types.RegionView3D`) – 3D region data, typically `bpy.context.space_data.region_3d`.
- **coord** (*3d vector*) – 3d worldspace location.

**Returns** 2d location

**Return type** `mathutils.Vector`

# GAME ENGINE MODULES

## 4.1 Game Types (bge.types)

**class bge.types.PyObjectPlus**

PyObjectPlus base class of most other types in the Game Engine.

**invalid**

Test if the object has been freed by the game engine and is no longer valid.

Normally this is not a problem but when storing game engine data in the GameLogic module, KX\_Scenes or other KX\_GameObjects its possible to hold a reference to invalid data. Calling an attribute or method on an invalid object will raise a SystemError.

The invalid attribute allows testing for this case without exception handling.

**Type** boolean

**class bge.types.CValue (PyObjectPlus)**

This class is a basis for other classes.

**name**

The name of this CValue derived object (read-only).

**Type** string

**class bge.types.CPropertyValue (CValue)**

This class has no python functions

**class bge.types.SCA\_ILogicBrick (CValue)**

Base class for all logic bricks.

**executePriority**

This determines the order controllers are evaluated, and actuators are activated (lower priority is executed first).

**Type** executePriority: int

**owner**

The game object this logic brick is attached to (read-only).

**Type** [KX\\_GameObject](#) or None in exceptional cases.

**name**

The name of this logic brick (read-only).

**Type** string

**class bge.types.SCA\_PythonKeyboard (PyObjectPlus)**

The current keyboard.

**events**

A dictionary containing the status of each keyboard event or key. (read-only).

**Type** dictionary {*keycode*:*status*, ...}

**class bge.types.SCA\_PythonMouse (PyObjectPlus)**

The current mouse.

**events**

a dictionary containing the status of each mouse event. (read-only).

**Type** dictionary {*keycode*:*status*, ...}

**position**

The normalized x and y position of the mouse cursor.

**Type** list [x, y]

**visible**

The visibility of the mouse cursor.

**Type** boolean

**class bge.types.SCA\_IObject (CValue)**

This class has no python functions

**class bge.types.SCA\_ISensor (SCAILogicBrick)**

Base class for all sensor logic bricks.

**usePosPulseMode**

Flag to turn positive pulse mode on and off.

**Type** boolean

**useNegPulseMode**

Flag to turn negative pulse mode on and off.

**Type** boolean

**frequency**

The frequency for pulse mode sensors.

**Type** integer

**level**

level Option whether to detect level or edge transition when entering a state. It makes a difference only in case of logic state transition (state actuator). A level detector will immediately generate a pulse, negative or positive depending on the sensor condition, as soon as the state is activated. A edge detector will wait for a state change before generating a pulse. note: mutually exclusive with `tap`, enabling will disable `tap`.

**Type** boolean

**tap**

When enabled only sensors that are just activated will send a positive event, after this they will be detected as negative by the controllers. This will make a key that's held act as if it's only tapped for an instant. note: mutually exclusive with `level`, enabling will disable `level`.

**Type** boolean

**invert**

Flag to set if this sensor activates on positive or negative events.

**Type** boolean

**triggered**

True if this sensor brick is in a positive state. (read-only).

**Type** boolean

**positive**

True if this sensor brick is in a positive state. (read-only).

**Type** boolean

**status**

The status of the sensor (read-only): can be one of *these constants*.

**Type** int

---

**Note:** This convenient attribute combines the values of triggered and positive attributes.

---

**reset()**

Reset sensor internal state, effect depends on the type of sensor and settings.

The sensor is put in its initial state as if it was just activated.

**class** bge.types.**SCA\_IController**(*SCAILogicBrick*)

Base class for all controller logic bricks.

**state**

The controllers state bitmask. This can be used with the GameObject's state to test if the controller is active.

**Type** int bitmask

**sensors**

A list of sensors linked to this controller.

**Type** sequence supporting index/string lookups and iteration.

---

**Note:** The sensors are not necessarily owned by the same object.

---

**Note:** When objects are instanced in dupligrroups links may be lost from objects outside the dupligrroup.

---

**actuators**

A list of actuators linked to this controller.

**Type** sequence supporting index/string lookups and iteration.

---

**Note:** The sensors are not necessarily owned by the same object.

---

**Note:** When objects are instanced in dupligrroups links may be lost from objects outside the dupligrroup.

---

**useHighPriority**

When set the controller executes always before all other controllers that dont have this set.

**Type** boolen

---

**Note:** Order of execution between high priority controllers is not guaranteed.

---

**class** bge.types.**SCA\_IActuator** (*SCAILogicBrick*)

Base class for all actuator logic bricks.

**class** bge.types.**BL\_ActionActuator** (*SCA\_IActuator*)

Action Actuators apply an action to an actor.

**action**

The name of the action to set as the current action.

**Type** string

**channelNames**

A list of channel names that may be used with `setChannel` and `getChannel`.

**Type** list of strings

**frameStart**

Specifies the starting frame of the animation.

**Type** float

**frameEnd**

Specifies the ending frame of the animation.

**Type** float

**blendIn**

Specifies the number of frames of animation to generate when making transitions between actions.

**Type** float

**priority**

Sets the priority of this actuator. Actuators will lower priority numbers will override actuators with higher numbers.

**Type** integer

**frame**

Sets the current frame for the animation.

**Type** float

**propName**

Sets the property to be used in FromProp playback mode.

**Type** string

**blendTime**

Sets the internal frame timer. This property must be in the range from 0.0 to blendIn.

**Type** float

**mode**

The operation mode of the actuator. Can be one of *these constants*.

**Type** integer

**useContinue**

The actions continue option, True or False. When True, the action will always play from where last left off, otherwise negative events to this actuator will reset it to its start frame.

**Type** boolean

**framePropName**

The name of the property that is set to the current frame number.

**Type** string

**setChannel (channel, matrix)**

Alternative to the 2 arguments, 4 arguments (channel, matrix, loc, size, quat) are also supported.

**Parameters**

- **channel (string)** – A string specifying the name of the bone channel, error raised if not in [channelNames](#).
- **matrix** – A 4x4 matrix specifying the overriding transformation as an offset from the bone's rest position.
- **matrix** – list [[float]]

---

**Note:** These values are relative to the bones rest position, currently the api has no way to get this info (which is annoying), but can be worked around by using bones with a rest pose that has no translation.

**getChannel (channel)**

**Parameters** **channel (string)** – A string specifying the name of the bone channel. error raised if not in [channelNames](#).

**Returns** (loc, size, quat)

**Return type** tuple

**class** bge.types.**BL\_Shader** (*PyObjectPlus*)  
BL\_Shader GLSL shaders.

TODO - Description

**setUniformfv (name, fList)**

Set a uniform with a list of float values

**Parameters**

- **name (string)** – the uniform name
- **fList (list[float])** – a list (2, 3 or 4 elements) of float values

**delSource ()**

Clear the shader. Use this method before the source is changed with [setSource](#).

**getFragmentProg ()**

Returns the fragment program.

**Returns** The fragment program.

**Return type** string

**getVertexProg ()**

Get the vertex program.

**Returns** The vertex program.

**Return type** string

**isValid ()**

Check if the shader is valid.

**Returns** True if the shader is valid

**Return type** boolean

**setAttrib** (*enum*)

Set attribute location. (The parameter is ignored a.t.m. and the value of “tangent” is always used.)

**Parameters** **enum** (*integer*) – attribute location value

**setNumberOfPasses** (*max\_pass*)

Set the maximum number of passes. Not used a.t.m.

**Parameters** **max\_pass** (*integer*) – the maximum number of passes

**setSampler** (*name, index*)

Set uniform texture sample index.

**Parameters**

- **name** (*string*) – Uniform name
- **index** (*integer*) – Texture sample index.

**setSource** (*vertexProgram, fragmentProgram*)

Set the vertex and fragment programs

**Parameters**

- **vertexProgram** (*string*) – Vertex program
- **fragmentProgram** (*string*) – Fragment program

**setUniform1f** (*name, fx*)

Set a uniform with 1 float value.

**Parameters**

- **name** (*string*) – the uniform name
- **fx** (*float*) – Uniform value

**setUniform1i** (*name, ix*)

Set a uniform with an integer value.

**Parameters**

- **name** (*string*) – the uniform name
- **ix** (*integer*) – the uniform value

**setUniform2f** (*name, fx, fy*)

Set a uniform with 2 float values

**Parameters**

- **name** (*string*) – the uniform name
- **fx** (*float*) – first float value
- (*float*) – second float value

**setUniform2i** (*name, ix, iy*)

Set a uniform with 2 integer values

**Parameters**

- **name** (*string*) – the uniform name
- **ix** (*integer*) – first integer value
- **iy** (*integer*) – second integer value

**setUniform3f** (*name, fx, fy, fz*)

Set a uniform with 3 float values.

**Parameters**

- **name** (*string*) – the uniform name
- **fx** (*float*) – first float value
- (*float*) – second float value
- **fz** (*float*) – third float value

**setUniform3i** (*name, ix, iy, iz*)

Set a uniform with 3 integer values

**Parameters**

- **name** (*string*) – the uniform name
- **ix** (*integer*) – first integer value
- **iy** (*integer*) – second integer value
- **iz** (*integer*) – third integer value

**setUniform4f** (*name, fx, fy, fz, fw*)

Set a uniform with 4 float values.

**Parameters**

- **name** (*string*) – the uniform name
- **fx** (*float*) – first float value
- **fy** (*float*) – second float value
- **fz** (*float*) – third float value
- **fw** (*float*) – fourth float value

**setUniform4i** (*name, ix, iy, iz, iw*)

Set a uniform with 4 integer values

**Parameters**

- **name** (*string*) – the uniform name
- **ix** (*integer*) – first integer value
- **iy** (*integer*) – second integer value
- **iz** (*integer*) – third integer value
- **iw** (*integer*) – fourth integer value

**setUniformDef** (*name, type*)

Define a new uniform

**Parameters**

- **name** (*string*) – the uniform name
- **type** (*UNI\_NONE, UNI\_INT, UNI\_FLOAT, UNI\_INT2, UNI\_FLOAT2, UNI\_INT3, UNI\_FLOAT3, UNI\_INT4, UNI\_FLOAT4, UNI\_MAT3, UNI\_MAT4, UNI\_MAX*) – uniform type

**setUniformMatrix3** (*name, mat, transpose*)

Set a uniform with a 3x3 matrix value

**Parameters**

- **name** (*string*) – the uniform name
- **mat** (*3x3 matrix*) – A 3x3 matrix [[f, f, f], [f, f, f], [f, f, f]]
- **transpose** (*boolean*) – set to True to transpose the matrix

**setUniformMatrix4** (*name, mat, transpose*)

Set a uniform with a 4x4 matrix value

**Parameters**

- **name** (*string*) – the uniform name
- **mat** (*4x4 matrix*) – A 4x4 matrix [[f, f, f, f], [f, f, f, f], [f, f, f, f], [f, f, f, f]]
- **transpose** (*boolean*) – set to True to transpose the matrix

**setUniformiv** (*name, iList*)

Set a uniform with a list of integer values

**Parameters**

- **name** (*string*) – the uniform name
- **iList** (*list[integer]*) – a list (2, 3 or 4 elements) of integer values

**validate()**

Validate the shader object.

**class bge.types.BL\_ShapeActionActuator** (*SCA\_IActuator*)

ShapeAction Actuators apply an shape action to an mesh object.

**action**

The name of the action to set as the current shape action.

**Type** string**frameStart**

Specifies the starting frame of the shape animation.

**Type** float**frameEnd**

Specifies the ending frame of the shape animation.

**Type** float**blendIn**

Specifies the number of frames of animation to generate when making transitions between actions.

**Type** float**priority**

Sets the priority of this actuator. Actuators will lower priority numbers will override actuators with higher numbers.

**Type** integer**frame**

Sets the current frame for the animation.

**Type** float**propName**

Sets the property to be used in FromProp playback mode.

**Type** string

**blendTime**  
Sets the internal frame timer. This property must be in the range from 0.0 to blendin.

**Type** float

**mode**  
The operation mode of the actuator. Can be one of *these constants*.

**Type** integer

**framePropName**  
The name of the property that is set to the current frame number.

**Type** string

**class** bge.types.CListValue (*CPropertyValue*)  
This is a list like object used in the game engine internally that behaves similar to a python list in most ways.  
As well as the normal index lookup (`val= clist[i]`), CListValue supports string lookups (`val= scene.objects["Cube"]`)  
Other operations such as `len(clist)`, `list(clist)`, `clist[0:10]` are also supported.

**append** (*val*)  
Add an item to the list (like pythons append)

**Warning:** Appending values to the list can cause crashes when the list is used internally by the game engine.

**count** (*val*)  
Count the number of instances of a value in the list.

**Returns** number of instances

**Return type** integer

**index** (*val*)  
Return the index of a value in the list.

**Returns** The index of the value in the list.

**Return type** integer

**reverse** ()  
Reverse the order of the list.

**get** (*key, default=None*)  
Return the value matching key, or the default value if its not found.

**Returns** The key value or a default.

**from\_id** (*id*)  
This is a function especially for the game engine to return a value with a specific id.  
Since object names are not always unique, the id of an object can be used to get an object from the CValueList.  
Example:  
`myObID=id(gameObject)  
ob= scene.objects.from_id(myObID)`

Where myObjID is an int or long from the id function.

This has the advantage that you can store the id in places you could not store a gameObject.

**Warning:** The id is derived from a memory location and will be different each time the game engine starts.

```
class bge.types.KX_BlenderMaterial (PyObjectPlus)
    KX_BlenderMaterial
```

**getShader()**

Returns the material's shader.

**Returns** the material's shader

**Return type** [BL\\_Shader](#)

**setBlending(src, dest)**

Set the pixel color arithmetic functions.

**Parameters**

- **src** – Specifies how the red, green, blue, and alpha source blending factors are computed.
- **dest** – Specifies how the red, green, blue, and alpha destination blending factors are computed.

**getMaterialIndex()**

Returns the material's index.

**Returns** the material's index

**Return type** integer

```
class bge.types.KX_CameraActuator (SCA_IActuator)
```

Applies changes to a camera.

**damping**

strength of of the camera following movement.

**Type** float

**min**

minimum distance to the target object maintained by the actuator.

**Type** float

**max**

maximum distance to stay from the target object.

**Type** float

**height**

height to stay above the target object.

**Type** float

**useXY**

axis this actuator is tracking, True=X, False=Y.

**Type** boolean

**object**

the object this actuator tracks.

**Type** [KX\\_GameObject](#) or None

```
class bge.types.KX_ConstraintActuator (SCA_IActuator)
    A constraint actuator limits the position, rotation, distance or orientation of an object.

damp
    Time constant of the constraint expressed in frame (not use by Force field constraint).
        Type integer

rotDamp
    Time constant for the rotation expressed in frame (only for the distance constraint), 0 = use damp for
    rotation as well.
        Type integer

direction
    The reference direction in world coordinate for the orientation constraint.
        Type 3-tuple of float: (x, y, z)

option
    Binary combination of these constants
        Type integer

time
    activation time of the actuator. The actuator disables itself after this many frame. If set to 0, the actuator is
    not limited in time.
        Type integer

propName
    the name of the property or material for the ray detection of the distance constraint.
        Type string

min
    The lower bound of the constraint. For the rotation and orientation constraint, it represents radiant.
        Type float

distance
    the target distance of the distance constraint.
        Type float

max
    the upper bound of the constraint. For rotation and orientation constraints, it represents radiant.
        Type float

rayLength
    the length of the ray of the distance constraint.
        Type float

limit
    type of constraint. Use one of the these constants
        Type integer.

class bge.types.KX_ConstraintWrapper (PyObjectPlus)
    KX_ConstraintWrapper

getConstraintId (val)
    Returns the constraint's ID
```

**Returns** the constraint's ID

**Return type** integer

**class** bge.types.KX\_GameActuator (SCA\_IActuator)

The game actuator loads a new .blend file, restarts the current .blend file or quits the game.

**fileName**

the new .blend file to load.

**Type** string

**mode**

The mode of this actuator. Can be one of *these constants*

**Type** Int

**class** bge.types.KX\_GameObject (SCA\_IObject)

All game objects are derived from this class.

Properties assigned to game objects are accessible as attributes of this class.

---

**Note:** Calling ANY method or attribute on an object that has been removed from a scene will raise a SystemError, if an object may have been removed since last accessing it use the invalid attribute to check.

---

**name**

The object's name. (read-only).

**Type** string

**mass**

The object's mass

**Type** float

---

**Note:** The object must have a physics controller for the mass to be applied, otherwise the mass value will be returned as 0.0.

---

**linVelocityMin**

Enforces the object keeps moving at a minimum velocity.

**Type** float

---

**Note:** Applies to dynamic and rigid body objects only.

---

---

**Note:** A value of 0.0 disables this option.

---

---

**Note:** While objects are stationary the minimum velocity will not be applied.

---

**linVelocityMax**

Clamp the maximum linear velocity to prevent objects moving beyond a set speed.

**Type** float

---

**Note:** Applies to dynamic and rigid body objects only.

---

---

**Note:** A value of 0.0 disables this option (rather than setting it stationary).

---

**localInertia**

the object's inertia vector in local coordinates. Read only.

**Type** list [ix, iy, iz]

**parent**

The object's parent object. (read-only).

**Type** [KX\\_GameObject](#) or None

**visible**

visibility flag.

**Type** boolean

---

**Note:** Game logic will still run for invisible objects.

---

**color**

The object color of the object. [r, g, b, a]

**Type** [mathutils.Vector](#)

**occlusion**

occlusion capability flag.

**Type** boolean

**position**

The object's position. [x, y, z] On write: local position, on read: world position Deprecated since version use: [localPosition](#) and [worldPosition](#).

**Type** [mathutils.Vector](#)

**orientation**

The object's orientation. 3x3 Matrix. You can also write a Quaternion or Euler vector. On write: local orientation, on read: world orientation Deprecated since version use: [localOrientation](#) and [worldOrientation](#).

**Type** [mathutils.Matrix](#)

**scaling**

The object's scaling factor. [sx, sy, sz] On write: local scaling, on read: world scaling Deprecated since version use: [localScale](#) and [worldScale](#).

**Type** [mathutils.Vector](#)

**localOrientation**

The object's local orientation. 3x3 Matrix. You can also write a Quaternion or Euler vector.

**Type** [mathutils.Matrix](#)

**worldOrientation**

The object's world orientation. 3x3 Matrix.

**Type** [mathutils.Matrix](#)

**localScale**

The object's local scaling factor. [sx, sy, sz]

**Type** [mathutils.Vector](#)

**worldScale**

The object's world scaling factor. Read-only. [sx, sy, sz]

**Type** `mathutils.Vector`

**localPosition**

The object's local position. [x, y, z]

**Type** `mathutils.Vector`

**worldPosition**

The object's world position. [x, y, z]

**Type** `mathutils.Vector`

**localLinearVelocity**

The object's local linear velocity. [x, y, z]

**Type** `mathutils.Vector`

**worldLinearVelocity**

The object's world linear velocity. [x, y, z]

**type** `mathutils.Vector`

**localAngularVelocity**

The object's local angular velocity. [x, y, z]

**type** `mathutils.Vector`

**worldAngularVelocity**

The object's world angular velocity. [x, y, z]

**type** `mathutils.Vector`

**timeOffset**

adjust the slowparent delay at runtime.

**Type** float

**state**

the game object's state bitmask, using the first 30 bits, one bit must always be set.

**Type** int

**meshes**

a list meshes for this object.

**Type** list of `KX_MeshProxy`

---

**Note:** Most objects use only 1 mesh.

---

---

**Note:** Changes to this list will not update the `KX_GameObject`.

---

**sensors**

a sequence of `SCA_ISensor` objects with string/index lookups and iterator support.

**Type** list

---

**Note:** This attribute is experimental and may be removed (but probably won't be).

---

**Note:** Changes to this list will not update the KX\_GameObject.

---

**controllers**

a sequence of [SCA\\_IController](#) objects with string/index lookups and iterator support.

**Type** list of [SCA\\_ISensor](#)

---

**Note:** This attribute is experimental and may be removed (but probably won't be).

---

**Note:** Changes to this list will not update the KX\_GameObject.

---

**actuators**

a list of [SCA\\_IActuator](#) with string/index lookups and iterator support.

**Type** list

---

**Note:** This attribute is experimental and may be removed (but probably won't be).

---

**Note:** Changes to this list will not update the KX\_GameObject.

---

**attrDict**

get the object's internal python attribute dictionary for direct (faster) access.

**Type** dict

**children**

direct children of this object, (read-only).

**Type** CListValue of [KX\\_GameObject](#)'s

**childrenRecursive**

all children of this object including children's children, (read-only).

**Type** CListValue of [KX\\_GameObject](#)'s

**endObject()**

Delete this object, can be used in place of the EndObject Actuator.

The actual removal of the object from the scene is delayed.

**replaceMesh (mesh, useDisplayMesh=True, usePhysicsMesh=False)**

Replace the mesh of this object with a new mesh. This works the same way as the actuator.

**Parameters**

- **mesh** (MeshProxy or string) – mesh to replace or the mesh's name.
- **useDisplayMesh** (boolean) – when enabled the display mesh will be replaced (optional argument).
- **usePhysicsMesh** (boolean) – when enabled the physics mesh will be replaced (optional argument).

**setVisible (visible, recursive)**

Sets the game object's visible flag.

**Parameters**

- **visible** (boolean) – the visible state to set.

- **recursive** (*boolean*) – optional argument to set all childrens visibility flag too.

**setOcclusion** (*occlusion, recursive*)

Sets the game object's occlusion capability.

#### Parameters

- **occlusion** (*boolean*) – the state to set the occlusion to.
- **recursive** (*boolean*) – optional argument to set all childrens occlusion flag too.

**alignAxisToVect** (*vect, axis=2, factor=1.0*)

Aligns any of the game object's axis along the given vector.

#### Parameters

- **vect** (*3D vector*) – a vector to align the axis.
- **axis** (*integer*) – The axis you want to align
  - 0: X axis
  - 1: Y axis
  - 2: Z axis
- **factor** (*float*) – Only rotate a feaction of the distance to the target vector (0.0 - 1.0)

**getAxisVect** (*vect*)

Returns the axis vector rotates by the objects worldspace orientation. This is the equivalent of multiplying the vector by the orientation matrix.

**Parameters** **vect** (*3D Vector*) – a vector to align the axis.

**Returns** The vector in relation to the objects rotation.

**Return type** 3d vector.

**applyMovement** (*movement, local=False*)

Sets the game object's movement.

#### Parameters

- **movement** (*3D Vector*) – movement vector.
- **local** –
  - False: you get the “global” movement ie: relative to world orientation.
  - True: you get the “local” movement ie: relative to object orientation.
- **local** – boolean

**applyRotation** (*rotation, local=False*)

Sets the game object's rotation.

#### Parameters

- **rotation** (*3D Vector*) – rotation vector.
- **local** –
  - False: you get the “global” rotation ie: relative to world orientation.
  - True: you get the “local” rotation ie: relative to object orientation.
- **local** – boolean

**applyForce** (*force, local=False*)

Sets the game object's force.

This requires a dynamic object.

**Parameters**

- **force** (*3D Vector*) – force vector.
- **local** (*boolean*) –
  - False: you get the “global” force ie: relative to world orientation.
  - True: you get the “local” force ie: relative to object orientation.

**applyTorque** (*torque, local=False*)

Sets the game object's torque.

This requires a dynamic object.

**Parameters**

- **torque** (*3D Vector*) – torque vector.
- **local** (*boolean*) –
  - False: you get the “global” torque ie: relative to world orientation.
  - True: you get the “local” torque ie: relative to object orientation.

**getLinearVelocity** (*local=False*)

Gets the game object's linear velocity.

This method returns the game object's velocity through it's centre of mass, ie no angular velocity component.

**Parameters** **local** (*boolean*) –

- False: you get the “global” velocity ie: relative to world orientation.
- True: you get the “local” velocity ie: relative to object orientation.

**Returns** the object's linear velocity.

**Return type** list [vx, vy, vz]

**setLinearVelocity** (*velocity, local=False*)

Sets the game object's linear velocity.

This method sets game object's velocity through it's centre of mass, ie no angular velocity component.

This requires a dynamic object.

**Parameters**

- **velocity** (*3D Vector*) – linear velocity vector.
- **local** (*boolean*) –
  - False: you get the “global” velocity ie: relative to world orientation.
  - True: you get the “local” velocity ie: relative to object orientation.

**getAngularVelocity** (*local=False*)

Gets the game object's angular velocity.

**Parameters** **local** (*boolean*) –

- False: you get the “global” velocity ie: relative to world orientation.

- True: you get the “local” velocity ie: relative to object orientation.

**Returns** the object’s angular velocity.

**Return type** list [vx, vy, vz]

**setAngularVelocity** (*velocity, local=False*)

Sets the game object’s angular velocity.

This requires a dynamic object.

#### Parameters

- **velocity** (*boolean*) – angular velocity vector.
- **local** –
  - False: you get the “global” velocity ie: relative to world orientation.
  - True: you get the “local” velocity ie: relative to object orientation.

**getVelocity** (*point=(0, 0, 0)*)

Gets the game object’s velocity at the specified point.

Gets the game object’s velocity at the specified point, including angular components.

**Parameters** **point** (*3D Vector*) – optional point to return the velocity for, in local coordinates.

**Returns** the velocity at the specified point.

**Return type** list [vx, vy, vz]

**getReactionForce** ()

Gets the game object’s reaction force.

The reaction force is the force applied to this object over the last simulation timestep. This also includes impulses, eg from collisions.

**Returns** the reaction force of this object.

**Return type** list [fx, fy, fz]

---

**Note:** This is not implemented at the moment.

**applyImpulse** (*point, impulse*)

Applies an impulse to the game object.

This will apply the specified impulse to the game object at the specified point. If point != position, apply-Impulse will also change the object’s angular momentum. Otherwise, only linear momentum will change.

**Parameters** **point** (*the point to apply the impulse to (in world coordinates)*) – the point to apply the impulse to (in world coordinates)

**suspendDynamics** ()

Suspends physics for this object.

**restoreDynamics** ()

Resumes physics for this object.

---

**Note:** The objects linear velocity will be applied from when the dynamics were suspended.

**enableRigidBody** ()

Enables rigid body physics for this object.

Rigid body physics allows the object to roll on collisions.

---

**Note:** This is not working with bullet physics yet.

---

**disableRigidBody ()**

Disables rigid body physics for this object.

---

**Note:** This is not working with bullet physics yet. The angular is removed but rigid body physics can still rotate it later.

---

**setParent (*parent, compound=True, ghost=True*)**

Sets this object's parent. Control the shape status with the optional compound and ghost parameters:

In that case you can control if it should be ghost or not:

**Parameters**

- **parent** ([KX\\_GameObject](#)) – new parent object.
- **compound** (*boolean*) – whether the shape should be added to the parent compound shape.
  - True: the object shape should be added to the parent compound shape.
  - False: the object should keep its individual shape.
- **ghost** (*boolean*) – whether the object should be ghost while parented.
  - True: if the object should be made ghost while parented.
  - False: if the object should be solid while parented.

---

**Note:** If the object type is sensor, it stays ghost regardless of ghost parameter

---

**removeParent ()**

Removes this objects parent.

**getPhysicsId ()**

Returns the user data object associated with this game object's physics controller.

**getPropertyNames ()**

Gets a list of all property names.

**Returns** All property names for this object.

**Return type** list

**getDistanceTo (*other*)**

**Parameters** *other* ([KX\\_GameObject](#) or list [x, y, z]) – a point or another [KX\\_GameObject](#) to measure the distance to.

**Returns** distance to another object or point.

**Return type** float

**getVectTo (*other*)**

Returns the vector and the distance to another object or point. The vector is normalized unless the distance is 0, in which a zero length vector is returned.

**Parameters** *other* ([KX\\_GameObject](#) or list [x, y, z]) – a point or another [KX\\_GameObject](#) to get the vector and distance to.

**Returns** (distance, globalVector(3), localVector(3))

**Return type** 3-tuple (float, 3-tuple (x, y, z), 3-tuple (x, y, z))

**rayCastTo** (*other, dist, prop*)

Look towards another point/object and find first object hit within dist that matches prop.

The ray is always casted from the center of the object, ignoring the object itself. The ray is casted towards the center of another object or an explicit [x, y, z] point. Use rayCast() if you need to retrieve the hit point

**Parameters**

- **other** ([KX\\_GameObject](#) or 3-tuple) – [x, y, z] or object towards which the ray is casted
- **dist** (*float*) – max distance to look (can be negative => look behind); 0 or omitted => detect up to other
- **prop** (*string*) – property name that object must have; can be omitted => detect any object

**Returns** the first object hit or None if no object or object does not match prop

**Return type** [KX\\_GameObject](#)

**rayCast** (*objto, objfrom, dist, prop, face, xray, poly*)

Look from a point/object to another point/object and find first object hit within dist that matches prop. if poly is 0, returns a 3-tuple with object reference, hit point and hit normal or (None, None, None) if no hit. if poly is 1, returns a 4-tuple with in addition a [KX\\_PolyProxy](#) as 4th element. if poly is 2, returns a 5-tuple with in addition a 2D vector with the UV mapping of the hit point as 5th element.

```
# shoot along the axis gun-gunAim (gunAim should be collision-free)
obj, point, normal = gun.rayCast(gunAim, None, 50)
if obj:
    # do something
    pass
```

The face parameter determines the orientation of the normal.

- 0 => hit normal is always oriented towards the ray origin (as if you casted the ray from outside)
- 1 => hit normal is the real face normal (only for mesh object, otherwise face has no effect)

The ray has X-Ray capability if xray parameter is 1, otherwise the first object hit (other than self object) stops the ray. The prop and xray parameters interact as follow.

- prop off, xray off: return closest hit or no hit if there is no object on the full extend of the ray.
- prop off, xray on : idem.
- prop on, xray off: return closest hit if it matches prop, no hit otherwise.
- prop on, xray on : return closest hit matching prop or no hit if there is no object matching prop on the full extend of the ray.

The [KX\\_PolyProxy](#) 4th element of the return tuple when poly=1 allows to retrieve information on the polygon hit by the ray. If there is no hit or the hit object is not a static mesh, None is returned as 4th element.

The ray ignores collision-free objects and faces that dont have the collision flag enabled, you can however use ghost objects.

**Parameters**

- **objto** ([KX\\_GameObject](#) or 3-tuple) – [x, y, z] or object to which the ray is casted
- **objfrom** ([KX\\_GameObject](#) or 3-tuple or None) – [x, y, z] or object from which the ray is casted; None or omitted => use self object center

- **dist** (*float*) – max distance to look (can be negative => look behind); 0 or omitted => detect up to to
- **prop** (*string*) – property name that object must have; can be omitted or “” => detect any object
- **face** (*integer*) – normal option: 1=>return face normal; 0 or omitted => normal is oriented towards origin
- **xray** (*integer*) – X-ray option: 1=>skip objects that don’t match prop; 0 or omitted => stop on first object
- **poly** (*integer*) – polygon option: 0, 1 or 2 to return a 3-, 4- or 5-tuple with information on the face hit.
  - 0 or omitted: return value is a 3-tuple (object, hitpoint, hitnormal) or (None, None, None) if no hit
  - 1: return value is a 4-tuple and the 4th element is a `KX_PolyProxy` or None if no hit or the object doesn’t use a mesh collision shape.
  - 2: return value is a 5-tuple and the 5th element is a 2-tuple (u, v) with the UV mapping of the hit point or None if no hit, or the object doesn’t use a mesh collision shape, or doesn’t have a UV mapping.

#### Returns

(object, hitpoint, hitnormal) or (object, hitpoint, hitnormal, polygon) or (object, hitpoint, hitnormal, polygon, hituv).

- object, hitpoint and hitnormal are None if no hit.
- polygon is valid only if the object is valid and is a static object, a dynamic object using mesh collision shape or a soft body object, otherwise it is None
- hituv is valid only if polygon is valid and the object has a UV mapping, otherwise it is None

#### Return type

- 3-tuple (`KX_GameObject`, 3-tuple (x, y, z), 3-tuple (nx, ny, nz))
- or 4-tuple (`KX_GameObject`, 3-tuple (x, y, z), 3-tuple (nx, ny, nz), `PolyProxy`)
- or 5-tuple (`KX_GameObject`, 3-tuple (x, y, z), 3-tuple (nx, ny, nz), `PolyProxy`, 2-tuple (u, v))

---

**Note:** The ray ignores the object on which the method is called. It is casted from/to object center or explicit [x, y, z] points.

---

#### `setCollisionMargin` (*margin*)

Set the objects collision margin.

**Parameters** **margin** (*float*) – the collision margin distance in blender units.

---

**Note:** If this object has no physics controller (a physics ID of zero), this function will raise RuntimeError.

---

#### `sendMessage` (*subject*, *body*=“”, *to*=“”)

Sends a message.

**Parameters**

- **subject** (*string*) – The subject of the message
- **body** (*string*) – The body of the message (optional)
- **to** (*string*) – The name of the object to send the message to (optional)

**reinstancePhysicsMesh** (*gameObject*, *meshObject*)

Updates the physics system with the changed mesh.

If no arguments are given the physics mesh will be re-created from the first mesh assigned to the game object.

**Parameters**

- **gameObject** (*string*, [KX\\_GameObject](#) or *None*) – optional argument, set the physics shape from this gameObjs mesh.
- **meshObject** (*string*, [MeshProxy](#) or *None*) – optional argument, set the physics shape from this mesh.

**Returns** True if reinstance succeeded, False if it failed.

**Return type** boolean

---

**Note:** If this object has instances the other instances will be updated too.

---

---

**Note:** The gameObject argument has an advantage that it can convert from a mesh with modifiers applied (such as subsurf).

---

**Warning:** Only triangle mesh type objects are supported currently (not convex hull)

**Warning:** If the object is a part of a combound object it will fail (parent or child)

**Warning:** Rebuilding the physics mesh can be slow, running many times per second will give a performance hit.

**get** (*key*, *default=None*)

Return the value matching key, or the default value if its not found. :return: The key value or a default.

**class bge.types.KX\_IpoActuator** (*SCA\_IActuator*)

IPO actuator activates an animation.

**frameStart**

Start frame.

**Type** float

**frameEnd**

End frame.

**Type** float

**propName**

Use this property to define the Ipo position.

**Type** string

**framePropName**

Assign this property this action current frame number.

**Type** string

**mode**  
Play mode for the ipo. Can be one of *these constants*

**Type** integer

**useIpoAsForce**  
Apply Ipo as a global or local force depending on the local option (dynamic objects only).

**Type** boolean

**useIpoAdd**  
Ipo is added to the current loc/rot/scale in global or local coordinate according to Local flag.

**Type** boolean

**useIpoLocal**  
Let the ipo acts in local coordinates, used in Force and Add mode.

**Type** boolean

**useChildren**  
Update IPO on all children Objects as well.

**Type** boolean

```
class bge.types.KX_LightObject (KX_GameObject)
    A Light object.

    # Turn on a red alert light.
    import bge

    co = bge.logic.getCurrentController()
    light = co.owner

    light.energy = 1.0
    light.colour = [1.0, 0.0, 0.0]
```

**SPOT**  
A spot light source. See attribute `type`

**SUN**  
A point light source with no attenuation. See attribute `type`

**NORMAL**  
A point light source. See attribute `type`

**type**  
The type of light - must be SPOT, SUN or NORMAL

**layer**  
The layer mask that this light affects objects on.

**Type** bitfield

**energy**  
The brightness of this light.

**Type** float

**distance**  
The maximum distance this light can illuminate. (SPOT and NORMAL lights only).

**Type** float

**colour**

The colour of this light. Black = [0.0, 0.0, 0.0], White = [1.0, 1.0, 1.0].

**Type** list [r, g, b]

**color**

Synonym for colour.

**lin\_attenuation**

The linear component of this light's attenuation. (SPOT and NORMAL lights only).

**Type** float

**quad\_attenuation**

The quadratic component of this light's attenuation (SPOT and NORMAL lights only).

**Type** float

**spotsize**

The cone angle of the spot light, in degrees (SPOT lights only).

**Type** float in [0 - 180].

**spotblend**

Specifies the intensity distribution of the spot light (SPOT lights only).

**Type** float in [0 - 1]

---

**Note:** Higher values result in a more focused light source.

---

**class bge.types.KX\_MeshProxy (SCA\_IObject)**

A mesh object.

You can only change the vertex properties of a mesh object, not the mesh topology.

To use mesh objects effectively, you should know a bit about how the game engine handles them.

1.Mesh Objects are converted from Blender at scene load.

2.The Converter groups polygons by Material. This means they can be sent to the renderer efficiently. A material holds:

- (a)The texture.
- (b)The Blender material.
- (c)The Tile properties
- (d)The face properties - (From the “Texture Face” panel)
- (e)Transparency & z sorting
- (f)Light layer
- (g)Polygon shape (triangle/quad)
- (h)Game Object

3.Verticies will be split by face if necessary. Verticies can only be shared between faces if:

- (a)They are at the same position
- (b)UV coordinates are the same
- (c)Their normals are the same (both polygons are “Set Smooth”)
- (d)They are the same colour, for example: a cube has 24 verticies: 6 faces with 4 verticies per face.

The correct method of iterating over every `KX_VertexProxy` in a game object

```
import GameLogic

co = GameLogic.getCurrentController()
obj = co.owner

m_i = 0
mesh = obj.getMesh(m_i) # There can be more than one mesh...
while mesh != None:
    for mat in range(mesh.getNumMaterials()):
        for v_index in range(mesh.getVertexArrayLength(mat)):
            vertex = mesh.getVertex(mat, v_index)
            # Do something with vertex here...
            # ... eg: colour the vertex red.
            vertex.colour = [1.0, 0.0, 0.0, 1.0]
    m_i += 1
    mesh = obj.getMesh(m_i)
```

**materials**

**Type** list of `KX_BlenderMaterial` or `KX_PolygonMaterial` types

**numPolygons**

**Type** integer

**numMaterials**

**Type** integer

**getNumMaterials()**

**Returns** number of materials associated with this object

**Return type** integer

**getMaterialName(matid)**

Gets the name of the specified material.

**Parameters** `matid` (integer) – the specified material.

**Returns** the attached material name.

**Return type** string

**getTextureName(matid)**

Gets the name of the specified material's texture.

**Parameters** `matid` (integer) – the specified material

**Returns** the attached material's texture name.

**Return type** string

**getVertexArrayLength(matid)**

Gets the length of the vertex array associated with the specified material.

There is one vertex array for each material.

**Parameters** `matid` (integer) – the specified material

**Returns** the number of vertices in the vertex array.

**Return type** integer

**getVertex (matid, index)**

Gets the specified vertex from the mesh object.

**Parameters**

- **matid** (*integer*) – the specified material
- **index** (*integer*) – the index into the vertex array.

**Returns** a vertex object.

**Return type** [KX\\_VertexProxy](#)

**getNumPolygons ()**

**Returns** The number of polygon in the mesh.

**Return type** integer

**getPolygon (index)**

Gets the specified polygon from the mesh.

**Parameters** **index** (*integer*) – polygon number

**Returns** a polygon object.

**Return type** PolyProxy

**class bge.types.SCA\_MouseSensor (SCA\_ISensor)**

Mouse Sensor logic brick.

**position**

current [x, y] coordinates of the mouse, in frame coordinates (pixels).

**Type** [integer, interger]

**mode**

sensor mode.

**Type** integer

- KX\_MOUSESENSORMODE\_LEFTBUTTON(1)
- KX\_MOUSESENSORMODE\_MIDDLEBUTTON(2)
- KX\_MOUSESENSORMODE\_RIGHTBUTTON(3)
- KX\_MOUSESENSORMODE\_WHEELUP(4)
- KX\_MOUSESENSORMODE\_WHEELEDOWN(5)
- KX\_MOUSESENSORMODE\_MOVEMENT(6)

**getButtonStatus (button)**

Get the mouse button status.

**Parameters** **button** (*int*) – The code that represents the key you want to get the state of, use one of [these constants](#)

**Returns** The state of the given key, can be one of [these constants](#)

**Return type** int

**class bge.types.KX\_MouseFocusSensor (SCA\_MouseSensor)**

The mouse focus sensor detects when the mouse is over the current game object.

The mouse focus sensor works by transforming the mouse coordinates from 2d device space to 3d space then raycasting away from the camera.

**raySource**

The worldspace source of the ray (the view position).

**Type** list (vector of 3 floats)

**rayTarget**

The worldspace target of the ray.

**Type** list (vector of 3 floats)

**rayDirection**

The `rayTarget` - `raySource` normalized.

**Type** list (normalized vector of 3 floats)

**hitObject**

the last object the mouse was over.

**Type** `KX_GameObject` or None

**hitPosition**

The worldspace position of the ray intersecton.

**Type** list (vector of 3 floats)

**hitNormal**

the worldspace normal from the face at point of intersection.

**Type** list (normalized vector of 3 floats)

**hitUV**

the UV coordinates at the point of intersection.

**Type** list (vector of 2 floats)

If the object has no UV mapping, it returns [0, 0].

The UV coordinates are not normalized, they can be < 0 or > 1 depending on the UV mapping.

**usePulseFocus**

When enabled, moving the mouse over a different object generates a pulse. (only used when the ‘Mouse Over Any’ sensor option is set).

**Type** boolean

**class bge.types.KX\_TouchSensor (SCA\_ISensor)**

Touch sensor detects collisions between objects.

**propName**

The property or material to collide with.

**Type** string

**useMaterial**

Determines if the sensor is looking for a property or material. KX\_True = Find material; KX\_False = Find property.

**Type** boolean

**usePulseCollision**

When enabled, changes to the set of colliding objects generate a pulse.

**Type** boolean

**hitObject**

The last collided object. (read-only).

**Type** `KX_GameObject` or None

**hitObjectList**

A list of colliding objects. (read-only).

**Type** `CListValue` of `KX_GameObject`

**class bge.types.KX\_NearSensor (KX\_TouchSensor)**

A near sensor is a specialised form of touch sensor.

**distance**

The near sensor activates when an object is within this distance.

**Type** float

**resetDistance**

The near sensor deactivates when the object exceeds this distance.

**Type** float

**class bge.types.KX\_NetworkMessageActuator (SCA\_IActuator)**

Message Actuator

**propName**

Messages will only be sent to objects with the given property name.

**Type** string

**subject**

The subject field of the message.

**Type** string

**body**

The body of the message.

**Type** string

**usePropBody**

Send a property instead of a regular body message.

**Type** boolean

**class bge.types.KX\_NetworkMessageSensor (SCA\_ISensor)**

The Message Sensor logic brick.

Currently only loopback (local) networks are supported.

**subject**

The subject the sensor is looking for.

**Type** string

**frameMessageCount**

The number of messages received since the last frame. (read-only).

**Type** integer

**subjects**

The list of message subjects received. (read-only).

**Type** list of strings

**bodies**

The list of message bodies received. (read-only).

**Type** list of strings

**class bge.types.KX\_ObjectActuator (SCA\_IActuator)**

The object actuator (“Motion Actuator”) applies force, torque, displacement, angular displacement, velocity, or angular velocity to an object. Servo control allows to regulate force to achieve a certain speed target.

**force**

The force applied by the actuator.

**Type** list [x, y, z]

**useLocalForce**

A flag specifying if the force is local.

**Type** boolean

**torque**

The torque applied by the actuator.

**Type** list [x, y, z]

**useLocalTorque**

A flag specifying if the torque is local.

**Type** boolean

**dLoc**

The displacement vector applied by the actuator.

**Type** list [x, y, z]

**useLocalDLoc**

A flag specifying if the dLoc is local.

**Type** boolean

**dRot**

The angular displacement vector applied by the actuator

**Type** list [x, y, z]

---

**Note:** Since the displacement is applied every frame, you must adjust the displacement based on the frame rate, or your game experience will depend on the player’s computer speed.

---

**useLocalDRot**

A flag specifying if the dRot is local.

**Type** boolean

**linV**

The linear velocity applied by the actuator.

**Type** list [x, y, z]

**useLocalLinV**

A flag specifying if the linear velocity is local.

**Type** boolean

---

**Note:** This is the target speed for servo controllers.

---

**angV**

The angular velocity applied by the actuator.

**Type** list [x, y, z]

---

**useLocalAngV**

A flag specifying if the angular velocity is local.

**Type** boolean

**damping**

The damping parameter of the servo controller.

**Type** short

**forceLimitX**

The min/max force limit along the X axis and activates or deactivates the limits in the servo controller.

**Type** list [min(float), max(float), bool]

**forceLimitY**

The min/max force limit along the Y axis and activates or deactivates the limits in the servo controller.

**Type** list [min(float), max(float), bool]

**forceLimitZ**

The min/max force limit along the Z axis and activates or deactivates the limits in the servo controller.

**Type** list [min(float), max(float), bool]

**pid**

The PID coefficients of the servo controller.

**Type** list of floats [proportional, integral, derivate]

**reference**

The object that is used as reference to compute the velocity for the servo controller.

**Type** [KX\\_GameObject](#) or None

**class bge.types.KX\_ParentActuator (SCA\_IActuator)**

The parent actuator can set or remove an objects parent object.

**object**

the object this actuator sets the parent too.

**Type** [KX\\_GameObject](#) or None

**mode**

The mode of this actuator.

**Type** integer from 0 to 1.

**compound**

Whether the object shape should be added to the parent compound shape when parenting.

Effective only if the parent is already a compound shape.

**Type** boolean

**ghost**

Whether the object should be made ghost when parenting Effective only if the shape is not added to the parent compound shape.

**Type** boolean

**class bge.types.KX\_PhysicsObjectWrapper (PyObjectPlus)**

KX\_PhysicsObjectWrapper

**setActive (active)**

Set the object to be active.

**Parameters** **active** (*boolean*) – set to True to be active

**setAngularVelocity** (*x, y, z, local*)

Set the angular velocity of the object.

#### Parameters

- **x** (*float*) – angular velocity for the x-axis
- **y** (*float*) – angular velocity for the y-axis
- **z** (*float*) – angular velocity for the z-axis
- **local** (*boolean*) – set to True for local axis

**setLinearVelocity** (*x, y, z, local*)

Set the linear velocity of the object.

#### Parameters

- **x** (*float*) – linear velocity for the x-axis
- **y** (*float*) – linear velocity for the y-axis
- **z** (*float*) – linear velocity for the z-axis
- **local** (*boolean*) – set to True for local axis

**class** bge.types.**KX\_PolyProxy** (*SCA\_IObject*)

A polygon holds the index of the vertex forming the polygon.

Note: The polygon attributes are read-only, you need to retrieve the vertex proxy if you want to change the vertex settings.

#### **matname**

The name of polygon material, empty if no material.

**Type** string

#### **material**

The material of the polygon.

**Type** KX\_PolygonMaterial or KX\_BlenderMaterial

#### **texture**

The texture name of the polygon.

**Type** string

#### **matid**

The material index of the polygon, use this to retrieve vertex proxy from mesh proxy.

**Type** integer

#### **v1**

vertex index of the first vertex of the polygon, use this to retrieve vertex proxy from mesh proxy.

**Type** integer

#### **v2**

vertex index of the second vertex of the polygon, use this to retrieve vertex proxy from mesh proxy.

**Type** integer

#### **v3**

vertex index of the third vertex of the polygon, use this to retrieve vertex proxy from mesh proxy.

**Type** integer

**v4**

Vertex index of the fourth vertex of the polygon, 0 if polygon has only 3 vertex Use this to retrieve vertex proxy from mesh proxy.

**Type** integer

**visible**

visible state of the polygon: 1=visible, 0=invisible.

**Type** integer

**collide**

collide state of the polygon: 1=receives collision, 0=collision free.

**Type** integer

**getMaterialName()**

Returns the polygon material name with MA prefix

**Returns** material name

**Return type** string

**getMaterial()**

**Returns** The polygon material

**Return type** KX\_PolygonMaterial or KX\_BlenderMaterial

**getTextureName()**

**Returns** The texture name

**Return type** string

**getMaterialIndex()**

Returns the material bucket index of the polygon. This index and the ones returned by getVertexIndex() are needed to retrieve the vertex proxy from MeshProxy.

**Returns** the material index in the mesh

**Return type** integer

**getNumVertex()**

Returns the number of vertex of the polygon.

**Returns** number of vertex, 3 or 4.

**Return type** integer

**isVisible()**

Returns whether the polygon is visible or not

**Returns** 0=invisible, 1=visible

**Return type** boolean

**isCollider()**

Returns whether the polygon is receives collision or not

**Returns** 0=collision free, 1=receives collision

**Return type** integer

**getVertexIndex(vertex)**

Returns the mesh vertex index of a polygon vertex This index and the one returned by getMaterialIndex() are needed to retrieve the vertex proxy from MeshProxy.

**Parameters**

- **vertex** – index of the vertex in the polygon: 0->3
- **vertex** – integer

**Returns** mesh vertex index**Return type** integer**getMesh()**

Returns a mesh proxy

**Returns** mesh proxy**Return type** MeshProxy**class bge.types.KX\_PolygonMaterial (PyObjectPlus)**

This is the interface to materials in the game engine.

Materials define the render state to be applied to mesh objects.

**Warning:** Some of the methods/variables are CObjects. If you mix these up, you will crash blender.

This example requires PyOpenGL and GLEWPy

```
import GameLogic
import OpenGL
from OpenGL.GL import *
from OpenGL.GLU import *
import glew
from glew import *

glewInit()

vertex_shader = """
void main(void)
{
    gl_Position = ftransform();
}
"""

fragment_shader ="""

void main(void)
{
    gl_FragColor = vec4(1.0, 0.0, 0.0, 1.0);
}
"""

class MyMaterial:
    def __init__(self):
        self.pass_no = 0
        # Create a shader
        self.m_program = glCreateProgramObjectARB()
        # Compile the vertex shader
        self.shader(GL_VERTEX_SHADER_ARB, (vertex_shader))
        # Compile the fragment shader
        self.shader(GL_FRAGMENT_SHADER_ARB, (fragment_shader))
        # Link the shaders together
```

```
        self.link()

    def PrintInfoLog(self, tag, object):
        """
        PrintInfoLog prints the GLSL compiler log
        """
        print "Tag:      def PrintGLError(self, tag = ""):

def PrintGLError(self, tag = ""):
    """
    Prints the current GL error status
    """
    if len(tag):
        print tag
    err = glGetError()
    if err != GL_NO_ERROR:
        print "GL Error: %s\n%(gluErrorString(err))

def shader(self, type, shaders):
    """
    shader compiles a GLSL shader and attaches it to the current
    program.

    type should be either GL_VERTEX_SHADER_ARB or GL_FRAGMENT_SHADER_ARB
    shaders should be a sequence of shader source to compile.
    """
    # Create a shader object
    shader_object = glCreateShaderObjectARB(type)

    # Add the source code
    glShaderSourceARB(shader_object, len(shaders), shaders)

    # Compile the shader
    glCompileShaderARB(shader_object)

    # Print the compiler log
    self.PrintInfoLog("vertex shader", shader_object)

    # Check if compiled, and attach if it did
    compiled = glGetObjectParameterivARB(shader_object, GL_OBJECT_COMPILE_STATUS_ARB)
    if compiled:
        glAttachObjectARB(self.m_program, shader_object)

    # Delete the object (glAttachObjectARB makes a copy)
    glDeleteObjectARB(shader_object)

    # print the gl error log
    self.PrintGLError()

def link(self):
    """
    Links the shaders together.
    """
    # clear error indicator
    glGetError()

    glLinkProgramARB(self.m_program)
```

```
    self.PrintInfoLog("link", self.m_program)

linked = glGetObjectParameterivARB(self.m_program, GL_OBJECT_LINK_STATUS_ARB)
if not linked:
    print "Shader failed to link"
    return

glValidateProgramARB(self.m_program)
valid = glGetObjectParameterivARB(self.m_program, GL_OBJECT_VALIDATE_STATUS_ARB)
if not valid:
    print "Shader failed to validate"
    return

def activate(self, rasty, cachingInfo, mat):
    self.pass_no+=1
    if (self.pass_no == 1):
        glDisable(GL_COLOR_MATERIAL)
        glUseProgramObjectARB(self.m_program)
    return True

    glEnable(GL_COLOR_MATERIAL)
    glUseProgramObjectARB(0)
    self.pass_no = 0
    return False

obj = GameLogic.getCurrentController().owner

mesh = obj.meshes[0]

for mat in mesh.materials:
    mat.setCustomMaterial(MyMaterial())
    print mat.texture

texture
    Texture name.

Type string (read-only)

gl_texture
    OpenGL texture handle (eg for glBindTexture(GL_TEXTURE_2D, gl_texture).

Type integer (read-only)

material
    Material name.

Type string (read-only)

tface
    Texture face properties.

Type CObject (read-only)

tile
    Texture is tiling.

Type boolean

tilexrep
    Number of tile repetitions in x direction.

Type integer
```

**tileyrep**

Number of tile repetitions in y direction.

**Type** integer

**drawingmode**

Drawing mode for the material. - 2 (drawingmode & 4) Textured - 4 (drawingmode & 16) Light - 14 (drawingmode & 16384) 3d Polygon Text.

**Type** bitfield

**transparent**

This material is transparent. All meshes with this material will be rendered after non transparent meshes from back to front.

**Type** boolean

**zsort**

Transparent polygons in meshes with this material will be sorted back to front before rendering. Non-Transparent polygons will be sorted front to back before rendering.

**Type** boolean

**lightlayer**

Light layers this material affects.

**Type** bitfield.

**triangle**

Mesh data with this material is triangles. It's probably not safe to change this.

**Type** boolean

**diffuse**

The diffuse colour of the material. black = [0.0, 0.0, 0.0] white = [1.0, 1.0, 1.0].

**Type** list [r, g, b]

**specular**

The specular colour of the material. black = [0.0, 0.0, 0.0] white = [1.0, 1.0, 1.0].

**Type** list [r, g, b]

**shininess**

The shininess (specular exponent) of the material. 0.0 <= shininess <= 128.0.

**Type** float

**specularity**

The amount of specular of the material. 0.0 <= specularity <= 1.0.

**Type** float

**updateTexture (tface, rasty)**

Updates a realtime animation.

**Parameters**

- **tface (CObject)** – Texture face (eg mat.tface)
- **rasty (CObject)** – Rasterizer

**setTexture (tface)**

Sets texture render state.

**Parameters** **tface (CObject)** – Texture face

```
mat.setTexture(mat.tface)
```

**activate** (*rasty, cachingInfo*)

Sets material parameters for this object for rendering.

Material Parameters set:

- 1.Texture
- 2.Backface culling
- 3.Line drawing
- 4.Specular Colour
- 5.Shininess
- 6.Diffuse Colour
- 7.Polygon Offset.

**Parameters**

- **rasty** (*CObject*) – Rasterizer instance.
- **cachingInfo** (*CObject*) – Material cache instance.

**setCustomMaterial** (*material*)

Sets the material state setup object.

Using this method, you can extend or completely replace the gameengine material to do your own advanced multipass effects.

Use this method to register your material class. Instead of the normal material, your class's activate method will be called just before rendering the mesh. This should setup the texture, material, and any other state you would like. It should return True to render the mesh, or False if you are finished. You should clean up any state Blender does not set before returning False.

Activate Method Definition:

```
def activate(self, rasty, cachingInfo, material):
```

**Parameters** **material** (*instance*) – The material object.

```
class PyMaterial:  
    def __init__(self):  
        self.pass_no = -1  
  
    def activate(self, rasty, cachingInfo, material):  
        # Activate the material here.  
        #  
        # The activate method will be called until it returns False.  
        # Every time the activate method returns True the mesh will  
        # be rendered.  
        #  
        # rasty is a CObject for passing to material.updateTexture()  
        # and material.activate()  
        # cachingInfo is a CObject for passing to material.activate()  
        # material is the KX_PolygonMaterial instance this material  
        # was added to
```

```
# default material properties:  
self.pass_no += 1  
if self.pass_no == 0:  
    material.activate(rasty, cachingInfo)  
    # Return True to do this pass  
    return True  
  
# clean up and return False to finish.  
self.pass_no = -1  
return False  
  
# Create a new Python Material and pass it to the renderer.  
mat.setCustomMaterial(PyMaterial())  
  
class bge.types.KX_RadarSensor (KX_NearSensor)  
    Radar sensor is a near sensor with a conical sensor object.  
  
    coneOrigin  
        The origin of the cone with which to test. The origin is in the middle of the cone. (read-only).  
        Type list of floats [x, y, z]  
  
    coneTarget  
        The center of the bottom face of the cone with which to test. (read-only).  
        Type list of floats [x, y, z]  
  
    distance  
        The height of the cone with which to test.  
        Type float  
  
    angle  
        The angle of the cone (in degrees) with which to test.  
        Type float from 0 to 360  
  
    axis  
        The axis on which the radar cone is cast.  
        Type integer from 0 to 5  
        KX_RADAR_AXIS_POS_X, KX_RADAR_AXIS_POS_Y, KX_RADAR_AXIS_POS_Z,  
        KX_RADAR_AXIS_NEG_X, KX_RADAR_AXIS_NEG_Y, KX_RADAR_AXIS_NEG_Z  
  
    getConeHeight ()  
        Returns The height of the cone with which to test.  
        Return type float  
  
class bge.types.KX_RaySensor (SCA_ISensor)  
    A ray sensor detects the first object in a given direction.  
  
    propName  
        The property the ray is looking for.  
        Type string  
  
    range  
        The distance of the ray.  
        Type float
```

**useMaterial**

Whether or not to look for a material (false = property).

**Type** boolean

**useXRay**

Whether or not to use XRay.

**Type** boolean

**hitObject**

The game object that was hit by the ray. (read-only).

**Type** KX\_GameObject

**hitPosition**

The position (in worldcoordinates) where the object was hit by the ray. (read-only).

**Type** list [x, y, z]

**hitNormal**

The normal (in worldcoordinates) of the object at the location where the object was hit by the ray. (read-only).

**Type** list [x, y, z]

**rayDirection**

The direction from the ray (in worldcoordinates). (read-only).

**Type** list [x, y, z]

**axis**

The axis the ray is pointing on.

**Type** integer from 0 to 5

- KX\_RAY\_AXIS\_POS\_X
- KX\_RAY\_AXIS\_POS\_Y
- KX\_RAY\_AXIS\_POS\_Z
- KX\_RAY\_AXIS\_NEG\_X
- KX\_RAY\_AXIS\_NEG\_Y
- KX\_RAY\_AXIS\_NEG\_Z

**class bge.types.KX\_SCA\_AddObjectActuator (SCA\_IActuator)**

Edit Object Actuator (in Add Object Mode)

**Warning:** An Add Object actuator will be ignored if at game start, the linked object doesn't exist (or is empty) or the linked object is in an active layer.

Error: GameObject 'Name' has a AddObjectActuator 'ActuatorName' without object (in 'nonactive'

**object**

the object this actuator adds.

**Type** KX\_GameObject or None

**objectLastCreated**

the last added object from this actuator (read-only).

**Type** `KX_GameObject` or None

**time**

the lifetime of added objects, in frames. Set to 0 to disable automatic deletion.

**Type** integer

**linearVelocity**

the initial linear velocity of added objects.

**Type** list [vx, vy, vz]

**angularVelocity**

the initial angular velocity of added objects.

**Type** list [vx, vy, vz]

**instantAddObject()**

adds the object without needing to calling `SCA_PythonController.activate()`

---

**Note:** Use `objectLastCreated` to get the newly created object.

---

**class** `bge.types.KX_SCA_DynamicActuator (SCA_IActuator)`

Dynamic Actuator.

**mode**

**Type** integer

the type of operation of the actuator, 0-4

- `KX_DYN_RESTORE_DYNAMICS(0)`
- `KX_DYN_DISABLE_DYNAMICS(1)`
- `KX_DYN_ENABLE_RIGID_BODY(2)`
- `KX_DYN_DISABLE_RIGID_BODY(3)`
- `KX_DYN_SET_MASS(4)`

**mass**

the mass value for the `KX_DYN_SET_MASS` operation.

**Type** float

**class** `bge.types.KX_SCA_EndObjectActuator (SCA_IActuator)`

Edit Object Actuator (in End Object mode)

This actuator has no python methods.

**class** `bge.types.KX_SCA_ReplaceMeshActuator (SCA_IActuator)`

Edit Object actuator, in Replace Mesh mode.

**Warning:** Replace mesh actuators will be ignored if at game start, the named mesh doesn't exist.  
This will generate a warning in the console

Error: GameObject 'Name' ReplaceMeshActuator 'ActuatorName' without object

```
# Level-of-detail
# Switch a game object's mesh based on its depth in the camera view.
# +-----+ +-----+ +-----+
# | Always | Python | Edit Object (Replace Mesh) LOD.Mesh |
```

```

# +-----+ +-----+ +-----+
import GameLogic

# List detail meshes here
# Mesh (name, near, far)
# Meshes overlap so that they don't 'pop' when on the edge of the distance.
meshes = ((".Hi", 0.0, -20.0),
           ("Med", -15.0, -50.0),
           ("Lo", -40.0, -100.0)
       )

co = GameLogic.getCurrentController()
obj = co.owner
act = co.actuators["LOD." + obj.name]
cam = GameLogic.getCurrentScene().active_camera

def Depth(pos, plane):
    return pos[0]*plane[0] + pos[1]*plane[1] + pos[2]*plane[2] + plane[3]

# Depth is negative and decreasing further from the camera
depth = Depth(obj.position, cam.world_to_camera[2])

newmesh = None
curmesh = None
# Find the lowest detail mesh for depth
for mesh in meshes:
    if depth < mesh[1] and depth > mesh[2]:
        newmesh = mesh
    if "ME" + obj.name + mesh[0] == act.getMesh():
        curmesh = mesh

if newmesh != None and "ME" + obj.name + newmesh[0] != act.getMesh():
    # The mesh is a different mesh - switch it.
    # Check the current mesh is not a better fit.
    if curmesh == None or curmesh[1] < depth or curmesh[2] > depth:
        act.mesh = obj.getName() + newmesh[0]
        GameLogic.addActiveActuator(act, True)

mesh
    MeshProxy or the name of the mesh that will replace the current one.

    Set to None to disable actuator.

    Type MeshProxy or None if no mesh is set

useDisplayMesh
    when true the displayed mesh is replaced.

    Type boolean

usePhysicsMesh
    when true the physics mesh is replaced.

    Type boolean

instantReplaceMesh()
    Immediately replace mesh without delay.

class bge.types.KX_Scene (PyObjectPlus)
    An active scene that gives access to objects, cameras, lights and scene attributes.

```

The activity culling stuff is supposed to disable logic bricks when their owner gets too far from the active camera. It was taken from some code lurking at the back of KX\_Scene - who knows what it does!

```
import GameLogic

# get the scene
scene = GameLogic.getCurrentScene()

# print all the objects in the scene
for obj in scene.objects:
    print obj.name

# get an object named 'Cube'
obj = scene.objects["Cube"]

# get the first object in the scene.
obj = scene.objects[0]

# Get the depth of an object in the camera view.
import GameLogic

obj = GameLogic.getCurrentController().owner
cam = GameLogic.getCurrentScene().active_camera

# Depth is negative and decreasing further from the camera
depth = obj.position[0]*cam.world_to_camera[2][0] + obj.position[1]*cam.world_to_camera[2][1] +
```

@bug: All attributes are read only at the moment.

**name**

The scene's name, (read-only).

**Type** string

**objects**

A list of objects in the scene, (read-only).

**Type** CListValue of KX\_GameObject

**objectsInactive**

A list of objects on background layers (used for the addObject actuator), (read-only).

**Type** CListValue of KX\_GameObject

**lights**

A list of lights in the scene, (read-only).

**Type** CListValue of KX\_LightObject

**cameras**

A list of cameras in the scene, (read-only).

**Type** CListValue of KX\_Camera

**active\_camera**

The current active camera.

**Type** KX\_Camera

---

**Note:** This can be set directly from python to avoid using the KX\_SceneActuator.

---

**suspended**

True if the scene is suspended, (read-only).

**Type** boolean

**activity\_culling**

True if the scene is activity culling.

**Type** boolean

**activity\_culling\_radius**

The distance outside which to do activity culling. Measured in manhattan distance.

**Type** float

**dbvt\_culling**

True when Dynamic Bounding box Volume Tree is set (read-only).

**Type** boolean

**pre\_draw**

A list of callables to be run before the render step.

**Type** list

**post\_draw**

A list of callables to be run after the render step.

**Type** list

**addObject (object, other, time=0)**

Adds an object to the scene like the Add Object Actuator would.

**Parameters**

- **object** ([KX\\_GameObject](#) or string) – The object to add
- **other** ([KX\\_GameObject](#) or string) – The object's center to use when adding the object
- **time** (*integer*) – The lifetime of the added object, in frames. A time of 0 means the object will last forever.

**Returns** The newly added object.

**Return type** [KX\\_GameObject](#)

**end()**

Removes the scene from the game.

**restart()**

Restarts the scene.

**replace (scene)**

Replaces this scene with another one.

**Parameters** **scene** (*string*) – The name of the scene to replace this scene with.

**suspend()**

Suspends this scene.

**resume()**

Resume this scene.

**get (key, default=None)**

Return the value matching key, or the default value if its not found. :return: The key value or a default.

**class bge.types.KX\_SceneActuator (SCA\_IActuator)**  
Scene Actuator logic brick.

**Warning:** Scene actuators that use a scene name will be ignored if at game start, the named scene doesn't exist or is empty

This will generate a warning in the console:

```
Error: GameObject 'Name' has a SceneActuator 'ActuatorName' (SetScene) without scene
```

**scene**

the name of the scene to change to/overlay/underlay/remove/suspend/resume.

**Type** string

**camera**

the camera to change to.

**Type** KX\_Camera on read, string or KX\_Camera on write

---

**Note:** When setting the attribute, you can use either a KX\_Camera or the name of the camera.

---

**useRestart**

Set flag to True to restart the scene.

**Type** boolean

**mode**

The mode of the actuator.

**Type** integer from 0 to 5.

**class bge.types.KX\_SoundActuator (SCA\_IActuator)**  
Sound Actuator.

The startSound, pauseSound and stopSound do not require the actuator to be activated - they act instantly provided that the actuator has been activated once at least.

**fileName**

The filename of the sound this actuator plays.

**Type** string

**volume**

The volume (gain) of the sound.

**Type** float

**pitch**

The pitch of the sound.

**Type** float

**rollOffFactor**

The roll off factor. Rolloff defines the rate of attenuation as the sound gets further away.

**Type** float

**looping**

The loop mode of the actuator.

**Type** integer

**position**

The position of the sound as a list: [x, y, z].

**Type** float array

**velocity**

The velocity of the emitter as a list: [x, y, z]. The relative velocity to the observer determines the pitch.  
List of 3 floats: [x, y, z].

**Type** float array

**orientation**

The orientation of the sound. When setting the orientation you can also use quaternion [float, float, float, float] or euler angles [float, float, float].

**Type** 3x3 matrix [[float]]

**mode**

The operation mode of the actuator. Can be one of *these constants*

**Type** integer

**class bge.types.KX\_StateActuator (SCA\_IActuator)**

State actuator changes the state mask of parent object.

**operation**

Type of bit operation to be applied on object state mask.

You can use one of *these constants*

**Type** integer

**mask**

Value that defines the bits that will be modified by the operation.

The bits that are 1 in the mask will be updated in the object state.

The bits that are 0 are will be left unmodified expect for the Copy operation which copies the mask to the object state.

**Type** integer

**class bge.types.KX\_TrackToActuator (SCA\_IActuator)**

Edit Object actuator in Track To mode.

**Warning:** Track To Actuators will be ignored if at game start, the object to track is invalid.

This will generate a warning in the console:

```
GameObject 'Name' no object in EditObjectActuator 'ActuatorName'
```

**object**

the object this actuator tracks.

**Type** KX\_GameObject or None

**time**

the time in frames with which to delay the tracking motion.

**Type** integer

**use3D**

the tracking motion to use 3D.

**Type** boolean

```
class bge.types.KX_VehicleWrapper (PyObjectPlus)
KX_VehicleWrapper

TODO - description

addWheel (wheel, attachPos, attachDir, axleDir, suspensionRestLength, wheelRadius, hasSteering)
Add a wheel to the vehicle

Parameters

- wheel (KX\_GameObject or a KX_GameObject name) – The object to use as a wheel.
- attachPos (vector of 3 floats) – The position that this wheel will attach to.
- attachDir (vector of 3 floats) – The direction this wheel points.
- axleDir (vector of 3 floats) – The direction of this wheels axle.
- suspensionRestLength (float) – TODO - Description
- wheelRadius (float) – The size of the wheel.

applyBraking (force, wheelIndex)
Apply a braking force to the specified wheel

Parameters

- force (float) – the brake force
- wheelIndex (integer) – index of the wheel where the force needs to be applied

applyEngineForce (force, wheelIndex)
Apply an engine force to the specified wheel

Parameters

- force (float) – the engine force
- wheelIndex (integer) – index of the wheel where the force needs to be applied

getConstraintId ()
Get the constraint ID

Returns the constraint id

Return type integer

getConstraintType ()
Returns the constraint type.

Returns constraint type

Return type integer

getNumWheels ()
Returns the number of wheels.

Returns the number of wheels for this vehicle

Return type integer

getWheelOrientationQuaternion (wheelIndex)
Returns the wheel orientation as a quaternion.

Parameters wheelIndex (integer) – the wheel index

Returns TODO Description
```

**Return type** TODO - type should be quat as per method name but from the code it looks like a matrix

**getWheelPosition (wheelIndex)**

Returns the position of the specified wheel

**Parameters** **wheelIndex (integer)** – the wheel index

**Returns** position vector

**Return type** list[x, y, z]

**getWheelRotation (wheelIndex)**

Returns the rotation of the specified wheel

**Parameters** **wheelIndex (integer)** – the wheel index

**Returns** the wheel rotation

**Return type** float

**setRollInfluence (rollInfluence, wheelIndex)**

Set the specified wheel's roll influence. The higher the roll influence the more the vehicle will tend to roll over in corners.

**Parameters**

- **rollInfluence (float)** – the wheel roll influence
- **wheelIndex (integer)** – the wheel index

**setSteeringValue (steering, wheelIndex)**

Set the specified wheel's steering

**Parameters**

- **steering (float)** – the wheel steering
- **wheelIndex (integer)** – the wheel index

**setSuspensionCompression (compression, wheelIndex)**

Set the specified wheel's compression

**Parameters**

- **compression (float)** – the wheel compression
- **wheelIndex (integer)** – the wheel index

**setSuspensionDamping (damping, wheelIndex)**

Set the specified wheel's damping

**Parameters**

- **damping (float)** – the wheel damping
- **wheelIndex (integer)** – the wheel index

**setSuspensionStiffness (stiffness, wheelIndex)**

Set the specified wheel's stiffness

**Parameters**

- **stiffness (float)** – the wheel stiffness
- **wheelIndex (integer)** – the wheel index

**setTyreFriction** (*friction, wheelIndex*)

Set the specified wheel's tyre friction

**Parameters**

- **friction** (*float*) – the tyre friction
- **wheelIndex** (*integer*) – the wheel index

**class bge.types.KX\_VertexProxy (SCA\_IObject)**

A vertex holds position, UV, colour and normal information.

Note: The physics simulation is NOT currently updated - physics will not respond to changes in the vertex position.

**XYZ**

The position of the vertex.

**Type** list [x, y, z]

**UV**

The texture coordinates of the vertex.

**Type** list [u, v]

**normal**

The normal of the vertex.

**Type** list [nx, ny, nz]

**colour**

The colour of the vertex.

**Type** list [r, g, b, a]

Black = [0.0, 0.0, 0.0, 1.0], White = [1.0, 1.0, 1.0, 1.0]

**color**

Synonym for colour.

**x**

The x coordinate of the vertex.

**Type** float

**y**

The y coordinate of the vertex.

**Type** float

**z**

The z coordinate of the vertex.

**Type** float

**u**

The u texture coordinate of the vertex.

**Type** float

**v**

The v texture coordinate of the vertex.

**Type** float

**u2**

The second u texture coordinate of the vertex.

**Type** float

**v2**

The second v texture coordinate of the vertex.

**Type** float

**r**

The red component of the vertex colour.  $0.0 \leq r \leq 1.0$ .

**Type** float

**g**

The green component of the vertex colour.  $0.0 \leq g \leq 1.0$ .

**Type** float

**b**

The blue component of the vertex colour.  $0.0 \leq b \leq 1.0$ .

**Type** float

**a**

The alpha component of the vertex colour.  $0.0 \leq a \leq 1.0$ .

**Type** float

**getXYZ()**

Gets the position of this vertex.

**Returns** this vertexes position in local coordinates.

**Return type** list [x, y, z]

**setXYZ(pos)**

Sets the position of this vertex.

**Type** list [x, y, z]

**Parameters** pos – the new position for this vertex in local coordinates.

**getUV()**

Gets the UV (texture) coordinates of this vertex.

**Returns** this vertexes UV (texture) coordinates.

**Return type** list [u, v]

**setUV(uv)**

Sets the UV (texture) coordinates of this vertex.

**Type** list [u, v]

**getUV2()**

Gets the 2nd UV (texture) coordinates of this vertex.

**Returns** this vertexes UV (texture) coordinates.

**Return type** list [u, v]

**setUV2(uv, unit)**

Sets the 2nd UV (texture) coordinates of this vertex.

**Type** list [u, v]

**Parameters**

- **unit** – optional argument, FLAT==1, SECOND\_UV==2, defaults to SECOND\_UV

- **unit** – integer

**getRGBA()**

Gets the colour of this vertex.

The colour is represented as four bytes packed into an integer value. The colour is packed as RGBA.

Since Python offers no way to get each byte without shifting, you must use the struct module to access colour in a machine independent way.

Because of this, it is suggested you use the r, g, b and a attributes or the colour attribute instead.

```
import struct;
col = struct.unpack('4B', struct.pack('I', v.getRGBA()))
# col = (r, g, b, a)
# black = ( 0, 0, 0, 255)
# white = (255, 255, 255, 255)
```

**Returns** packed colour. 4 byte integer with one byte per colour channel in RGBA format.

**Return type** integer

**setRGBA(col)**

Sets the colour of this vertex.

See getRGBA() for the format of col, and its relevant problems. Use the r, g, b and a attributes or the colour attribute instead.

setRGBA() also accepts a four component list as argument col. The list represents the colour as [r, g, b, a] with black = [0.0, 0.0, 0.0, 1.0] and white = [1.0, 1.0, 1.0, 1.0]

```
v.setRGBA(0xff0000ff) # Red
v.setRGBA(0xff00ff00) # Green on little endian, transparent purple on big endian
v.setRGBA([1.0, 0.0, 0.0, 1.0]) # Red
v.setRGBA([0.0, 1.0, 0.0, 1.0]) # Green on all platforms.
```

**Parameters** **col** (integer or list [r, g, b, a]) – the new colour of this vertex in packed RGBA format.

**getNormal()**

Gets the normal vector of this vertex.

**Returns** normalised normal vector.

**Return type** list [nx, ny, nz]

**setNormal(normal)**

Sets the normal vector of this vertex.

**Type** sequence of floats [r, g, b]

**Parameters** **normal** – the new normal of this vertex.

```
class bge.types.KX_VisibilityActuator(SCA_IActuator)
Visibility Actuator.
```

**visibility**

whether the actuator makes its parent object visible or invisible.

**Type** boolean

**useOcclusion**

whether the actuator makes its parent object an occluder or not.

**Type** boolean

**useRecursion**  
whether the visibility/occlusion should be propagated to all children of the object.

**Type** boolean

**class** bge.types.**SCA\_2DFilterActuator** (*SCA\_IActuator*)  
Create, enable and disable 2D filters

The following properties don't have an immediate effect. You must active the actuator to get the result. The actuator is not persistent: it automatically stops itself after setting up the filter but the filter remains active. To stop a filter you must activate the actuator with 'type' set to `RAS_2DFILTER_DISABLED` or `RAS_2DFILTER_NOFILTER`.

**shaderText**  
shader source code for custom shader.

**Type** string

**disableMotionBlur**  
action on motion blur: 0=enable, 1=disable.

**Type** integer

**mode**  
Type of 2D filter, use one of *these constants*

**Type** integer

**passNumber**  
order number of filter in the stack of 2D filters. Filters are executed in increasing order of passNb.  
Only be one filter can be defined per passNb.

**Type** integer (0-100)

**value**  
argument for motion blur filter.

**Type** float (0.0-100.0)

**class** bge.types.**SCA\_ANDController** (*SCA\_IController*)  
An AND controller activates only when all linked sensors are activated.  
There are no special python methods for this controller.

**class** bge.types.**SCA\_ActuatorSensor** (*SCA\_ISensor*)  
Actuator sensor detect change in actuator state of the parent object. It generates a positive pulse if the corresponding actuator is activated and a negative pulse if the actuator is deactivated.

**actuator**  
the name of the actuator that the sensor is monitoring.

**Type** string

**class** bge.types.**SCA\_AlwaysSensor** (*SCA\_ISensor*)  
This sensor is always activated.

**class** bge.types.**SCA\_DelaySensor** (*SCA\_ISensor*)  
The Delay sensor generates positive and negative triggers at precise time, expressed in number of frames. The delay parameter defines the length of the initial OFF period. A positive trigger is generated at the end of this period.

The duration parameter defines the length of the ON period following the OFF period. There is a negative trigger at the end of the ON period. If duration is 0, the sensor stays ON and there is no negative trigger.

The sensor runs the OFF-ON cycle once unless the repeat option is set: the OFF-ON cycle repeats indefinitely (or the OFF cycle if duration is 0).

Use `SCA_ISensor.reset` at any time to restart sensor.

**delay**

length of the initial OFF period as number of frame, 0 for immediate trigger.

**Type** integer

**duration**

length of the ON period in number of frame after the initial OFF period.

If duration is greater than 0, a negative trigger is sent at the end of the ON pulse.

**Type** integer

**repeat**

1 if the OFF-ON cycle should be repeated indefinitely, 0 if it should run once.

**Type** integer

**class bge.types.SCA\_JoystickSensor (SCA\_ISensor)**

This sensor detects player joystick events.

**axisValues**

The state of the joysticks axis as a list of values `numAxis` long. (read-only).

**Type** list of ints

Each specifies the value of an axis between -32767 and 32767 depending on how far the axis is pushed, 0 for nothing. The first 2 values are used by most joysticks and gamepads for directional control. 3rd and 4th values are only on some joysticks and can be used for arbitrary controls.

- left:[-32767, 0, ...]
- right:[32767, 0, ...]
- up:[0, -32767, ...]
- down:[0, 32767, ...]

**axisSingle**

like `axisValues` but returns a single axis value that is set by the sensor. (read-only).

**Type** integer

---

**Note:** Only use this for “Single Axis” type sensors otherwise it will raise an error.

---

**hatValues**

The state of the joysticks hats as a list of values `numHats` long. (read-only).

**Type** list of ints

Each specifies the direction of the hat from 1 to 12, 0 when inactive.

Hat directions are as follows...

- 0:None
- 1:Up
- 2:Right

- 4:Down
- 8:Left
- 3:Up - Right
- 6:Down - Right
- 12:Down - Left
- 9:Up - Left

**hatSingle**

Like `hatValues` but returns a single hat direction value that is set by the sensor. (read-only).

**Type** integer

**numAxis**

The number of axes for the joystick at this index. (read-only).

**Type** integer

**numButtons**

The number of buttons for the joystick at this index. (read-only).

**Type** integer

**numHats**

The number of hats for the joystick at this index. (read-only).

**Type** integer

**connected**

True if a joystick is connected at this joysticks index. (read-only).

**Type** boolean

**index**

The joystick index to use (from 0 to 7). The first joystick is always 0.

**Type** integer

**threshold**

Axis threshold. Joystick axis motion below this threshold wont trigger an event. Use values between (0 and 32767), lower values are more sensitive.

**Type** integer

**button**

The button index the sensor reacts to (first button = 0). When the “All Events” toggle is set, this option has no effect.

**Type** integer

**axis**

The axis this sensor reacts to, as a list of two values [axisIndex, axisDirection]

- axisIndex: the axis index to use when detecting axis movement, 1=primary directional control, 2=secondary directional control.
- axisDirection: 0=right, 1=up, 2=left, 3=down.

**Type** [integer, integer]

**hat**

The hat the sensor reacts to, as a list of two values: [hatIndex, hatDirection]

- hatIndex: the hat index to use when detecting hat movement, 1=primary hat, 2=secondary hat (4 max).
- hatDirection: 1-12.

**Type** [integer, integer]

**getButtonActiveList ()**

**Returns** A list containing the indices of the currently pressed buttons.

**Return type** list

**getButtonStatus (buttonIndex)**

**Parameters** **buttonIndex** (integer) – the button index, 0=first button

**Returns** The current pressed state of the specified button.

**Return type** boolean

**class bge.types.SCA\_KeyboardSensor (SCA\_ISensor)**

A keyboard sensor detects player key presses.

See module `bge.keys` for keycode values.

**key**

The key code this sensor is looking for.

**Type** keycode from `bge.keys` module

**hold1**

The key code for the first modifier this sensor is looking for.

**Type** keycode from `bge.keys` module

**hold2**

The key code for the second modifier this sensor is looking for.

**Type** keycode from `bge.keys` module

**toggleProperty**

The name of the property that indicates whether or not to log keystrokes as a string.

**Type** string

**targetProperty**

The name of the property that receives keystrokes in case in case a string is logged.

**Type** string

**useAllKeys**

Flag to determine whether or not to accept all keys.

**Type** boolean

**events**

a list of pressed keys that have either been pressed, or just released, or are active this frame. (read-only).

**Type** list [[`keycode`, `status`], ...]

**getKeyStatus (keycode)**

Get the status of a key.

**Parameters** **keycode** (integer) – The code that represents the key you want to get the state of,  
use one of [these constants](#)

**Returns** The state of the given key, can be one of [these constants](#)

**Return type** int

**class** bge.types.**SCA\_NANDController** (*SCA\_IController*)

An NAND controller activates when all linked sensors are not active.

There are no special python methods for this controller.

**class** bge.types.**SCA\_NORController** (*SCA\_IController*)

An NOR controller activates only when all linked sensors are de-activated.

There are no special python methods for this controller.

**class** bge.types.**SCA\_ORController** (*SCA\_IController*)

An OR controller activates when any connected sensor activates.

There are no special python methods for this controller.

**class** bge.types.**SCA\_PropertyActuator** (*SCA\_IActuator*)

Property Actuator

**propName**

the property on which to operate.

**Type** string

**value**

the value with which the actuator operates.

**Type** string

**mode**

TODO - add constants to game logic dict!.

**Type** integer

**class** bge.types.**SCA\_PropertySensor** (*SCA\_ISensor*)

Activates when the game object property matches.

**mode**

Type of check on the property. Can be one of *these constants*

**Type** integer.

**propName**

the property the sensor operates.

**Type** string

**value**

the value with which the sensor compares to the value of the property.

**Type** string

**min**

the minimum value of the range used to evaluate the property when in interval mode.

**Type** string

**max**

the maximum value of the range used to evaluate the property when in interval mode.

**Type** string

**class** bge.types.**SCA\_PythonController** (*SCA\_IController*)

A Python controller uses a Python script to activate it's actuators, based on it's sensors.

**script**

The value of this variable depends on the execution methid.

- When ‘Script’ execution mode is set this value contains the entire python script as a single string (not the script name as you might expect) which can be modified to run different scripts.
- When ‘Module’ execution mode is set this value will contain a single line string - module name and function “module.func” or “package.module.func” where the module names are python textblocks or external scripts.

**Type** string

---

**Note:** Once this is set the script name given for warnings will remain unchanged.

---

**mode**

the execution mode for this controller (read-only).

- Script: 0, Execite the `script` as a python code.
- Module: 1, Execite the `script` as a module and function.

**Type** integer

**activate** (*actuator*)

Activates an actuator attached to this controller.

**Parameters** **actuator** (*actuator or the actuator name as a string*) – The actuator to operate on.

**deactivate** (*actuator*)

Deactivates an actuator attached to this controller.

**Parameters** **actuator** (*actuator or the actuator name as a string*) – The actuator to operate on.

**class** `bge.types.SCA_RandomActuator` (*SCA\_IActuator*)

Random Actuator

**seed**

Seed of the random number generator.

**Type** integer.

Equal seeds produce equal series. If the seed is 0, the generator will produce the same value on every call.

**para1**

the first parameter of the active distribution.

**Type** float, read-only.

Refer to the documentation of the generator types for the meaning of this value.

**para2**

the second parameter of the active distribution.

**Type** float, read-only

Refer to the documentation of the generator types for the meaning of this value.

**distribution**

Distribution type. (read-only). Can be one of *these constants*

**Type** integer

**propName**

the name of the property to set with the random value.

**Type** string

If the generator and property types do not match, the assignment is ignored.

**setBoolConst (value)**

Sets this generator to produce a constant boolean value.

**Parameters** **value** (*boolean*) – The value to return.

**setBoolUniform ()**

Sets this generator to produce a uniform boolean distribution.

The generator will generate True or False with 50% chance.

**setBoolBernouilli (value)**

Sets this generator to produce a Bernouilli distribution.

**Parameters** **value** (*float*) – Specifies the proportion of False values to produce.

- 0.0: Always generate True
- 1.0: Always generate False

**setIntConst (value)**

Sets this generator to always produce the given value.

**Parameters** **value** (*integer*) – the value this generator produces.

**setIntUniform (lower\_bound, upper\_bound)**

Sets this generator to produce a random value between the given lower and upper bounds (inclusive).

**setIntPoisson (value)**

Generate a Poisson-distributed number.

This performs a series of Bernouilli tests with parameter value. It returns the number of tries needed to achieve success.

**setFloatConst (value)**

Always generate the given value.

**setFloatUniform (lower\_bound, upper\_bound)**

Generates a random float between lower\_bound and upper\_bound with a uniform distribution.

**setFloatNormal (mean, standard\_deviation)**

Generates a random float from the given normal distribution.

**Parameters**

- **mean** (*float*) – The mean (average) value of the generated numbers
- **standard\_deviation** (*float*) – The standard deviation of the generated numbers.

**setFloatNegativeExponential (half\_life)**

Generate negative-exponentially distributed numbers.

The half-life ‘time’ is characterized by half\_life.

**class** bge.types.**SCA\_RandomSensor** (*SCA\_ISensor*)  
This sensor activates randomly.

**lastDraw**

The seed of the random number generator.

**Type** integer

**seed**

The seed of the random number generator.

**Type** integer

**setSeed** (*seed*)

Sets the seed of the random number generator.

If the seed is 0, the generator will produce the same value on every call.

**getSeed()**

**Returns** The initial seed of the generator. Equal seeds produce equal random series.

**Return type** integer

**getLastDraw()**

**Returns** The last random number generated.

**Return type** integer

**class** bge.types.**SCA\_XNORController** (*SCA\_IController*)

An XNOR controller activates when all linked sensors are the same (activated or inactive).

There are no special python methods for this controller.

**class** bge.types.**SCA\_XORController** (*SCA\_IController*)

An XOR controller activates when there is the input is mixed, but not when all are on or off.

There are no special python methods for this controller.

**class** bge.types.**KX\_Camera** (*KX\_GameObject*)

A Camera object.

**INSIDE**

See `sphereInsideFrustum` and `boxInsideFrustum`

**INTERSECT**

See `sphereInsideFrustum` and `boxInsideFrustum`

**OUTSIDE**

See `sphereInsideFrustum` and `boxInsideFrustum`

**lens**

The camera's lens value.

**Type** float

**ortho\_scale**

The camera's view scale when in orthographic mode.

**Type** float

**near**

The camera's near clip distance.

**Type** float

**far**

The camera's far clip distance.

**Type** float

**perspective**

True if this camera has a perspective transform, False for an orthographic projection.

**Type** boolean

**frustum\_culling**

True if this camera is frustum culling.

**Type** boolean

**projection\_matrix**

This camera's 4x4 projection matrix.

**Type** 4x4 Matrix [[float]]

**modelview\_matrix**

This camera's 4x4 model view matrix. (read-only).

**Type** 4x4 Matrix [[float]]

---

**Note:** This matrix is regenerated every frame from the camera's position and orientation.

---

**camera\_to\_world**

This camera's camera to world transform. (read-only).

**Type** 4x4 Matrix [[float]]

---

**Note:** This matrix is regenerated every frame from the camera's position and orientation.

---

**world\_to\_camera**

This camera's world to camera transform. (read-only).

**Type** 4x4 Matrix [[float]]

---

**Note:** Regenerated every frame from the camera's position and orientation.

---

**Note:** This is camera\_to\_world inverted.

---

**useViewport**

True when the camera is used as a viewport, set True to enable a viewport for this camera.

**Type** boolean

**sphereInsideFrustum**(*centre*, *radius*)

Tests the given sphere against the view frustum.

**Parameters**

- **centre** (*list* [*x*, *y*, *z*]) – The centre of the sphere (in world coordinates.)

- **radius** (*float*) – the radius of the sphere

**Returns** `INSIDE`, `OUTSIDE` or `INTERSECT`

**Return type** integer

---

**Note:** When the camera is first initialized the result will be invalid because the projection matrix has not been set.

---

```
import GameLogic
co = GameLogic.getCurrentController()
cam = co.owner

# A sphere of radius 4.0 located at [x, y, z] = [1.0, 1.0, 1.0]
if (cam.sphereInsideFrustum([1.0, 1.0, 1.0], 4) != cam.OUTSIDE):
    # Sphere is inside frustum !
    # Do something useful !
else:
    # Sphere is outside frustum
```

#### **boxInsideFrustum**(*box*)

Tests the given box against the view frustum.

**Parameters** `box` (*list of lists*) – Eight (8) corner points of the box (in world coordinates.)

**Returns** `INSIDE`, `OUTSIDE` or `INTERSECT`

---

**Note:** When the camera is first initialized the result will be invalid because the projection matrix has not been set.

---

```
import GameLogic
co = GameLogic.getCurrentController()
cam = co.owner

# Box to test...
box = []
box.append([-1.0, -1.0, -1.0])
box.append([-1.0, -1.0, 1.0])
box.append([-1.0, 1.0, -1.0])
box.append([-1.0, 1.0, 1.0])
box.append([1.0, -1.0, -1.0])
box.append([1.0, -1.0, 1.0])
box.append([1.0, 1.0, -1.0])
box.append([1.0, 1.0, 1.0])
```

```
if (cam.boxInsideFrustum(box) != cam.OUTSIDE):
    # Box is inside/intersects frustum !
    # Do something useful !
else:
    # Box is outside the frustum !
```

#### **pointInsideFrustum**(*point*)

Tests the given point against the view frustum.

**Parameters** `point` (*3D Vector*) – The point to test (in world coordinates.)

**Returns** True if the given point is inside this camera's viewing frustum.

**Return type** boolean

---

**Note:** When the camera is first initialized the result will be invalid because the projection matrix has not been set.

---

```
import GameLogic
co = GameLogic.getCurrentController()
cam = co.owner

# Test point [0.0, 0.0, 0.0]
if (cam.pointInsideFrustum([0.0, 0.0, 0.0])):
    # Point is inside frustum !
    # Do something useful !
else:
    # Box is outside the frustum !
```

**getCameraToWorld()**

Returns the camera-to-world transform.

**Returns** the camera-to-world transform matrix.

**Return type** matrix (4x4 list)

**getWorldToCamera()**

Returns the world-to-camera transform.

This returns the inverse matrix of getCameraToWorld().

**Returns** the world-to-camera transform matrix.

**Return type** matrix (4x4 list)

**setOnTop()**

Set this cameras viewport ontop of all other viewport.

**setViewport (left, bottom, right, top)**

Sets the region of this viewport on the screen in pixels.

Use `bge.render.getWindowHeight` and `bge.render.getWindowWidth` to calculate values relative to the entire display.

**Parameters**

- **left** (*integer*) – left pixel coordinate of this viewport
- **bottom** (*integer*) – bottom pixel coordinate of this viewport
- **right** (*integer*) – right pixel coordinate of this viewport
- **top** (*integer*) – top pixel coordinate of this viewport

**getScreenPosition (object)**

Gets the position of an object projected on screen space.

```
# For an object in the middle of the screen, coord = [0.5, 0.5]
coord = camera.getScreenPosition(object)
```

**Parameters** **object** (`KX_GameObject` or 3D Vector) – object name or list [x, y, z]

**Returns** the object's position in screen coordinates.

**Return type** list [x, y]

**getScreenVect** (*x, y*)

Gets the vector from the camera position in the screen coordinate direction.

**Parameters**

- **x** (*float*) – X Axis
- **y** (*float*) – Y Axis

**Return type** 3D Vector

**Returns** The vector from screen coordinate.

```
# Gets the vector of the camera front direction:  
m_vect = camera.getScreenVect(0.5, 0.5)
```

**getScreenRay** (*x, y, dist=inf, property=None*)

Look towards a screen coordinate (*x, y*) and find first object hit within *dist* that matches prop. The ray is similar to KX\_GameObject->rayCastTo.

**Parameters**

- **x** (*float*) – X Axis
- **y** (*float*) – Y Axis
- **dist** (*float*) – max distance to look (can be negative => look behind); 0 or omitted => detect up to other
- **property** (*string*) – property name that object must have; can be omitted => detect any object

**Return type** KX\_GameObject

**Returns** the first object hit or None if no object or object does not match prop

```
# Gets an object with a property "wall" in front of the camera within a distance of 100:  
target = camera.getScreenRay(0.5, 0.5, 100, "wall")
```

**class bge.types.BL\_ArmatureObject (KX\_GameObject)**

An armature object.

**constraints**

The list of armature constraint defined on this armature. Elements of the list can be accessed by index or string. The key format for string access is ‘<bone\_name>:<constraint\_name>’.

**Type** list of BL\_ArmatureConstraint

**channels**

The list of armature channels. Elements of the list can be accessed by index or name the bone.

**Type** list of BL\_ArmatureChannel

**update ()**

Ensures that the armature will be updated on next graphic frame.

This action is unnecessary if a KX\_ArmatureActuator with mode run is active or if an action is playing. Use this function in other cases. It must be called on each frame to ensure that the armature is updated continuously.

**class bge.types.BL\_ArmatureActuator (SCA\_IActuator)**

Armature Actuators change constraint condition on armatures. Constants related to **type**

**KX\_ACT\_ARMATURE\_RUN**

Just make sure the armature will be updated on the next graphic frame. This is the only persistent mode of the actuator: it executes automatically once per frame until stopped by a controller

**Value** 0

**KX\_ACT\_ARMATURE\_ENABLE**

Enable the constraint.

**Value** 1

**KX\_ACT\_ARMATURE\_DISABLE**

Disable the constraint (runtime constraint values are not updated).

**Value** 2

**KX\_ACT\_ARMATURE\_SETTARGET**

Change target and subtarget of constraint.

**Value** 3

**KX\_ACT\_ARMATURE\_SETWEIGHT**

Change weight of (only for IK constraint).

**Value** 4

**type**

The type of action that the actuator executes when it is active.

Can be one of *these constants*

**Type** integer

**constraint**

The constraint object this actuator is controlling.

**Type** [BL\\_ArmatureConstraint](#)

**target**

The object that this actuator will set as primary target to the constraint it controls.

**Type** [KX\\_GameObject](#)

**subtarget**

The object that this actuator will set as secondary target to the constraint it controls.

**Type** [KX\\_GameObject](#).

---

**Note:** Currently, the only secondary target is the pole target for IK constraint.

---

**weight**

The weight this actuator will set on the constraint it controls.

**Type** float.

---

**Note:** Currently only the IK constraint has a weight. It must be a value between 0 and 1.

---

**Note:** A weight of 0 disables a constraint while still updating constraint runtime values (see [BL\\_ArmatureConstraint](#))

---

**class bge.types.KX\_ArmatureSensor (SCA\_ISensor)**

Armature sensor detect conditions on armatures. Constants related to **type**

**KX\_ARMSENSOR\_STATE\_CHANGED**

Detect that the constraint is changing state (active/inactive)

**Value** 0

**KX\_ARMSENSOR\_LIN\_ERROR\_BELOW**

Detect that the constraint linear error is above a threshold

**Value** 1

**KX\_ARMSENSOR\_LIN\_ERROR ABOVE**

Detect that the constraint linear error is below a threshold

**Value** 2

**KX\_ARMSENSOR\_ROT\_ERROR\_BELOW**

Detect that the constraint rotation error is above a threshold

**Value** 3

**KX\_ARMSENSOR\_ROT\_ERROR ABOVE**

Detect that the constraint rotation error is below a threshold

**Value** 4

**type**

The type of measurement that the sensor make when it is active.

Can be one of *these constants*

**Type** integer.

**constraint**

The constraint object this sensor is watching.

**Type** [BL\\_ArmatureConstraint](#)

**value**

The threshold used in the comparison with the constraint error. The linear error is only updated on Copy-Pose/Distance IK constraint with iTaSC solver. The rotation error is only updated on CopyPose+rotation IK constraint with iTaSC solver. The linear error on CopyPose is always  $\geq 0$ : it is the norm of the distance between the target and the bone. The rotation error on CopyPose is always  $\geq 0$ : it is the norm of the equivalent rotation vector between the bone and the target orientations. The linear error on Distance can be positive if the distance between the bone and the target is greater than the desired distance, and negative if the distance is smaller.

**Type** float

**class bge.types.BL\_ArmatureConstraint (PyObjectPlus)**

Proxy to Armature Constraint. Allows to change constraint on the fly. Obtained through [BL\\_ArmatureObject.constraints](#).

---

**Note:** Not all armature constraints are supported in the GE.

---

Constants related to **type**

**CONSTRAINT\_TYPE\_TRACKTO**

**CONSTRAINT\_TYPE\_KINEMATIC**

**CONSTRAINT\_TYPE\_ROTLIKE**

**CONSTRAINT\_TYPE\_LOCLIKE**

**CONSTRAINT\_TYPE\_MINMAX**

**CONSTRAINT\_TYPE\_SIZELIKE**

**CONSTRAINT\_TYPE\_LOCKTRACK**

**CONSTRAINT\_TYPE\_STRETCHTO**

**CONSTRAINT\_TYPE\_CLAMPTO**

**CONSTRAINT\_TYPE\_TRANSFORM**

**CONSTRAINT\_TYPE\_DISTLIMIT**

Constants related to [ik\\_type](#)

**CONSTRAINT\_IK\_COPYPOSE**

constraint is trying to match the position and eventually the rotation of the target.

**Value 0**

**CONSTRAINT\_IK\_DISTANCE**

Constraint is maintaining a certain distance to target subject to ik\_mode

**Value 1**

Constants related to [ik\\_flag](#)

**CONSTRAINT\_IK\_FLAG\_TIP**

Set when the constraint operates on the head of the bone and not the tail

**Value 1**

**CONSTRAINT\_IK\_FLAG\_ROT**

Set when the constraint tries to match the orientation of the target

**Value 2**

**CONSTRAINT\_IK\_FLAG\_STRETCH**

Set when the armature is allowed to stretch (only the bones with stretch factor > 0.0)

**Value 16**

**CONSTRAINT\_IK\_FLAG\_POS**

Set when the constraint tries to match the position of the target.

**Value 32**

Constants related to [ik\\_mode](#)

**CONSTRAINT\_IK\_MODE\_INSIDE**

The constraint tries to keep the bone within ik\_dist of target

**Value 0**

**CONSTRAINT\_IK\_MODE\_OUTSIDE**

The constraint tries to keep the bone outside ik\_dist of the target

**Value 1**

**CONSTRAINT\_IK\_MODE\_ONSURFACE**

The constraint tries to keep the bone exactly at ik\_dist of the target.

**Value 2**

**type**

Type of constraint, (read-only).

Use one of *these constants*.

**Type** integer, one of CONSTRAINT\_TYPE\_\* constants

**name**

Name of constraint constructed as <bone\_name>:<constraint\_name>. constraints list.

**Type** string

This name is also the key subscript on [BL\\_ArmatureObject](#).

**enforce**

fraction of constraint effect that is enforced. Between 0 and 1.

**Type** float

**headtail**

Position of target between head and tail of the target bone: 0=head, 1=tail.

**Type** float.

---

**Note:** Only used if the target is a bone (i.e target object is an armature).

---

**lin\_error**

runtime linear error (in Blender units) on constraint at the current frame.

This is a runtime value updated on each frame by the IK solver. Only available on IK constraint and iTaSC solver.

**Type** float

**rot\_error**

Runtime rotation error (in radiant) on constraint at the current frame.

**Type** float.

This is a runtime value updated on each frame by the IK solver. Only available on IK constraint and iTaSC solver.

It is only set if the constraint has a rotation part, for example, a CopyPose+Rotation IK constraint.

**target**

Primary target object for the constraint. The position of this object in the GE will be used as target for the constraint.

**Type** [KX\\_GameObject](#).

**subtarget**

Secondary target object for the constraint. The position of this object in the GE will be used as secondary target for the constraint.

**Type** [KX\\_GameObject](#).

Currently this is only used for pole target on IK constraint.

**active**

True if the constraint is active.

**Type** boolean

---

**Note:** An inactive constraint does not update lin\_error and rot\_error.

---

**ik\_weight**

Weight of the IK constraint between 0 and 1.

Only defined for IK constraint.

**Type** float

**ik\_type**

Type of IK constraint, (read-only).

Use one of *these constants*.

**Type** integer

**ik\_flag**

Combination of IK constraint option flags, read-only.

Use one of *these constants*.

**Type** integer

**ik\_dist**

Distance the constraint is trying to maintain with target, only used when ik\_type=CONSTRAINT\_IK\_DISTANCE.

**Type** float

**ik\_mode**

Use one of *these constants*.

Additional mode for IK constraint. Currently only used for Distance constraint:

**Type** integer

**class bge.types.BL\_ArmatureChannel (PyObjectPlus)**

Proxy to armature pose channel. Allows to read and set armature pose. The attributes are identical to RNA attributes, but mostly in read-only mode.

See [rotation\\_mode](#)

**PCHAN\_ROT\_QUAT****PCHAN\_ROT\_XYZ****PCHAN\_ROT\_XZY****PCHAN\_ROT\_YXZ****PCHAN\_ROT\_YZX****PCHAN\_ROT\_ZXY****PCHAN\_ROT\_ZYX****name**

channel name (=bone name), read-only.

**Type** string

**bone**

return the bone object corresponding to this pose channel, read-only.

**Type** [BL\\_ArmatureBone](#)

**parent**

return the parent channel object, None if root channel, read-only.

**Type** [BL\\_ArmatureChannel](#)

**has\_ik**

true if the bone is part of an active IK chain, read-only. This flag is not set when an IK constraint is defined but not enabled (miss target information for example).

**Type** boolean

**ik\_dof\_x**

true if the bone is free to rotation in the X axis, read-only.

**Type** boolean

**ik\_dof\_y**

true if the bone is free to rotation in the Y axis, read-only.

**Type** boolean

**ik\_dof\_z**

true if the bone is free to rotation in the Z axis, read-only.

**Type** boolean

**ik\_limit\_x**

true if a limit is imposed on X rotation, read-only.

**Type** boolean

**ik\_limit\_y**

true if a limit is imposed on Y rotation, read-only.

**Type** boolean

**ik\_limit\_z**

true if a limit is imposed on Z rotation, read-only.

**Type** boolean

**ik\_rot\_control**

true if channel rotation should applied as IK constraint, read-only.

**Type** boolean

**ik\_lin\_control**

true if channel size should applied as IK constraint, read-only.

**Type** boolean

**location**

displacement of the bone head in armature local space, read-write.

**Type** vector [X, Y, Z].

---

**Note:** You can only move a bone if it is unconnected to its parent. An action playing on the armature may change the value. An IK chain does not update this value, see joint\_rotation.

---

---

**Note:** Changing this field has no immediate effect, the pose is updated when the armature is updated during the graphic render (see [BL\\_ArmatureObject.update](#)).

---

**scale**

scale of the bone relative to its parent, read-write.

**Type** vector [sizeX, sizeY, sizeZ].

---

**Note:** An action playing on the armature may change the value. An IK chain does not update this value, see joint\_rotation.

---

**Note:** Changing this field has no immediate effect, the pose is updated when the armature is updated during the graphic render (see `BL_ArmatureObject.update`)

---

**rotation\_quaternion**

rotation of the bone relative to its parent expressed as a quaternion, read-write.

**Type** vector [qr, qi, qj, qk].

---

**Note:** This field is only used if rotation\_mode is 0. An action playing on the armature may change the value. An IK chain does not update this value, see joint\_rotation.

---

**Note:** Changing this field has no immediate effect, the pose is updated when the armature is updated during the graphic render (see `BL_ArmatureObject.update`)

---

**rotation\_euler**

rotation of the bone relative to its parent expressed as a set of euler angles, read-write.

**Type** vector [X, Y, Z].

---

**Note:** This field is only used if rotation\_mode is > 0. You must always pass the angles in [X, Y, Z] order; the order of applying the angles to the bone depends on rotation\_mode. An action playing on the armature may change this field. An IK chain does not update this value, see joint\_rotation.

---

**Note:** Changing this field has no immediate effect, the pose is updated when the armature is updated during the graphic render (see `BL_ArmatureObject.update`)

---

**rotation\_mode**

Method of updating the bone rotation, read-write.

**Type** integer

Use the following constants (euler mode are named as in Blender UI but the actual axis order is reversed).

- PCHAN\_ROT\_QUAT(0) : use quaternion in rotation attribute to update bone rotation
- PCHAN\_ROT\_XYZ(1) : use euler\_rotation and apply angles on bone's Z, Y, X axis successively
- PCHAN\_ROT\_XZY(2) : use euler\_rotation and apply angles on bone's Y, Z, X axis successively
- PCHAN\_ROT\_YXZ(3) : use euler\_rotation and apply angles on bone's Z, X, Y axis successively
- PCHAN\_ROT\_YZX(4) : use euler\_rotation and apply angles on bone's X, Z, Y axis successively
- PCHAN\_ROT\_ZXY(5) : use euler\_rotation and apply angles on bone's Y, X, Z axis successively
- PCHAN\_ROT\_ZYX(6) : use euler\_rotation and apply angles on bone's X, Y, Z axis successively

**channel\_matrix**

pose matrix in bone space (deformation of the bone due to action, constraint, etc), Read-only. This field is updated after the graphic render, it represents the current pose.

**Type** matrix [4][4]

**pose\_matrix**

pose matrix in armature space, read-only. This field is updated after the graphic render, it represents the current pose.

**Type** matrix [4][4]

**pose\_head**

position of bone head in armature space, read-only.

**Type** vector [x, y, z]

**pose\_tail**

position of bone tail in armature space, read-only.

**Type** vector [x, y, z]

**ik\_min\_x**

minimum value of X rotation in degree (<= 0) when X rotation is limited (see ik\_limit\_x), read-only.

**Type** float

**ik\_max\_x**

maximum value of X rotation in degree (>= 0) when X rotation is limited (see ik\_limit\_x), read-only.

**Type** float

**ik\_min\_y**

minimum value of Y rotation in degree (<= 0) when Y rotation is limited (see ik\_limit\_y), read-only.

**Type** float

**ik\_max\_y**

maximum value of Y rotation in degree (>= 0) when Y rotation is limited (see ik\_limit\_y), read-only.

**Type** float

**ik\_min\_z**

minimum value of Z rotation in degree (<= 0) when Z rotation is limited (see ik\_limit\_z), read-only.

**Type** float

**ik\_max\_z**

maximum value of Z rotation in degree (>= 0) when Z rotation is limited (see ik\_limit\_z), read-only.

**Type** float

**ik\_stiffness\_x**

bone rotation stiffness in X axis, read-only.

**Type** float between 0 and 1

**ik\_stiffness\_y**

bone rotation stiffness in Y axis, read-only.

**Type** float between 0 and 1

**ik\_stiffness\_z**

bone rotation stiffness in Z axis, read-only.

**Type** float between 0 and 1

**ik\_stretch**

ratio of scale change that is allowed, 0=bone can't change size, read-only.

**Type** float

**ik\_rot\_weight**

weight of rotation constraint when ik\_rot\_control is set, read-write.

**Type** float between 0 and 1

**ik\_lin\_weight**

weight of size constraint when ik\_lin\_control is set, read-write.

**Type** float between 0 and 1

**joint\_rotation**

Control bone rotation in term of joint angle (for robotic applications), read-write.

When writing to this attribute, you pass a [x, y, z] vector and an appropriate set of euler angles or quaternion is calculated according to the rotation\_mode.

When you read this attribute, the current pose matrix is converted into a [x, y, z] vector representing the joint angles.

The value and the meaning of the x, y, z depends on the ik\_dof\_x/ik\_dof\_y/ik\_dof\_z attributes:

- 1DoF joint X, Y or Z: the corresponding x, y, or z value is used as a joint angle in radiant
- 2DoF joint X+Y or Z+Y: treated as 2 successive 1DoF joints: first X or Z, then Y. The x or z value is used as a joint angle in radiant along the X or Z axis, followed by a rotation along the new Y axis of y radians.
- 2DoF joint X+Z: treated as a 2DoF joint with rotation axis on the X/Z plane. The x and z values are used as the coordinates of the rotation vector in the X/Z plane.
- 3DoF joint X+Y+Z: treated as a revolute joint. The [x, y, z] vector represents the equivalent rotation vector to bring the joint from the rest pose to the new pose.

**Type** vector [x, y, z]

---

**Note:** The bone must be part of an IK chain if you want to set the ik\_dof\_x/ik\_dof\_y/ik\_dof\_z attributes via the UI, but this will interfere with this attribute since the IK solver will overwrite the pose. You can stay in control of the armature if you create an IK constraint but do not finalize it (e.g. don't set a target) the IK solver will not run but the IK panel will show up on the UI for each bone in the chain.

---

**Note:** [0, 0, 0] always corresponds to the rest pose.

---

**Note:** You must request the armature pose to update and wait for the next graphic frame to see the effect of setting this attribute (see [BL\\_ArmatureObject.update](#)).

---

**Note:** You can read the result of the calculation in rotation or euler\_rotation attributes after setting this attribute.

---

**class** bge.types.**BL\_ArmatureBone** (*PyObjectPlus*)

Proxy to Blender bone structure. All fields are read-only and comply to RNA names. All space attribute correspond to the rest pose.

**name**

bone name.

**Type** string

**connected**

true when the bone head is struck to the parent's tail.

**Type** boolean

**hinge**

true when bone doesn't inherit rotation or scale from parent bone.

**Type** boolean

**inherit\_scale**

true when bone inherits scaling from parent bone.

**Type** boolean

**bbone\_segments**

number of B-bone segments.

**Type** integer

**roll**

bone rotation around head-tail axis.

**Type** float

**head**

location of head end of the bone in parent bone space.

**Type** vector [x, y, z]

**tail**

location of head end of the bone in parent bone space.

**Type** vector [x, y, z]

**length**

bone length.

**Type** float

**arm\_head**

location of head end of the bone in armature space.

**Type** vector [x, y, z]

**arm\_tail**

location of tail end of the bone in armature space.

**Type** vector [x, y, z]

**arm\_mat**

matrix of the bone head in armature space.

**Type** matrix [4][4]

---

**Note:** This matrix has no scale part.

---

**bone\_mat**

rotation matrix of the bone in parent bone space.

**Type** matrix [3][3]

**parent**

parent bone, or None for root bone.

**Type** BL\_ArmatureBone

**children**

list of bone's children.

**Type** list of BL\_ArmatureBone

## 4.2 Game Logic (bge.logic)

### 4.2.1 Intro

Module to access logic functions, imported automatically into the python controllers namespace.

```
# To get the controller that's running this python script:  
cont = bge.logic.getCurrentController() # bge.logic is automatically imported  
  
# To get the game object this controller is on:  
obj = cont.owner  
  
KX_GameObject and KX_Camera or KX_LightObject methods are available depending on the type of object  
  
# To get a sensor linked to this controller.  
# "sensornname" is the name of the sensor as defined in the Blender interface.  
# +-----+ +-----+  
# | Sensor "sensornname" ---+ Python +  
# +-----+ +-----+  
sens = cont.sensors["sensornname"]  
  
# To get a sequence of all sensors:  
sensors = co.sensors
```

See the sensor's reference for available methods:

- KX\_MouseFocusSensor
- KX\_NearSensor
- KX\_NetworkMessageSensor
- KX\_RadarSensor
- KX\_RaySensor
- KX\_TouchSensor
- SCA\_DelaySensor
- SCA\_JoystickSensor
- SCA\_KeyboardSensor
- SCA\_MouseSensor
- SCA\_PropertySensor
- SCA\_RandomSensor

You can also access actuators linked to the controller

```
# To get an actuator attached to the controller:  
# +-----+ +-----+  
# + Python ---+ Actuator "actuatorname" /  
# +-----+ +-----+  
actuator = co.actuators["actuatorname"]
```

```
# Activate an actuator
controller.activate(actuator)
```

See the actuator's reference for available methods

- [BL\\_ActionActuator](#)
- [BL\\_ShapeActionActuator](#)
- [KX\\_CameraActuator](#)
- [KX\\_ConstraintActuator](#)
- [KX\\_GameActuator](#)
- [KX\\_IpoActuator](#)
- [KX\\_NetworkMessageActuator](#)
- [KX\\_ObjectActuator](#)
- [KX\\_ParentActuator](#)
- [KX\\_SCA\\_AddObjectActuator](#)
- [KX\\_SCA\\_DynamicActuator](#)
- [KX\\_SCA\\_EndObjectActuator](#)
- [KX\\_SCA\\_ReplaceMeshActuator](#)
- [KX\\_SceneActuator](#)
- [KX\\_SoundActuator](#)
- [KX\\_StateActuator](#)
- [KX\\_TrackToActuator](#)
- [KX\\_VisibilityActuator](#)
- [SCA\\_2DFilterActuator](#)
- [SCA\\_PropertyActuator](#)
- [SCA\\_RandomActuator](#)

Most logic brick's methods are accessors for the properties available in the logic buttons. Consult the logic bricks documentation for more information on how each logic brick works.

There are also methods to access the current `bge.types.KX_Scene`

```
# Get the current scene
scene = bge.logic.getCurrentScene()

# Get the current camera
cam = scene.active_camera
```

Matrices as used by the game engine are **row major** `matrix[row][col] = float`

`bge.types.KX_Camera` has some examples using matrices.

## 4.2.2 Variables

### `bge.logic.globalData`

A dictionary that is saved between loading blend files so you can use it to store inventory and other variables you want to store between scenes and blend files. It can also be written to a file and loaded later on with the game load/save actuators.

---

**Note:** only python built in types such as int/string/bool/float/tuples/lists can be saved, GameObjects, Actuators etc will not work as expected.

---

### `bge.logic.keyboard`

The current keyboard wrapped in an `SCA_PythonKeyboard` object.

**bge.logic.mouse**

The current mouse wrapped in an `SCA_PythonMouse` object.

### 4.2.3 General functions

**bge.logic.getCurrentController()**

Gets the Python controller associated with this Python script.

**Return type** `bge.types.SCA_PythonController`

**bge.logic.getCurrentScene()**

Gets the current Scene.

**Return type** `bge.types.KX_Scene`

**bge.logic.getSceneList()**

Gets a list of the current scenes loaded in the game engine.

**Return type** list of `bge.types.KX_Scene`

---

**Note:** Scenes in your blend file that have not been converted wont be in this list. This list will only contain scenes such as overlays scenes.

---

**bge.logic.loadGlobalDict()**

Loads `bge.logic.globalDict` from a file.

**bge.logic.saveGlobalDict()**

Saves `bge.logic.globalDict` to a file.

**bge.logic.startGame(*blend*)**

Loads the blend file.

**Parameters** `blend (string)` – The name of the blend file

**bge.logic.endGame()**

Ends the current game.

**bge.logic.restartGame()**

Restarts the current game by reloading the .blend file (the last saved version, not what is currently running).

**bge.logic.LibLoad(*blend*, *type*, *data*, *load\_actions=False*, *verbose=False*)**

Converts the all of the datablocks of the given type from the given blend.

**Parameters**

- **blend (string)** – The path to the blend file (or the name to use for the library if data is supplied)
- **type (string)** – The datablock type (currently only “Action”, “Mesh” and “Scene” are supported)
- **data (bytes)** – Binary data from a blend file (optional)
- **load\_actions (bool)** – Search for and load all actions in a given Scene and not just the “active” actions (Scene type only)
- **verbose (bool)** – Whether or not to print debugging information (e.g., “SceneName: Scene”)

**bge.logic.LibNew(*name*, *type*, *data*)**

Uses existing datablock data and loads in as a new library.

**Parameters**

- **name** (*string*) – A unique library name used for removal later
- **type** (*string*) – The datablock type (currently only “Mesh” is supported)
- **data** (*list of strings*) – A list of names of the datablocks to load

`bge.logic.LibFree(name)`

Frees a library, removing all objects and meshes from the currently active scenes.

**Parameters** **name** (*string*) – The name of the library to free (the name used in LibNew)

`bge.logic.LibList()`

Returns a list of currently loaded libraries.

**Return type** list [str]

`bge.logic.addScene(name, overlay=1)`

Loads a scene into the game engine.

---

**Note:** This function is not effective immediately, the scene is queued and added on the next logic cycle where it will be available from *getSceneList*

---

#### Parameters

- **name** (*string*) – The name of the scene
- **overlay** (*integer*) – Overlay or underlay (optional)

`bge.logic.sendMessage(subject, body=""", to=""", message_from="")`

Sends a message to sensors in any active scene.

#### Parameters

- **subject** (*string*) – The subject of the message
- **body** (*string*) – The body of the message (optional)
- **to** (*string*) – The name of the object to send the message to (optional)
- **message\_from** (*string*) – The name of the object that the message is coming from (optional)

`bge.logic.setGravity(gravity)`

Sets the world gravity.

`bge.logic.getSpectrum()`

Returns a 512 point list from the sound card. This only works if the fmod sound driver is being used.

**Return type** list [float], len(getSpectrum()) == 512

`bge.logic.stopDSP()`

Stops the sound driver using DSP effects.

Only the fmod sound driver supports this. DSP can be computationally expensive.

`bge.logic.getMaxLogicFrame()`

Gets the maximum number of logic frames per render frame.

**Returns** The maximum number of logic frames per render frame

**Return type** integer

bge.logic.**setMaxLogicFrame** (*maxlogic*)

Sets the maximum number of logic frames that are executed per render frame. This does not affect the physics system that still runs at full frame rate.

**Parameters** **maxlogic** (*integer*) – The new maximum number of logic frames per render frame.

Valid values: 1..5

bge.logic.**getMaxPhysicsFrame** ()

Gets the maximum number of physics frames per render frame.

**Returns** The maximum number of physics frames per render frame

**Return type** integer

bge.logic.**setMaxPhysicsFrame** (*maxphysics*)

Sets the maximum number of physics timestep that are executed per render frame. Higher value allows physics to keep up with realtime even if graphics slows down the game. Physics timestep is fixed and equal to 1/tickrate (see *setLogicTicRate*) maxphysics/ticrate is the maximum delay of the renderer that physics can compensate.

**Parameters** **maxphysics** (*integer*) – The new maximum number of physics timestep per render frame. Valid values: 1..5.

bge.logic.**getLogicTicRate** ()

Gets the logic update frequency.

**Returns** The logic frequency in Hz

**Return type** float

bge.logic.**setLogicTicRate** (*ticrate*)

Sets the logic update frequency.

The logic update frequency is the number of times logic bricks are executed every second. The default is 60 Hz.

**Parameters** **ticrate** (*float*) – The new logic update frequency (in Hz).

bge.logic.**getPhysicsTicRate** ()

Gets the physics update frequency

**Returns** The physics update frequency in Hz

**Return type** float

bge.logic.**setPhysicsTicRate** (*ticrate*)

Sets the physics update frequency

The physics update frequency is the number of times the physics system is executed every second. The default is 60 Hz.

**Parameters** **ticrate** (*float*) – The new update frequency (in Hz).

#### 4.2.4 Utility functions

bge.logic.**expandPath** (*path*)

Converts a blender internal path into a proper file system path.

Use / as directory separator in path You can use ‘//’ at the start of the string to define a relative path; Blender replaces that string by the directory of the startup .blend or runtime file to make a full path name (doesn’t change during the game, even if you load other .blend). The function also converts the directory separator to the local file system format.

**Parameters** **path** (*string*) – The path string to be converted/expanded.

**Returns** The converted string

**Return type** string

`bge.logic.getAverageFrameRate()`

Gets the estimated/average framerate for all the active scenes, not only the current scene.

**Returns** The estimated average framerate in frames per second

**Return type** float

`bge.logic.getBlendFileList(path = "")`

Returns a list of blend files in the same directory as the open blend file, or from using the option argument.

**Parameters** `path` (string) – Optional directory argument, will be expanded (like expandPath) into the full path.

**Returns** A list of filenames, with no directory prefix

**Return type** list

`bge.logic.getRandomFloat()`

Returns a random floating point value in the range [0 - 1)

`bge.logic.PrintGLInfo()`

Prints GL Extension Info into the console

## 4.2.5 Constants

`bge.logic.KX_TRUE`

True value used by some modules.

`bge.logic.KX_FALSE`

False value used by some modules.

### Sensors

#### Sensor Status

`bge.logic.KX_SENSOR_INACTIVE`

`bge.logic.KX_SENSOR_JUST_ACTIVATED`

`bge.logic.KX_SENSOR_ACTIVE`

`bge.logic.KX_SENSOR_JUST_DEACTIVATED`

#### Property Sensor

`bge.logic.KX_PROPSENSOR_EQUAL`

Activate when the property is equal to the sensor value.

**Value** 1

`bge.logic.KX_PROPSENSOR_NOTEQUAL`

Activate when the property is not equal to the sensor value.

**Value** 2

`bge.logic.KX_PROPSENSOR_INTERVAL`

Activate when the property is between the specified limits.

**Value** 3

bge.logic.KX\_PROPSENSOR\_CHANGED  
Activate when the property changes

**Value** 4

bge.logic.KX\_PROPSENSOR\_EXPRESSION  
Activate when the expression matches

**Value** 5

## Radar Sensor

See [bge.types.KX\\_RadarSensor](#)

bge.logic.KX\_RADAR\_AXIS\_POS\_X  
bge.logic.KX\_RADAR\_AXIS\_POS\_Y  
bge.logic.KX\_RADAR\_AXIS\_POS\_Z  
bge.logic.KX\_RADAR\_AXIS\_NEG\_X  
bge.logic.KX\_RADAR\_AXIS\_NEG\_Y  
bge.logic.KX\_RADAR\_AXIS\_NEG\_Z

## Ray Sensor

See [bge.types.KX\\_RaySensor](#)

bge.logic.KX\_RAY\_AXIS\_POS\_X  
bge.logic.KX\_RAY\_AXIS\_POS\_Y  
bge.logic.KX\_RAY\_AXIS\_POS\_Z  
bge.logic.KX\_RAY\_AXIS\_NEG\_X  
bge.logic.KX\_RAY\_AXIS\_NEG\_Y  
bge.logic.KX\_RAY\_AXIS\_NEG\_Z

## Actuators

### Action Actuator

See [bge.types.BL\\_ActionActuator](#)

bge.logic.KX\_ACTIONACT\_PLAY  
bge.logic.KX\_ACTIONACT\_FLIPPER  
bge.logic.KX\_ACTIONACT\_LOOPSTOP  
bge.logic.KX\_ACTIONACT\_LOOPEND  
bge.logic.KX\_ACTIONACT\_PROPERTY

## Constraint Actuator

See `bge.types.KX_ConstraintActuator.option`

- Applicable to Distance constraint:

`bge.logic.KX_ACT_CONSTRAINT_NORMAL`

Activate alignment to surface

`bge.logic.KX_ACT_CONSTRAINT_DISTANCE`

Activate distance control

`bge.logic.KX_ACT_CONSTRAINT_LOCAL`

Direction of the ray is along the local axis

- Applicable to Force field constraint:

`bge.logic.KX_ACT_CONSTRAINT_DOROTFH`

Force field act on rotation as well

- Applicable to both:

`bge.logic.KX_ACT_CONSTRAINT_MATERIAL`

Detect material rather than property

`bge.logic.KX_ACT_CONSTRAINT_PERMANENT`

No deactivation if ray does not hit target

See `bge.types.KX_ConstraintActuator.limit`

`bge.logic.KX_CONSTRAINTACT_LOCKX`

Limit X coord.

`bge.logic.KX_CONSTRAINTACT_LOCY`

Limit Y coord

`bge.logic.KX_CONSTRAINTACT_LOCZ`

Limit Z coord

`bge.logic.KX_CONSTRAINTACT_ROTX`

Limit X rotation

`bge.logic.KX_CONSTRAINTACT_ROTY`

Limit Y rotation

`bge.logic.KX_CONSTRAINTACT_ROTZ`

Limit Z rotation

`bge.logic.KX_CONSTRAINTACT_DIRNX`

Set distance along negative X axis

`bge.logic.KX_CONSTRAINTACT_DIRNY`

Set distance along negative Y axis

`bge.logic.KX_CONSTRAINTACT_DIRNZ`

Set distance along negative Z axis

`bge.logic.KX_CONSTRAINTACT_DIRPX`

Set distance along positive X axis

`bge.logic.KX_CONSTRAINTACT_DIRPY`

Set distance along positive Y axis

`bge.logic.KX_CONSTRAINTACT_DIRPZ`

Set distance along positive Z axis

bge.logic.**KX\_CONSTRAINTACT\_ORIX**  
Set orientation of X axis

bge.logic.**KX\_CONSTRAINTACT\_ORIY**  
Set orientation of Y axis

bge.logic.**KX\_CONSTRAINTACT\_ORIZ**  
Set orientation of Z axis

bge.logic.**KX\_ACT\_CONSTRAINT\_FHNX**  
Set force field along negative X axis

bge.logic.**KX\_ACT\_CONSTRAINT\_FHNY**  
Set force field along negative Y axis

bge.logic.**KX\_ACT\_CONSTRAINT\_FHNZ**  
Set force field along negative Z axis

bge.logic.**KX\_ACT\_CONSTRAINT\_FHPX**  
Set force field along positive X axis

bge.logic.**KX\_ACT\_CONSTRAINT\_FHPY**  
Set force field along positive Y axis

bge.logic.**KX\_ACT\_CONSTRAINT\_FHPZ**  
Set force field along positive Z axis

### Dynamic Actuator

See [bge.types.KX\\_SCA\\_DynamicActuator](#)

bge.logic.**KX\_DYN\_RESTORE\_DYNAMICS**

bge.logic.**KX\_DYN\_DISABLE\_DYNAMICS**

bge.logic.**KX\_DYN\_ENABLE\_RIGID\_BODY**

bge.logic.**KX\_DYN\_DISABLE\_RIGID\_BODY**

bge.logic.**KX\_DYN\_SET\_MASS**

### Game Actuator

See [bge.types.KX\\_GameActuator](#)

bge.logic.**KX\_GAME\_LOAD**

bge.logic.**KX\_GAME\_START**

bge.logic.**KX\_GAME\_RESTART**

bge.logic.**KX\_GAME\_QUIT**

bge.logic.**KX\_GAME\_SAVECFG**

bge.logic.**KX\_GAME\_LOADCFG**

### IPO Actuator

See `bge.types.KX_IpoActuator`

`bge.logic.KX_IPOACT_PLAY`  
`bge.logic.KX_IPOACT_PINGPONG`  
`bge.logic.KX_IPOACT_FLIPPER`  
`bge.logic.KX_IPOACT_LOOPSTOP`  
`bge.logic.KX_IPOACT_LOOPEND`  
`bge.logic.KX_IPOACT_FROM_PROP`

### Parent Actuator

`bge.logic.KX_PARENT_REMOVE`  
`bge.logic.KX_PARENT_SET`

### Random Distributions

See `bge.types.SCA_RandomActuator`

`bge.logic.KX_RANDOMACT_BOOL_CONST`  
`bge.logic.KX_RANDOMACT_BOOL_UNIFORM`  
`bge.logic.KX_RANDOMACT_BOOL_BERNOULLI`  
`bge.logic.KX_RANDOMACT_INT_CONST`  
`bge.logic.KX_RANDOMACT_INT_UNIFORM`  
`bge.logic.KX_RANDOMACT_INT_POISSON`  
`bge.logic.KX_RANDOMACT_FLOAT_CONST`  
`bge.logic.KX_RANDOMACT_FLOAT_UNIFORM`  
`bge.logic.KX_RANDOMACT_FLOAT_NORMAL`  
`bge.logic.KX_RANDOMACT_FLOAT_NEGATIVE_EXPONENTIAL`

### Scene Actuator

See `bge.types.KX_SceneActuator`

`bge.logic.KX_SCENE_RESTART`  
`bge.logic.KX_SCENE_SET_SCENE`  
`bge.logic.KX_SCENE_SET_CAMERA`  
`bge.logic.KX_SCENE_ADD_FRONT_SCENE`  
`bge.logic.KX_SCENE_ADD_BACK_SCENE`  
`bge.logic.KX_SCENE_REMOVE_SCENE`  
`bge.logic.KX_SCENE_SUSPEND`

bge.logic.KX\_SCENE\_RESUME

### Shape Action Actuator

See [bge.types.BL\\_ActionActuator](#)

bge.logic.KX\_ACTIONACT\_PLAY

bge.logic.KX\_ACTIONACT\_FLIPPER

bge.logic.KX\_ACTIONACT\_LOOPSTOP

bge.logic.KX\_ACTIONACT\_LOOPEND

bge.logic.KX\_ACTIONACT\_PROPERTY

### Sound Actuator

See [bge.types.KX\\_SoundActuator](#)

bge.logic.KX\_SOUNDACT\_PLAYSTOP

**Value 1**

bge.logic.KX\_SOUNDACT\_PLAYEND

**Value 2**

bge.logic.KX\_SOUNDACT\_LOOPSTOP

**Value 3**

bge.logic.KX\_SOUNDACT\_LOOPEND

**Value 4**

bge.logic.KX\_SOUNDACT\_LOOPBIDIRECTIONAL

**Value 5**

bge.logic.KX\_SOUNDACT\_LOOPBIDIRECTIONAL\_STOP

**Value 6**

### Various

#### Input Status

See [bge.types.SCA\\_PythonKeyboard](#), [bge.types.SCA\\_PythonMouse](#),  
[bge.types.SCA\\_MouseSensor](#), [bge.types.SCA\\_KeyboardSensor](#)

bge.logic.KX\_INPUT\_NONE

bge.logic.KX\_INPUT\_JUST\_ACTIVATED

bge.logic.KX\_INPUT\_ACTIVE

bge.logic.KX\_INPUT\_JUST\_RELEASED

## Mouse Buttons

See `bge.types.SCA_MouseSensor`

`bge.logic.KX_MOUSE_BUT_LEFT`

`bge.logic.KX_MOUSE_BUT_MIDDLE`

`bge.logic.KX_MOUSE_BUT_RIGHT`

## States

See `bge.types.KX_StateActuator`

`bge.logic.KX_STATE1`

`bge.logic.KX_STATE2`

`bge.logic.KX_STATE3`

`bge.logic.KX_STATE4`

`bge.logic.KX_STATE5`

`bge.logic.KX_STATE6`

`bge.logic.KX_STATE7`

`bge.logic.KX_STATE8`

`bge.logic.KX_STATE9`

`bge.logic.KX_STATE10`

`bge.logic.KX_STATE11`

`bge.logic.KX_STATE12`

`bge.logic.KX_STATE13`

`bge.logic.KX_STATE14`

`bge.logic.KX_STATE15`

`bge.logic.KX_STATE16`

`bge.logic.KX_STATE17`

`bge.logic.KX_STATE18`

`bge.logic.KX_STATE19`

`bge.logic.KX_STATE20`

`bge.logic.KX_STATE21`

`bge.logic.KX_STATE22`

`bge.logic.KX_STATE23`

`bge.logic.KX_STATE24`

`bge.logic.KX_STATE25`

`bge.logic.KX_STATE26`

`bge.logic.KX_STATE27`

bge.logic.KX\_STATE28

bge.logic.KX\_STATE29

bge.logic.KX\_STATE30

See [bge.types.KX\\_StateActuator.operation](#)

bge.logic.KX\_STATE\_OP\_CLR

Subtract bits to state mask

**Value** 0

bge.logic.KX\_STATE\_OP\_CPY

Copy state mask

**Value** 1

bge.logic.KX\_STATE\_OP\_NEG

Invert bits to state mask

**Value** 2

bge.logic.KX\_STATE\_OP\_SET

Add bits to state mask

**Value** 3

## 2D Filter

bge.logic.RAS\_2DFILTER\_BLUR

**Value** 2

bge.logic.RAS\_2DFILTER\_CUSTOMFILTER

Customer filter, the code code is set via shaderText property.

**Value** 12

bge.logic.RAS\_2DFILTER\_DILATION

**Value** 4

bge.logic.RAS\_2DFILTER\_DISABLED

Disable the filter that is currently active

**Value** -1

bge.logic.RAS\_2DFILTER\_ENABLED

Enable the filter that was previously disabled

**Value** -2

bge.logic.RAS\_2DFILTER\_EROSION

**Value** 5

bge.logic.RAS\_2DFILTER\_GRAYSCALE

**Value** 9

bge.logic.RAS\_2DFILTER\_INVERT

**Value** 11

bge.logic.RAS\_2DFILTER\_LAPLACIAN

**Value** 6

bge.logic.RAS\_2DFILTER\_MOTIONBLUR

Create and enable preset filters

**Value** 1

bge.logic.RAS\_2DFILTER\_NOFILTER

Disable and destroy the filter that is currently active

**Value** 0

bge.logic.RAS\_2DFILTER\_PREWITT

**Value** 8

bge.logic.RAS\_2DFILTER\_SEPIA

**Value** 10

bge.logic.RAS\_2DFILTER\_SHARPEN

**Value** 3

bge.logic.RAS\_2DFILTER\_SOBEL

**Value** 7

## Shader

bge.logic.VIEWMATRIX

bge.logic.VIEWMATRIX\_INVERSE

bge.logic.VIEWMATRIX\_INVERSETRANSPOSE

bge.logic.VIEWMATRIX\_TRANSPOSE

bge.logic.MODELMATRIX

bge.logic.MODELMATRIX\_INVERSE

bge.logic.MODELMATRIX\_INVERSETRANSPOSE

bge.logic.MODELMATRIX\_TRANSPOSE

bge.logic.MODELVIEWMATRIX

bge.logic.MODELVIEWMATRIX\_INVERSE

bge.logic.MODELVIEWMATRIX\_INVERSETRANSPOSE

bge.logic.MODELVIEWMATRIX\_TRANSPOSE

bge.logic.CAM\_POS

Current camera position

bge.logic.CONSTANT\_TIMER

User a timer for the uniform value.

bge.logic.SHD\_TANGENT

## Blender Material

```
bge.logic.BL_DST_ALPHA
bge.logic.BL_DST_COLOR
bge.logic.BL_ONE
bge.logic.BL_ONE_MINUS_DST_ALPHA
bge.logic.BL_ONE_MINUS_DST_COLOR
bge.logic.BL_ONE_MINUS_SRC_ALPHA
bge.logic.BL_ONE_MINUS_SRC_COLOR
bge.logic.BL_SRC_ALPHA
bge.logic.BL_SRC_ALPHA_SATURATE
bge.logic.BL_SRC_COLOR
bge.logic.BL_ZERO
```

## 4.3 Rasterizer (bge.render)

### 4.3.1 Intro

```
# Example Uses an L{SCA_MouseSensor}, and two L{KX_ObjectActuator}s to implement MouseLook::
# To use a mouse movement sensor "Mouse" and a
# motion actuator to mouse look:
import bge.render
import bge.logic

# scale sets the speed of motion
scale = 1.0, 0.5

co = bge.logic.getCurrentController()
obj = co.getOwner()
mouse = co.getSensor("Mouse")
lmotion = co.getActuator("LMove")
wmotion = co.getActuator("WMove")

# Transform the mouse coordinates to see how far the mouse has moved.
def mousePos():
    x = (bge.render.getWindowWidth() / 2 - mouse.getXPosition()) * scale[0]
    y = (bge.render.getWindowHeight() / 2 - mouse.getYPosition()) * scale[1]
    return (x, y)

pos = mousePos()

# Set the amount of motion: X is applied in world coordinates...
lmotion.setTorque(0.0, 0.0, pos[0], False)
# ...Y is applied in local coordinates
wmotion.setTorque(-pos[1], 0.0, 0.0, True)

# Activate both actuators
bge.logic.addActiveActuator(lmotion, True)
bge.logic.addActiveActuator(wmotion, True)
```

```
# Centre the mouse
bge.render.setMousePosition(bge.render.getWindowWidth() / 2, bge.render.getHeight() / 2)
```

### 4.3.2 Constants

**bge.render.KX\_TEXFACE\_MATERIAL**

Materials as defined by the texture face settings.

**bge.render.KX\_BLENDER\_MULTITEX\_MATERIAL**

Materials approximating blender materials with multitexturing.

**bge.render.KX\_BLENDER\_GLSL\_MATERIAL**

Materials approximating blender materials with GLSL.

### 4.3.3 Functions

**bge.render.getWindowWidth()**

Gets the width of the window (in pixels)

**Return type** integer

**bge.render.getWindowHeight()**

Gets the height of the window (in pixels)

**Return type** integer

**bge.render.makeScreenshot (filename)**

Writes a screenshot to the given filename.

If filename starts with // the image will be saved relative to the current directory. If the filename contains # it will be replaced with the frame number.

The standalone player saves .png files. It does not support colour space conversion or gamma correction.

When run from Blender, makeScreenshot supports Iris, IrisZ, TGA, Raw TGA, PNG, HamX, and Jpeg. Gamma, Colourspace conversion and Jpeg compression are taken from the Render settings panels.

**bge.render.enableVisibility (visible)**

Doesn't really do anything...

**bge.render.showMouse (visible)**

Enables or disables the operating system mouse cursor.

**bge.render.setMousePosition (x, y)**

Sets the mouse cursor position.

**bge.render.setBackgroundColor (rgba)**

Sets the window background colour.

**bge.render.setMistColor (rgb)**

Sets the mist colour.

bge.render.**setAmbientColor**(*rgb*)  
Sets the color of ambient light.

bge.render.**setMistStart**(*start*)  
Sets the mist start value. Objects further away than start will have mist applied to them.

bge.render.**setMistEnd**(*end*)  
Sets the mist end value. Objects further away from this will be coloured solid with the colour set by setMistColor().

bge.render.**disableMist**()  
Disables mist.

---

**Note:** Set any of the mist properties to enable mist.

---

bge.render.**setEyeSeparation**(*eyesep*)  
Sets the eye separation for stereo mode. Usually Focal Length/30 provides a comfortable value.

**Parameters** *eyesep* (*float*) – The distance between the left and right eye.

bge.render.**getEyeSeparation**()  
Gets the current eye separation for stereo mode.

**Return type** float

bge.render.**setFocalLength**(*focallength*)  
Sets the focal length for stereo mode. It uses the current camera focal length as initial value.

**Parameters** *focallength* (*float*) – The focal length.

bge.render.**getFocalLength**()  
Gets the current focal length for stereo mode.

**Return type** float

bge.render.**setMaterialMode**(*mode*)  
Set the material mode to use for OpenGL rendering.

---

**Note:** Changes will only affect newly created scenes.

---

bge.render.**getMaterialMode**(*mode*)  
Get the material mode to use for OpenGL rendering.

**Return type** KX\_TEXFACE\_MATERIAL, KX\_BLENDER\_MULTITEX\_MATERIAL,  
KX\_BLENDER\_GLSL\_MATERIAL

bge.render.**setGLSLMaterialSetting**(*setting*, *enable*)  
Enables or disables a GLSL material setting.

bge.render.**getGLSLMaterialSetting**(*setting*, *enable*)  
Get the state of a GLSL material setting.

**Return type** boolean

bge.render.**drawLine** (*fromVec, toVec, color*)

Draw a line in the 3D scene.

#### Parameters

- **fromVec** (*list [x, y, z]*) – the origin of the line
- **toVec** (*list [x, y, z]*) – the end of the line
- **color** (*list [r, g, b]*) – the color of the line

bge.render.**enableMotionBlur** (*factor*)

Enable the motion blur effect.

**Parameters** **factor** (*float [0.0 - 1.0]*) – the amount of motion blur to display.

bge.render.**disableMotionBlur** ()

Disable the motion blur effect.

## 4.4 Video Texture (bge.texture)

### 4.4.1 Intro

The bge.texture module allows you to manipulate textures during the game.

Several sources for texture are possible: video files, image files, video capture, memory buffer, camera render or a mix of that.

The video and image files can be loaded from the internet using an URL instead of a file name.

In addition, you can apply filters on the images before sending them to the GPU, allowing video effect: blue screen, color band, gray, normal map.

bge.texture uses FFmpeg to load images and videos. All the formats and codecs that FFmpeg supports are supported by this module, including but not limited to:

```
* AVI
* Ogg
* Xvid
* Theora
* dv1394 camera
* video4linux capture card (this includes many webcams)
* videoForWindows capture card (this includes many webcams)
* JPG
```

The principle is simple: first you identify a texture on an existing object using the :materialID: function, then you create a new texture with dynamic content and swap the two textures in the GPU.

The GE is not aware of the substitution and continues to display the object as always, except that you are now in control of the texture.

When the texture object is deleted, the new texture is deleted and the old texture restored.

```
"""
Basic Video Playback
+++++
Example of how to replace a texture in game with a video. It needs to run everyframe
"""

import bge
from bge import texture
from bge import logic
```

```
cont = logic.getCurrentController()
obj = cont.owner

# the creation of the texture must be done once: save the
# texture object in an attribute of bge.logic module makes it persistent
if not hasattr(logic, 'video'):

    # identify a static texture by name
    matID = texture.materialID(obj, 'IMvideo.png')

    # create a dynamic texture that will replace the static texture
    logic.video = texture.Texture(obj, matID)

    # define a source of image for the texture, here a movie
    movie = logic.expandPath('//trailer_400p.ogv')
    logic.video.source = texture.VideoFFmpeg(movie)
    logic.video.source.scale = True

    # quick off the movie, but it wont play in the background
    logic.video.source.play()

# you need to call this function every frame to ensure update of the texture.
logic.video.refresh(True)

"""
Texture replacement
+++++
Example of how to replace a texture in game with an external image.
createTexture() and removeTexture() are to be called from a module Python
Controller.
"""
from bge import logic
from bge import texture

def createTexture(cont):
    """Create a new Dynamic Texture"""
    object = cont.owner

    # get the reference pointer (ID) of the internal texture
    ID = texture.materialID(obj, 'IMoriginal.png')

    # create a texture object
    object_texture = texture.Texture(object, ID)

    # create a new source with an external image
    url = logic.expandPath("//newtexture.jpg")
    new_source = texture.ImageFFmpeg(url)

    # the texture has to be stored in a permanent Python object
    logic.texture = object_texture

    # update/replace the texture
    logic.texture.source = new_source
    logic.texture.refresh(False)

def removeTexture(cont):
```

```
"""Delete the Dynamic Texture, reversing back the final to its original state."""
try:
    del logic.texture
except:
    pass

class bge.texture.VideoFFmpeg(file[, capture=-1, rate=25.0, width=0, height=0])
    FFmpeg video source

    status
        video status

    range
        replay range

    repeat
        repeat count, -1 for infinite repeat
        Type int

    framerate
        frame rate
        Type float

    valid
        Tells if an image is available
        Type bool

    image
        image data

    size
        image size

    scale
        fast scale of image (near neighbour)

    flip
        flip image vertically

    filter
        pixel filter

    preseek
        number of frames of preseek
        Type int

    deinterlace
        deinterlace image
        Type bool

    play()
        Play (restart) video

    pause()
        pause video

    stop()
        stop video (play will replay it from start)
```

```
refresh()
    Refresh video - get its status

class bge.texture.ImageFFmpeg (file)
    FFmpeg image source

    status
        video status

    valid
        Tells if an image is available
            Type bool

    image
        image data

    size
        image size

    scale
        fast scale of image (near neighbour)

    flip
        flip image vertically

    filter
        pixel filter

    refresh()
        Refresh image, i.e. load it

    reload ([newname])
        Reload image, i.e. reopen it

class bge.texture.ImageBuff
    Image source from image buffer

    filter
        pixel filter

    flip
        flip image vertically

    image
        image data

    load (imageBuffer, width, height)
        Load image from buffer

    plot (imageBuffer, width, height, positionX, positionY)
        update image buffer

    scale
        fast scale of image (near neighbour)

    size
        image size

    valid
        bool to tell if an image is available

class bge.texture.ImageMirror (scene)
    Image source from mirror
```

**alpha**  
use alpha in texture

**background**  
background color

**capsize**  
size of render area

**clip**  
clipping distance

**filter**  
pixel filter

**flip**  
flip image vertically

**image**  
image data

**refresh** (*imageMirror*)  
Refresh image - invalidate its current content

**scale**  
fast scale of image (near neighbour)

**size**  
image size

**valid**  
bool to tell if an image is available

**whole**  
use whole viewport to render

**class bge.texture.ImageMix**  
Image mixer

**filter**  
pixel filter

**flip**  
flip image vertically

**getSource** (*imageMix*)  
get image source

**getWeight** (*imageMix*)  
get image source weight

**image**  
image data

**refresh** (*imageMix*)  
Refresh image - invalidate its current content

**scale**  
fast scale of image (near neighbour)

**setSource** (*imageMix*)  
set image source

**setWeight** (*imageMix*)  
set image source weight

**valid**  
bool to tell if an image is available

**class bge.texture.ImageRender** (*scene, camera*)  
Image source from render

**alpha**  
use alpha in texture

**background**  
background color

**capsize**  
size of render area

**filter**  
pixel filter

**flip**  
flip image vertically

**image**  
image data

**refresh** (*imageRender*)  
Refresh image - invalidate its current content

**scale**  
fast scale of image (near neighbour)

**size**  
image size

**valid**  
bool to tell if an image is available

**whole**  
use whole viewport to render

**class bge.texture.ImageViewport**  
Image source from viewport

**alpha**  
use alpha in texture

**capsize**  
size of viewport area being captured

**filter**  
pixel filter

**flip**  
flip image vertically

**image**  
image data

**position**  
upper left corner of captured area

```
refresh (imageViewport)
    Refresh image - invalidate its current content

scale
    fast scale of image (near neighbour)

size
    image size

valid
    bool to tell if an image is available

whole
    use whole viewport to capture

class bge.texture.Texture (gameObj)
    Texture objects

    bindId
        OpenGL Bind Name

    close (texture)
        Close dynamic texture and restore original

    mipmap
        mipmap texture

    refresh (texture)
        Refresh texture from source

    source
        source of texture

class bge.texture.FilterBGR24
    Source filter BGR24 objects

class bge.texture.FilterBlueScreen
    Filter for Blue Screen objects

    color
        blue screen color

    limits
        blue screen color limits

    previous
        previous pixel filter

class bge.texture.FilterColor
    Filter for color calculations

    matrix
        matrix [4][5] for color calculation

    previous
        previous pixel filter

class bge.texture.FilterGray
    Filter for gray scale effect

    previous
        previous pixel filter
```

```
class bge.texture.FilterLevel
    Filter for levels calculations

    levels
        levels matrix [4] (min, max)

    previous
        previous pixel filter

class bge.texture.FilterNormal
    Filter for Blue Screen objects

    colorIdx
        index of color used to calculate normal (0 - red, 1 - green, 2 - blue)

    depth
        depth of relief

    previous
        previous pixel filter

class bge.texture.FilterRGB24
    Returns a new input filter object to be used with ImageBuff object when the image passed to the ImageBuff.load() function has the 3-bytes pixel format BGR.
```

```
class bge.texture.FilterRGBA32
    Source filter RGBA32 objects
```

```
bge.texture.getError()
    Last error that occurred in a bge.texture function.
```

**Returns** the description of the last error occurred in a bge.texture function.

**Return type** string

```
bge.texture.imageToArray(image, mode)
```

Returns a buffer corresponding to the current image stored in a texture source object.

#### Parameters

- **image** (object of type [VideoFFmpeg](#), [ImageFFmpeg](#), [ImageBuff](#), [ImageMix](#), [ImageRender](#), [ImageMirror](#) or [ImageViewport](#)) – Image source object.
- **mode** (*string*) – optional argument representing the pixel format. You can use the characters R, G, B for the 3 color channels, A for the alpha channel, 0 to force a fixed 0 color channel and 1 to force a fixed 255 color channel. Example: “BGR” will return 3 bytes per pixel with the Blue, Green and Red channels in that order. “RGB1” will return 4 bytes per pixel with the Red, Green, Blue channels in that order and the alpha channel forced to 255. The default mode is “RGBA”.

**Return type** buffer

**Returns** A object representing the image as one dimensional array of bytes of size (pixel\_size\*width\*height), line by line starting from the bottom of the image. The pixel size and format is determined by the mode parameter.

## 4.5 Game Keys (bge.events)

### 4.5.1 Intro

This module holds key constants for the SCA\_KeyboardSensor.

```
# Set a connected keyboard sensor to accept F1
import bge

co = bge.logic.getCurrentController()
# 'Keyboard' is a keyboard sensor
sensor = co.sensors["Keyboard"]
sensor.key = bge.events.F1KEY

# Do the all keys thing
import bge

co = bge.logic.getCurrentController()
# 'Keyboard' is a keyboard sensor
sensor = co.sensors["Keyboard"]

for key,status in sensor.events:
    # key[0] == bge.events.keycode, key[1] = status
    if status == bge.logic.KX_INPUT JUST_ACTIVATED:
        if key == bge.events.WKEY:
            # Activate Forward!
        if key == bge.events.SKEY:
            # Activate Backward!
        if key == bge.events.AKEY:
            # Activate Left!
        if key == bge.events.DKEY:
            # Activate Right!

# The all keys thing without a keyboard sensor (but you will
# need an always sensor with pulse mode on)
import bge

# Just shortening names here
keyboard = bge.logic.keyboard
JUST_ACTIVATED = bge.logic.KX_INPUT JUST_ACTIVATED

if keyboard.events[bge.events.WKEY] == JUST_ACTIVATED:
    print("Activate Forward!")
if keyboard.events[bge.events.SKEY] == JUST_ACTIVATED:
    print("Activate Backward!")
if keyboard.events[bge.events.AKEY] == JUST_ACTIVATED:
    print("Activate Left!")
if keyboard.events[bge.events.DKEY] == JUST_ACTIVATED:
    print("Activate Right!")
```

### 4.5.2 Functions

`bge.events.EventToString(event)`

Return the string name of a key event. Will raise a ValueError error if its invalid.

**Parameters** `event (int)` – key event from bge.keys or the keyboard sensor.

**Return type** string

bge.events.**EventToCharacter**(*event, shift*)

Return the string name of a key event. Returns an empty string if the event cant be represented as a character.

**Parameters**

- **event** (*int*) – key event from bge.keys or the keyboard sensor.
- **shift** (*bool*) – set to true if shift is held.

**Return type** string

### 4.5.3 Keys (Constants)

#### Mouse Keys

```
bge.events.LEFTMOUSE  
bge.events.MIDDLEMOUSE  
bge.events.RIGHTMOUSE  
bge.events.WHEELUPMOUSE  
bge.events.WHEELEDOWNMOUSE  
bge.events.MOUSEX  
bge.events.MOUSEY
```

#### Keyboard Keys

##### Alphabet keys

```
bge.events.AKEY  
bge.events.BKEY  
bge.events.CKEY  
bge.events.DKEY  
bge.events.EKEY  
bge.events.FKEY  
bge.events.GKEY  
bge.events.HKEY  
bge.events.IKEY  
bge.events.JKEY  
bge.events.KKEY  
bge.events.LKEY  
bge.events.MKEY  
bge.events.NKEY  
bge.events.OKEY
```

```
bge.events.PKEY  
bge.events.QKEY  
bge.events.RKEY  
bge.events.SKEY  
bge.events.TKEY  
bge.events.UKEY  
bge.events.VKEY  
bge.events.WKEY  
bge.events.XKEY  
bge.events.YKEY  
bge.events.ZKEY
```

### Number keys

```
bge.events.ZEROKEY  
bge.events.ONEKEY  
bge.events.TWOKEY  
bge.events.THREEKEY  
bge.events.FOURKEY  
bge.events.FIVEKEY  
bge.events.SIXKEY  
bge.events.SEVENKEY  
bge.events.EIGHTKEY  
bge.events.NINEKEY
```

### Modifiers Keys

```
bge.events.CAPSLOCKKEY  
bge.events.LEFTCTRLKEY  
bge.events.LEFTALTKEY  
bge.events.RIGHTALTKEY  
bge.events.RIGHTCTRLKEY  
bge.events.RIGHTSHIFTKEY  
bge.events.LEFTSHIFTKEY
```

## Arrow Keys

```
bge.events.LEFTARROWKEY  
bge.events.DOWNARROWKEY  
bge.events.RIGHTARROWKEY  
bge.events.UPARROWKEY
```

## Numberpad Keys

```
bge.events.PAD0  
bge.events.PAD1  
bge.events.PAD2  
bge.events.PAD3  
bge.events.PAD4  
bge.events.PAD5  
bge.events.PAD6  
bge.events.PAD7  
bge.events.PAD8  
bge.events.PAD9  
bge.events.PADPERIOD  
bge.events.PADSLASHKEY  
bge.events.PADASTERKEY  
bge.events.PADMINUS  
bge.events.PADENTER  
bge.events.PADPLUSKEY
```

## Function Keys

```
bge.events.F1KEY  
bge.events.F2KEY  
bge.events.F3KEY  
bge.events.F4KEY  
bge.events.F5KEY  
bge.events.F6KEY  
bge.events.F7KEY  
bge.events.F8KEY  
bge.events.F9KEY  
bge.events.F10KEY
```

```
bge.events.F11KEY
bge.events.F12KEY
bge.events.F13KEY
bge.events.F14KEY
bge.events.F15KEY
bge.events.F16KEY
bge.events.F17KEY
bge.events.F18KEY
bge.events.F19KEY
```

### Other Keys

```
bge.events.ACCENTGRAVEKEY
bge.events.BACKSLASHKEY
bge.events.BACKSPACEKEY
bge.events.COMMASEPKEY
bge.events.DELKEY
bge.events.ENDKEY
bge.events.EQUALKEY
bge.events.ESCKEY
bge.events.HOMEKEY
bge.events.INSERTKEY
bge.events.LEFTBRACKETKEY
bge.events.LINEFEEDKEY
bge.events.MINUSKEY
bge.events.PAGEDOWNKEY
bge.events.PAGEUPKEY
bge.events.PAUSEKEY
bge.events.PERIODKEY
bge.events.QUOTEKEY
bge.events.RIGHTBRACKETKEY
bge.events.RETKEY (Deprecated: use bge.events.ENTERKEY)
bge.events.ENTERKEY
bge.events.SEMICOLONKEY
bge.events.SLASHKEY
bge.events.SPACEKEY
bge.events.TABKEY
```

## 4.6 Physics Constraints (bge.constraints)

```
"""
Basic Physics Constraint
+++++
Example of how to create a hinge Physics Constraint between two objects.
"""

from bge import logic
from bge import constraints

# get object list
objects = logic.getCurrentScene().objects

# get object named Object1 and Object 2
object_1 = objects["Object1"]
object_2 = objects["Object2"]

# want to use Edge constraint type
constraint_type = 2

# get Object1 and Object2 physics IDs
physics_id_1 = object_1.getPhysicsId()
physics_id_2 = object_2.getPhysicsId()

# Use bottom right edge of Object1 for hinge position
edge_position_x = 1.0
edge_position_y = 0.0
edge_position_z = -1.0

# use Object1 y axis for angle to point hinge
edge_angle_x = 0.0
edge_angle_y = 1.0
edge_angle_z = 0.0

# create an edge constraint
constraints.createConstraint(physics_id_1, physics_id_2,
                             constraint_type,
                             edge_position_x, edge_position_y, edge_position_z,
                             edge_angle_x, edge_angle_y, edge_angle_z)

bge.constraints.createConstraint(physicsid, physicsid2, constrainttype, [pivotX, pivotY, pivotZ,
  [axisX, axisY, axisZ, [flag]]])
```

Creates a constraint.

### Parameters

- **physicsid** (*int*) – the physics id of the first object in constraint
- **physicsid2** (*int*) – the physics id of the second object in constraint
- **constrainttype** – the type of the constraint. The constraint types are:

- POINTTOPOINT\_CONSTRAINT
- LINEHINGE\_CONSTRAINT
- ANGULAR\_CONSTRAINT
- CONETWIST\_CONSTRAINT
- VEHICLE\_CONSTRAINT

### Parameters

- **pivotX** (*float*) – pivot X position
- **pivotY** (*float*) – pivot Y position
- **pivotZ** (*float*) – pivot Z position
- **axisX** (*float*) – X axis
- **axisY** (*float*) – Y axis
- **axisZ** (*float*) – Z axis
- **flag** (*int*) –

`bge.constraints.error`

Symbolic constant string that indicates error.

`bge.constraints.exportBulletFile (filename)`

export a .bullet file

**Parameters** `filename` (*string*) – File name

`bge.constraints.getAppliedImpulse (constraintId)`

**Parameters** `constraintId` (*int*) – The id of the constraint.

**Returns** the most recent applied impulse.

**Return type** float

`bge.constraints.getVehicleConstraint (constraintId)`

**Parameters** `constraintId` (*int*) – The id of the vehicle constraint.

**Returns** a vehicle constraint object.

**Return type** `bge.types.KX_VehicleWrapper`

`bge.constraints.removeConstraint (constraintId)`

Removes a constraint.

**Parameters** `constraintId` (*int*) – The id of the constraint to be removed.

`bge.constraints.setCcdMode (ccdMode)`

---

**Note:** Very experimental, not recommended

---

Sets the CCD (Continous Colision Detection) mode in the Physics Environment.

**Parameters** `ccdMode` (*int*) – The new CCD mode.

`bge.constraints.setContactBreakingThreshold (breakingThreshold)`

---

**Note:** Reasonable default is 0.02 (if units are meters)

---

Sets thresholds to do with contact point management.

**Parameters** `breakingThreshold` (*float*) – The new contact breaking threshold.

`bge.constraints.setDeactivationAngularThreshold (angularThreshold)`

Sets the angular velocity threshold.

**Parameters** **angularThreshold** (*float*) – New deactivation angular threshold.

`bge.constraints.setDeactivationLinearThreshold(linearThreshold)`  
Sets the linear velocity threshold.

**Parameters** **linearThreshold** (*float*) – New deactivation linear threshold.

`bge.constraints.setDeactivationTime(time)`  
Sets the time after which a resting rigidbody gets deactivated.

**Parameters** **time** (*float*) – The deactivation time.

`bge.constraints.setDebugMode(mode)`  
Sets the debug mode.

#### Debug modes:

- `DBG_NODEBUG`
- `DBG_DRAWWIREFRAME`
- `DBG_DRAWAABB`
- `DBG_DRAWFEATURESTEXT`
- `DBG_DRAWCONTACTPOINTS`
- `DBG_NOHELPTEXT`
- `DBG_DRAWTEXT`
- `DBG_PROFILETIMINGS`
- `DBG_ENABLESATCOMPARISION`
- `DBG_DISABLEBULLETLCF`
- `DBG_ENABLECCD`
- `DBG_DRAWCONSTRAINTS`
- `DBG_DRAWCONSTRAINTLIMITS`
- `DBG_FASTWIREFRAME`

**Parameters** **mode** (*int*) – The new debug mode.

`bge.constraints.setGravity(x, y, z)`  
Sets the gravity force.

#### Parameters

- `x` (*float*) – Gravity X force.
- `y` (*float*) – Gravity Y force.
- `z` (*float*) – Gravity Z force.

`bge.constraints.setLinearAirDamping(damping)`

---

**Note:** Not implemented.

---

Sets the linear air damping for rigidbodies.

bge.constraints.**setNumIterations** (*numiter*)  
Sets the number of iterations for an iterative constraint solver.

**Parameters** **numiter** (*int*) – New number of iterations.

bge.constraints.**setNumTimeSubSteps** (*numsubstep*)  
Sets the number of substeps for each physics proceed. Tradeoff quality for performance.

**Parameters** **numsubstep** (*int*) – New number of substeps.

bge.constraints.**setSolverDamping** (*damping*)

---

**Note:** Very experimental, not recommended

---

Sets the damper constant of a penalty based solver.

**Parameters** **damping** (*float*) – New damping for the solver.

bge.constraints.**setSolverTau** (*tau*)

---

**Note:** Very experimental, not recommended

---

Sets the spring constant of a penalty based solver.

**Parameters** **tau** (*float*) – New tau for the solver.

bge.constraints.**setSolverType** (*solverType*)

---

**Note:** Very experimental, not recommended

---

Sets the solver type.

**Parameters** **solverType** (*int*) – The new type of the solver.

bge.constraints.**setSorConstant** (*sor*)

---

**Note:** Very experimental, not recommended

---

Sets the successive overrelaxation constant.

**Parameters** **sor** (*float*) – New sor value.

bge.constraints.**setUseEpa** (*epa*)

Not implemented.

bge.constraints.**DBG\_NODEBUG**

---

**Note:** Debug mode to be used with function `setDebugMode`

---

No debug.

bge.constraints.**DBG\_DRAWWIREFRAME**

---

**Note:** Debug mode to be used with function `setDebugMode`

---

Draw wireframe in debug.

bge.constraints.**DBG\_DRAWAABB**

---

**Note:** Debug mode to be used with function `setDebugMode`

---

Draw Axis Aligned Bounding Box in debug.

bge.constraints.**DBG\_DRAWFEATURESTEXT**

---

**Note:** Debug mode to be used with function `setDebugMode`

---

Draw features text in debug.

bge.constraints.**DBG\_DRAWCONTACTPOINTS**

---

**Note:** Debug mode to be used with function `setDebugMode`

---

Draw contact points in debug.

bge.constraints.**DBG\_NOHELPTEXT**

---

**Note:** Debug mode to be used with function `setDebugMode`

---

Debug without help text.

bge.constraints.**DBG\_DRAWTEXT**

---

**Note:** Debug mode to be used with function `setDebugMode`

---

Draw text in debug.

bge.constraints.**DBG\_PROFILETIMINGS**

---

**Note:** Debug mode to be used with function `setDebugMode`

---

Draw profile timings in debug.

bge.constraints.**DBG\_ENABLESATCOMPARISON**

---

**Note:** Debug mode to be used with function `setDebugMode`

---

---

Enable sat comparision in debug.

bge.constraints.**DBG\_DISABLEBULLETLCP**

---

**Note:** Debug mode to be used with function [setDebugMode](#)

---

Disable Bullet LCP.

bge.constraints.**DBG\_ENABLECCD**

---

**Note:** Debug mode to be used with function [setDebugMode](#)

---

Enable Continous Colision Detection in debug.

bge.constraints.**DBG\_DRAWCONSTRAINTS**

---

**Note:** Debug mode to be used with function [setDebugMode](#)

---

Draw constraints in debug.

bge.constraints.**DBG\_DRAWCONSTRAINTLIMITS**

---

**Note:** Debug mode to be used with function [setDebugMode](#)

---

Draw constraint limits in debug.

bge.constraints.**DBG\_FASTWIREFRAME**

---

**Note:** Debug mode to be used with function [setDebugMode](#)

---

Draw a fast wireframe in debug.

bge.constraints.**POINTTOPPOINT\_CONSTRAINT**

---

**Note:** Constraint type to be used with function [createConstraint](#)

---

bge.constraints.**LINEHINGE\_CONSTRAINT**

---

**Note:** Constraint type to be used with function [createConstraint](#)

---

bge.constraints.**ANGULAR\_CONSTRAINT**

---

**Note:** Constraint type to be used with function [createConstraint](#)

---

---

bge.constraints.**CONETWIST\_CONSTRAINT**

---

**Note:** Constraint type to be used with function `createConstraint`

---

bge.constraints.**VEHICLE\_CONSTRAINT**

---

**Note:** Constraint type to be used with function `createConstraint`

---



# API INFO

## 5.1 Blender API Change Log

### 5.1.1 2.56 to 2.57

#### bpy.types.SplineBezierPoints

##### Function Arguments

- bpy.types.SplineBezierPoints.friction (count), was (number)

#### bpy.types.RenderSettings

##### Added

- bpy.types.RenderSettings.use\_stamp\_lens

##### Removed

- use\_backbuf

#### bpy.types.ActionPoseMarkers

##### Added

- bpy.types.ActionPoseMarkers.active
- bpy.types.ActionPoseMarkers.active\_index

#### bpy.types.SpaceImageEditor

##### Renamed

- **curves** -> bpy.types.SpaceImageEditor.curve

## bpy.types.Scene

### Removed

- `network_render`

## bpy.types.GameObjectSettings

### Added

- `bpy.types.GameObjectSettings.use_material_physics_fh`

### Removed

- `use_material_physics`

## bpy.types.SplinePoints

### Function Arguments

- `bpy.types.SplinePoints.use_material_physics(count), was (number)`

## bpy.types.Area

### Added

- `bpy.types.Area.height`
- `bpy.types.Area.width`

## bpy.types.SolidifyModifier

### Added

- `bpy.types.SolidifyModifier.material_offset`
- `bpy.types.SolidifyModifier.material_offset_rim`

### Removed

- `use_rim_material`

## bpy.types.UserPreferencesEdit

### Removed

- `use_keyframe_insert_keyingset`

**bpy.types.MaterialTextureSlot****Added**

- bpy.types.MaterialTextureSlot.bump\_method
- bpy.types.MaterialTextureSlot.bump\_objectspace

**Removed**

- use\_old\_bump

**bpy.types.ExplodeModifier****Added**

- bpy.types.ExplodeModifier.particle\_uv
- bpy.types.ExplodeModifier.use\_edge\_cut

**Removed**

- use\_edge\_split

**bpy.types.Node****Added**

- bpy.types.Node.label

**bpy.types.RigidBodyJointConstraint****Added**

- bpy.types.RigidBodyJointConstraint.limit\_angle\_max\_x
- bpy.types.RigidBodyJointConstraint.limit\_angle\_max\_y
- bpy.types.RigidBodyJointConstraint.limit\_angle\_max\_z
- bpy.types.RigidBodyJointConstraint.limit\_angle\_min\_x
- bpy.types.RigidBodyJointConstraint.limit\_angle\_min\_y
- bpy.types.RigidBodyJointConstraint.limit\_angle\_min\_z
- bpy.types.RigidBodyJointConstraint.limit\_max\_x
- bpy.types.RigidBodyJointConstraint.limit\_max\_y
- bpy.types.RigidBodyJointConstraint.limit\_max\_z
- bpy.types.RigidBodyJointConstraint.limit\_min\_x
- bpy.types.RigidBodyJointConstraint.limit\_min\_y

- bpy.types.RigidBodyJointConstraint.limit\_min\_z

#### **Removed**

- limit\_cone\_max
- limit\_cone\_min
- limit\_generic\_max
- limit\_generic\_min

### **bpy.types.KeyMap**

#### **Renamed**

- items -> bpy.types.KeyMap.keymap\_items

### **bpy.types.SpaceNodeEditor**

#### **Added**

- bpy.types.SpaceNodeEditor.backdrop\_channels
- bpy.types.SpaceNodeEditor.backdrop\_x
- bpy.types.SpaceNodeEditor.backdrop\_y
- bpy.types.SpaceNodeEditor.backdrop\_zoom
- bpy.types.SpaceNodeEditor.use\_auto\_render

### **bpy.types.SPHFluidSettings**

#### **Added**

- bpy.types.SPHFluidSettings.factor\_density
- bpy.types.SPHFluidSettings.factor\_radius
- bpy.types.SPHFluidSettings.factor\_repulsion
- bpy.types.SPHFluidSettings.factor\_rest\_length
- bpy.types.SPHFluidSettings.factor\_stiff\_viscosity
- bpy.types.SPHFluidSettings.plasticity
- bpy.types.SPHFluidSettings.repulsion
- bpy.types.SPHFluidSettings.spring\_frames
- bpy.types.SPHFluidSettings.stiff\_viscosity
- bpy.types.SPHFluidSettings.use\_initial\_rest\_length
- bpy.types.SPHFluidSettings.use\_viscoelastic\_springs
- bpy.types.SPHFluidSettings.yield\_ratio

**Removed**

- **stiffness\_near**
- **viscosity\_beta**

**Renamed**

- **viscosity\_omega** -> `bpy.types.SPHFluidSettings.linear_viscosity`

**bpy.types.ConstraintActuator****Added**

- `bpy.types.ConstraintActuator.direction_axis_pos`
- `bpy.types.ConstraintActuator.fh_force`

**Removed**

- **spring**

**bpy.typesUILayout****Renamed**

- **operator\_enums** -> `bpy.typesUILayout.operator_enum`

**bpy.types.SpaceDopeSheetEditor****Added**

- `bpy.types.SpaceDopeSheetEditor.show_pose_markers`

**bpy.types.ToolSettings****Added**

- `bpy.types.ToolSettings.edge_path_live_unwrap`
- `bpy.types.ToolSettings.proportional_size`
- `bpy.types.ToolSettings.use_keyframe_insert_keyingset`

## bpy.types.EditBone

### Added

- bpy.types>EditBone.bbone\_x
- bpy.types>EditBone.bbone\_z

### Function Arguments

- bpy.types>EditBone.bbone\_z (self, matrix, scale, roll), was (self, matrix)

## bpy.types.ID

### Renamed

- **update** -> bpy.types.ID.update\_tag

## bpy.types.SpaceGraphEditor

### Added

- bpy.types.SpaceGraphEditor.use\_fancy\_drawing

## bpy.types.ParticleSystem

### Added

- bpy.types.ParticleSystem.child\_seed

## bpy.types.SpaceTimeline

### Removed

- use\_play\_3d\_editors
- use\_play\_animation\_editors
- use\_play\_image\_editors
- use\_play\_node\_editors
- use\_play\_properties\_editors
- use\_play\_sequence\_editors
- use\_play\_top\_left\_3d\_editor

## bpy.types.Mesh

### Added

- bpy.types.Mesh.validate

### Renamed

- **show\_extra\_edge\_angle** -> bpy.types.Mesh.show\_extra\_face\_angle

### Function Arguments

- bpy.types.Mesh.show\_extra\_face\_angle (*self, vertices, edges, faces*), *was (self, verts, edges, faces)*

## bpy.types.EnumProperty

### Added

- bpy.types.EnumProperty.default\_flag

### Renamed

- **items** -> bpy.types.EnumProperty.enum\_items

## bpy.types.Screen

### Added

- bpy.types.Screen.use\_play\_3d\_editors
- bpy.types.Screen.use\_play\_animation\_editors
- bpy.types.Screen.use\_play\_image\_editors
- bpy.types.Screen.use\_play\_node\_editors
- bpy.types.Screen.use\_play\_properties\_editors
- bpy.types.Screen.use\_play\_sequence\_editors
- bpy.types.Screen.use\_play\_top\_left\_3d\_editor

## bpy.types.MirrorModifier

### Added

- bpy.types.MirrorModifier.use\_mirror\_merge

## bpy.types.Operator

### Added

- bpy.types.Operator.cancel

## bpy.types.Brush

### Added

- bpy.types.Brush.height
- bpy.types.Brush.use\_fixed\_texture

### Renamed

- **imagepaint\_tool** -> bpy.types.Brush.image\_tool
- **use\_paint\_texture** -> bpy.types.Brush.use\_paint\_image
- **vertexpaint\_tool** -> bpy.types.Brush.vertex\_tool

## bpy.types.Key

### Renamed

- **keys** -> bpy.types.Key.key\_blocks

## bpy.types.CompositorNodeBlur

### Added

- bpy.types.CompositorNodeBlur.aspect\_correction

## bpy.types.SpaceTextEditor

### Added

- bpy.types.SpaceTextEditor.margin\_column
- bpy.types.SpaceTextEditor.show\_margin

## bpy.types.GPencilLayer

### Added

- bpy.types.GPencilLayer.show\_x\_ray

**Removed**

- **active**

**bpy.types.MarbleTexture****Renamed**

- **noisebasis\_2** -> `bpy.types.MarbleTexture.noise_basis_2`

**bpy.types.Particle****Removed**

- **is\_hair**

**Renamed**

- **keys** -> `bpy.types.Particle.hair_keys`
- **keys** -> `bpy.types.Particle.particle_keys`

**bpy.types.Modifier****Added**

- `bpy.types.Modifier.use_apply_on_spline`

**bpy.types.Property****Added**

- `bpy.types.Property.is_enum_flag`

**bpy.types.SpaceProperties****Added**

- `bpy.types.SpaceProperties.texture_context`

**Removed**

- **show\_brush\_texture**

## bpy.types.VertexGroups

### Added

- bpy.types.VertexGroups.remove

### Removed

- assign

## bpy.types.Material

### Added

- bpy.types.Material.shadow\_only\_type

## bpy.types.RenderLayer

### Function Arguments

- bpy.types.RenderLayer.shadow\_only\_type (filename, x, y), was (filename)

## bpy.types.Object

### Added

- bpy.types.Object.is\_modified

### Renamed

- **create\_dupli\_list** -> bpy.types.Object.dupli\_list\_create
- **create\_mesh** -> bpy.types.Object.to\_mesh
- **free\_dupli\_list** -> bpy.types.Object.dupli\_list\_clear

## bpy.types.NodeTree

### Added

- bpy.types.NodeTree.inputs
- bpy.types.NodeTree.outputs

## bpy.types.DopeSheet

### Added

- bpy.types.DopeSheet.filter\_fcurve\_name
- bpy.types.DopeSheet.show\_lattices
- bpy.types.DopeSheet.show\_only\_matching\_fcurves

## bpy.types.ActionFCurves

### Function Arguments

- bpy.types.ActionFCurves.show\_only\_matching\_fcurves (data\_path, index, action\_group),  
was (*data\_path*, *array\_index*, *action\_group*)

## bpy.types.ShrinkwrapModifier

### Added

- bpy.types.ShrinkwrapModifier.cull\_face

### Removed

- use\_cull\_back\_faces
- use\_cull\_front\_faces

## bpy.types.WindowManager

### Added

- bpy.types.WindowManager.addon\_filter
- bpy.types.WindowManager.addon\_search
- bpy.types.WindowManager.addon\_support
- bpy.types.WindowManager.event\_timer\_add
- bpy.types.WindowManager.event\_timer\_remove

## bpy.types.WoodTexture

### Renamed

- noisebasis\_2 -> bpy.types.WoodTexture.noise\_basis\_2

## bpy.types.VertexGroup

### Added

- bpy.types.VertexGroup.add
- bpy.types.VertexGroup.remove
- bpy.types.VertexGroup.weight

## bpy.types.FCurveKeyframePoints

### Added

- bpy.types.FCurveKeyframePoints.insert

### Function Arguments

- bpy.types.FCurveKeyframePoints.insert (*count*), *was* (*frame*, *value*, *replace*, *needed*, *fast*)

## bpy.types.ThemeView3D

### Added

- bpy.types.ThemeView3D.outline\_width

## bpy.types.Image

### Added

- bpy.types.Image.pixels

## bpy.types.Bone

### Added

- bpy.types.Bone.bbone\_x
- bpy.types.Bone.bbone\_z

## bpy.types.InputKeyMapPanel

### Removed

- draw\_entry
- draw\_filtered
- draw\_hierarchy

- **draw\_keymaps**
- **draw\_km**
- **draw\_kmi**
- **draw\_kmi\_properties**
- **indented\_layout**

## bpy.types.ParticleSettings

### Added

- bpy.types.ParticleSettings.active\_texture
- bpy.types.ParticleSettings.active\_texture\_index
- bpy.types.ParticleSettings.child\_parting\_factor
- bpy.types.ParticleSettings.child\_parting\_max
- bpy.types.ParticleSettings.child\_parting\_min
- bpy.types.ParticleSettings.color\_maximum
- bpy.types.ParticleSettings.create\_long\_hair\_children
- bpy.types.ParticleSettings.draw\_color
- bpy.types.ParticleSettings.effector\_amount
- bpy.types.ParticleSettings.grid\_random
- bpy.types.ParticleSettings.hair\_length
- bpy.types.ParticleSettings.hexagonal\_grid
- bpy.types.ParticleSettings.is\_fluid
- bpy.types.ParticleSettings.kink\_amplitude\_clump
- bpy.types.ParticleSettings.kink\_flat
- bpy.types.ParticleSettings.texture\_slots
- bpy.types.ParticleSettings.timestep
- bpy.types.ParticleSettings.use\_advanced\_hair

### Removed

- **reaction\_shape**
- **show\_material\_color**
- **use\_animate\_branching**
- **use\_branching**
- **use\_symmetric\_branching**

## bpy.types.SceneGameData

### Added

- bpy.types.SceneGameData.show\_mouse

## bpy.types.MaterialPhysics

### Renamed

- **damping** -> bpy.types.MaterialPhysics.fh\_damping
- **distance** -> bpy.types.MaterialPhysics.fh\_distance
- **force** -> bpy.types.MaterialPhysics.fh\_force
- **use\_normal\_align** -> bpy.types.MaterialPhysics.use\_fh\_normal

## 5.1.2 2.57 to 2.58

## bpy\_extras

### Added

- bpy\_extras
- bpy\_extras.view3d\_utils

### Moved

- io\_utils -> bpy\_extras.io\_utils
- image\_utils -> bpy\_extras.image\_utils
- mesh\_utils -> bpy\_extras.mesh\_utils
- object\_utils -> bpy\_extras.object\_utils

## bpy.types.RenderSettings

### Added

- bpy.types.RenderSettings.use\_bake\_lores\_mesh
- bpy.types.RenderSettings.use\_bake\_multires

## bpy.types.Camera

### Added

- bpy.types.Camera.show\_guide

**bpy.types.SpaceImageEditor****Added**

- bpy.types.SpaceImageEditor.zoom

**bpy.types.SpaceView3D****Added**

- bpy.types.SpaceView3D.lock\_camera

**bpy.types.RegionView3D****Added**

- bpy.types.RegionView3D.is\_perspective

**bpy.types.Scene****Added**

- bpy.types.Scene.frame\_subframe

**bpy.types.Area****Removed**

- active\_space

**bpy.types.DisplaceModifier****Renamed**

- texture\_coordinate\_object -> bpy.types.DisplaceModifier.texture\_coords\_object

**bpy.types.UserPreferencesView****Added**

- bpy.types.UserPreferencesView.use\_camera\_lock\_parent

## bpy.types.DomainFluidSettings

### Added

- bpy.types.DomainFluidSettings.fluid\_mesh\_vertices
- bpy.types.DomainFluidSettings.surface\_noobs

## bpy.types.Sculpt

### Added

- bpy.types.Sculpt.use\_deform\_only

## bpy.types.ClothCollisionSettings

### Added

- bpy.types.ClothCollisionSettings.distance\_repel
- bpy.types.ClothCollisionSettings.repel\_force

## bpy.typesUILayout

### Added

- bpy.typesUILayout.template\_edit\_mode\_selection

## bpy.types.ToolSettings

### Added

- bpy.types.ToolSettings.use\_snap\_project\_self

## bpy.types.Mesh

### Removed

- edge\_face\_count
- edge\_face\_count\_dict
- edge\_loops\_from\_edges
- edge\_loops\_from\_faces

**bpy.types.PointDensity****Added**

- bpy.types.PointDensity.falloff\_curve
- bpy.types.PointDensity.falloff\_speed\_scale
- bpy.types.PointDensity.use\_falloff\_curve

**bpy.types.SpaceTextEditor****Added**

- bpy.types.SpaceTextEditor.use\_match\_case

**bpy.types.CameraActuator****Added**

- bpy.types.CameraActuator.damping

**bpy.types.Property****Added**

- bpy.types.Property.is\_skip\_save

**bpy.types.UserPreferencesSystem****Added**

- bpy.types.UserPreferencesSystem.anisotropic\_filter

**bpy.types.Object****Added**

- bpy.types.Object.empty\_image\_offset

**bpy.types.Image****Added**

- bpy.types.Image.resolution

## bpy.types.SceneGameData

### Added

- `bpy.types.SceneGameData.use_gsl_color_management`
- 

**Note:** The Blender Python API has areas which are still in development.

**The following areas are subject to change.**

- operator behavior, names and arguments
- mesh creation and editing functions

**These parts of the API are relatively stable and are unlikely to change significantly**

- data API, access to attributes of blender data such as mesh verts, material color, timeline frames and scene objects
  - user interface functions for defining buttons, creation of menus, headers, panels
  - render engine integration
  - modules: bgl, mathutils & game engine.
-

# PYTHON MODULE INDEX

## a

aud, 1149

## b

bge.constraints, 1265  
bge.events, 1260  
bge.logic, 1235  
bge.render, 1249  
bge.texture, 1252  
bge.types, 1163  
bgl, 1116  
blf, 1146  
bpy, 31  
bpy.app, 1075  
bpy.context, 27  
bpy.ops.action, 32  
bpy.ops.anim, 35  
bpy.ops.armature, 38  
bpy.ops.boid, 41  
bpy.ops.brush, 41  
bpy.ops.buttons, 42  
bpy.ops.cloth, 43  
bpy.ops.console, 43  
bpy.ops.constraint, 45  
bpy.ops.curve, 46  
bpy.ops.ed, 50  
bpy.ops.export\_anim, 50  
bpy.ops.export\_mesh, 51  
bpy.ops.export\_scene, 51  
bpy.ops.file, 54  
bpy.ops.fluid, 56  
bpy.ops.font, 56  
bpy.ops.gpencil, 59  
bpy.ops.graph, 60  
bpy.ops.group, 64  
bpy.ops.help, 64  
bpy.ops.image, 64  
bpy.ops.import\_anim, 68  
bpy.ops.import\_curve, 68  
bpy.ops.import\_mesh, 69  
bpy.ops.import\_scene, 69

bpy.ops.info, 70  
bpy.ops.lamp, 71  
bpy.ops.lattice, 71  
bpy.ops.logic, 71  
bpy.ops.marker, 73  
bpy.ops.material, 74  
bpy.ops.mball, 74  
bpy.ops.mesh, 75  
bpy.ops.nla, 87  
bpy.ops.node, 89  
bpy.ops.object, 93  
bpy.ops.outliner, 109  
bpy.ops.paint, 111  
bpy.ops.particle, 113  
bpy.ops.pose, 114  
bpy.ops.poselib, 118  
bpy.ops.ptcache, 119  
bpy.ops.render, 119  
bpy.ops.scene, 120  
bpy.ops.screen, 120  
bpy.ops.script, 123  
bpy.ops.sculpt, 123  
bpy.ops.sequencer, 124  
bpy.ops.sketch, 131  
bpy.ops.sound, 132  
bpy.ops.surface, 132  
bpy.ops.text, 135  
bpy.ops.texture, 138  
bpy.ops.time, 139  
bpy.ops.transform, 140  
bpy.ops.ui, 148  
bpy.ops.uv, 148  
bpy.ops.view2d, 153  
bpy.ops.view3d, 155  
bpy.ops.wm, 159  
bpy.ops.world, 170  
bpy.path, 1074  
bpy.props, 1076  
bpy.types, 1067  
bpy.utils, 1072  
bpy\_extras, 1157

`bpy_extras.image_utils`, 1159  
`bpy_extras.io_utils`, 1158  
`bpy_extras.mesh_utils`, 1160  
`bpy_extras.object_utils`, 1157  
`bpy_extras.view3d_utils`, 1161

**m**

`mathutils`, 1083  
`mathutils.geometry`, 1112

# INDEX

## A

a (bge.types.KX\_VertexProxy attribute), 1211  
absorption (bpy.types.CollisionSettings attribute), 286  
abspath() (in module bpy.path), 1074  
ACCENTGRAVEKEY (in module bge.events), 1264  
accuracy (bpy.types.BoidSettings attribute), 248  
accuracy (bpy.types.Scopes attribute), 787  
act\_spline (bpy.types.ThemeView3D attribute), 966  
action (bge.types.BL\_ActionActuator attribute), 1166  
action (bge.types.BL\_ShapeActionActuator attribute), 1170  
action (bpy.types.ActionActuator attribute), 172  
action (bpy.types.ActionConstraint attribute), 173  
action (bpy.types.AnimData attribute), 186  
action (bpy.types.NlaStrip attribute), 623  
action (bpy.types.ShapeActionActuator attribute), 824  
action (bpy.types.SpaceDopeSheetEditor attribute), 852  
Action (class in bpy.types), 170  
Action.fcurves (in module bpy.types), 170  
Action.frame\_range (in module bpy.types), 170  
Action.groups (in module bpy.types), 170  
Action.pose\_markers (in module bpy.types), 171  
action\_blend\_type (bpy.types.AnimData attribute), 187  
action\_extrapolation (bpy.types.AnimData attribute), 187  
action\_frame\_end (bpy.types.NlaStrip attribute), 623  
action\_frame\_start (bpy.types.NlaStrip attribute), 623  
action\_influence (bpy.types.AnimData attribute), 187  
action\_sanitise() (in module bpy.ops.poselib), 118  
action\_sync\_length() (in module bpy.ops.nla), 87  
ActionActuator (class in bpy.types), 172  
actionclip\_add() (in module bpy.ops.nla), 87  
ActionConstraint (class in bpy.types), 173  
ActionFCurves (class in bpy.types), 174  
ActionGroup (class in bpy.types), 175  
ActionGroup.channels (in module bpy.types), 175  
ActionGroups (class in bpy.types), 177  
ActionPoseMarkers (class in bpy.types), 177  
actionzone() (in module bpy.ops.screen), 120  
activate() (bge.types.KX\_PolygonMaterial method), 1199  
activate() (bge.types.SCA\_PythonController method), 1218

active (bge.types.BL\_ArmatureConstraint attribute), 1228  
active (bpy.types.ActionPoseMarkers attribute), 177  
active (bpy.types.ArmatureBones attribute), 202  
active (bpy.types.ArmatureEditBones attribute), 202  
active (bpy.types.BoneGroups attribute), 257  
active (bpy.types.Constraint attribute), 352  
active (bpy.types.CurveSplines attribute), 375  
active (bpy.types.FCurveModifiers attribute), 416  
active (bpy.types.FModifier attribute), 418  
active (bpy.types.GreasePencilLayers attribute), 463  
active (bpy.types.KeyConfigurations attribute), 497  
active (bpy.types.KeyingSetPaths attribute), 517  
active (bpy.types.KeyingSets attribute), 518  
active (bpy.types.KeyingSetsAll attribute), 519  
active (bpy.types.KeyMapItem attribute), 499  
active (bpy.types.MeshColorLayer attribute), 581  
active (bpy.types.MeshFaces attribute), 587  
active (bpy.types.MeshTextureFaceLayer attribute), 595  
active (bpy.types.NlaTracks attribute), 628  
active (bpy.types.ObjectConstraints attribute), 652  
active (bpy.types.PoseBoneConstraints attribute), 727  
active (bpy.types.RenderLayers attribute), 753  
active (bpy.types.SceneBases attribute), 775  
active (bpy.types.SceneObjects attribute), 779  
active (bpy.types.ThemeBoneColorSet attribute), 935  
active (bpy.typesUILayout attribute), 987  
active (bpy.types.UVTextures attribute), 1011  
active (bpy.types.VertexColors attribute), 1034  
active() (bpy.types.KeyMap method), 499  
active\_base (in module bpy.context), 28, 29  
active\_boid\_rule\_index (bpy.types.BoidState attribute), 251  
active\_boid\_state\_index (bpy.types.BoidSettings attribute), 248  
active\_bone (in module bpy.context), 28  
active\_camera (bge.types.KX\_Scene attribute), 1204  
active\_channels\_group (bpy.types.ThemeDopeSheet attribute), 938  
active\_channels\_group (bpy.types.ThemeGraphEditor attribute), 943

active\_clone (bpy.types.MeshTextureFaceLayer attribute), 595  
active\_dupliclimate\_index (bpy.types.ParticleSettings attribute), 684  
active\_file (bpy.types.ThemeFileBrowser attribute), 940  
active\_file\_text (bpy.types.ThemeFileBrowser attribute), 940  
active\_frame\_delete() (in module bpy.ops.gpencil), 59  
active\_index (bpy.types.ActionPoseMarkers attribute), 178  
active\_index (bpy.types.BoneGroups attribute), 257  
active\_index (bpy.types.KeyingSetPaths attribute), 517  
active\_index (bpy.types.KeyingSets attribute), 518  
active\_index (bpy.types.KeyingSetsAll attribute), 519  
active\_index (bpy.types.ParticleSystems attribute), 706  
active\_index (bpy.types.PointCaches attribute), 714  
active\_index (bpy.types.RenderLayers attribute), 753  
active\_index (bpy.types.UVTextures attribute), 1012  
active\_index (bpy.types.VertexColors attribute), 1034  
active\_index (bpy.types.VertexGroups attribute), 1037  
active\_index\_set() (in module bpy.ops.brush), 41  
active\_keyconfig (bpy.types.UserPreferencesInput attribute), 1021  
active\_material (bpy.types.Object attribute), 637  
active\_material\_index (bpy.types.Object attribute), 637  
active\_node\_material (bpy.types.Material attribute), 547  
active\_object (in module bpy.context), 28, 29  
active\_particle\_target\_index (bpy.types.ParticleSystem attribute), 701  
active\_pose\_bone (in module bpy.context), 28  
active\_render (bpy.types.MeshColorLayer attribute), 581  
active\_render (bpy.types.MeshTextureFaceLayer attribute), 595  
active\_section (bpy.types.UserPreferences attribute), 1014  
active\_shape\_key\_index (bpy.types.Object attribute), 638  
active\_strip (bpy.types.SequenceEditor attribute), 799  
active\_textbox (bpy.types.TextCurve attribute), 904  
active\_texture (bpy.types.Lamp attribute), 523  
active\_texture (bpy.types.Material attribute), 547  
active\_texture (bpy.types.ParticleSettings attribute), 684  
active\_texture (bpy.types.World attribute), 1056  
active\_texture\_index (bpy.types.Lamp attribute), 523  
active\_texture\_index (bpy.types.Material attribute), 547  
active\_texture\_index (bpy.types.ParticleSettings attribute), 684  
active\_texture\_index (bpy.types.World attribute), 1056  
activity\_culling (bge.types.KX\_Scene attribute), 1205  
activity\_culling\_box\_radius (bpy.types.SceneGameData attribute), 775  
activity\_culling\_radius (bge.types.KX\_Scene attribute), 1205  
actuator (bge.types.SCA\_ActuatorSensor attribute), 1213  
actuator (bpy.types.ActuatorSensor attribute), 180  
Actuator (class in bpy.types), 179  
actuator\_add() (in module bpy.ops.logic), 71  
actuator\_move() (in module bpy.ops.logic), 71  
actuator\_remove() (in module bpy.ops.logic), 71  
actuators (bge.types.KX\_GameObject attribute), 1177  
actuators (bge.types.SCA\_IController attribute), 1165  
ActuatorSensor (class in bpy.types), 180  
adapt\_to\_speed (bpy.types.WorldLighting attribute), 1058  
adaptation (bpy.types.CompositorNodeTonemap attribute), 343  
adaptive\_angle (bpy.types.ParticleSettings attribute), 684  
adaptive\_pixel (bpy.types.ParticleSettings attribute), 684  
add (bpy.types.MaterialHalo attribute), 554  
add() (bpy.types.FCurveKeyframePoints method), 416  
add() (bpy.types.KeyingSetPaths method), 517  
add() (bpy.types.LampTextureSlots class method), 528  
add() (bpy.types.MaterialTextureSlots class method), 569  
add() (bpy.types.MeshEdges method), 584  
add() (bpy.types.MeshFaces method), 587  
add() (bpy.types.MeshVertices method), 597  
add() (bpy.types.ParticleSettingsTextureSlots class method), 700  
add() (bpy.types.SplineBezierPoints method), 880  
add() (bpy.types.SplinePoints method), 883  
add() (bpy.types.VertexGroup method), 1035  
add() (bpy.types.WorldTextureSlots class method), 1064  
add() (in module bpy.ops.brush), 41  
add() (in module bpy.ops.marker), 73  
add() (in module bpy.ops.object), 93  
add() (in module bpy.ops.ptcache), 119  
add\_file() (in module bpy.ops.node), 89  
add\_named() (in module bpy.ops.object), 93  
add\_named\_cursor() (in module bpy.ops.object), 93  
add\_object\_align\_init() (in module bpy\_extras.object\_utils), 1157  
addObject() (bge.types.KX\_Scene method), 1205  
Addon (class in bpy.types), 181  
addon\_disable() (in module bpy.ops.wm), 159  
addon\_enable() (in module bpy.ops.wm), 159  
addon\_expand() (in module bpy.ops.wm), 159  
addon\_filter (bpy.types.WindowManager attribute), 1049  
addon\_install() (in module bpy.ops.wm), 159  
addon\_remove() (in module bpy.ops.wm), 160  
addon\_search (bpy.types.WindowManager attribute), 1050  
addon\_support (bpy.types.WindowManager attribute), 1050  
Addons (class in bpy.types), 181  
addScene() (in module bge.logic), 1238  
addWheel() (bge.types.KX\_VehicleWrapper method), 1208  
AdjustmentSequence (class in bpy.types), 182

AdjustmentSequence.color\_balance (in module bpy.types), 182

AdjustmentSequence.crop (in module bpy.types), 183

AdjustmentSequence.proxy (in module bpy.types), 183

AdjustmentSequence.transform (in module bpy.types), 183

aero (bpy.types.SoftBodySettings attribute), 840

aerodynamics\_type (bpy.types.SoftBodySettings attribute), 840

aggression (bpy.types.BoidSettings attribute), 248

air\_acc\_max (bpy.types.BoidSettings attribute), 248

air\_ave\_max (bpy.types.BoidSettings attribute), 248

air\_damping (bpy.types.ClothSettings attribute), 279

air\_personal\_space (bpy.types.BoidSettings attribute), 248

air\_speed\_max (bpy.types.BoidSettings attribute), 248

air\_speed\_min (bpy.types.BoidSettings attribute), 249

AKEY (in module bge.events), 1261

alert (bpy.typesUILayout attribute), 987

align (bpy.types.SpaceProperties attribute), 864

align (bpy.types.TextCurve attribute), 904

align() (in module bpy.ops.armature), 38

align() (in module bpy.ops.object), 94

align() (in module bpy.ops.uv), 148

align\_orientation() (bpy.types>EditBone method), 395

align\_roll() (bpy.types>EditBone method), 395

alignAxisToVect() (bge.types.KX\_GameObject method), 1178

alignment (bpy.typesUILayout attribute), 987

alive\_state (bpy.types.Particle attribute), 674

all (bpy.types.EffectorWeights attribute), 400

alliance (bpy.types.ParticleTarget attribute), 707

alpha (bge.texture.ImageMirror attribute), 1255

alpha (bge.texture.ImageRender attribute), 1257

alpha (bge.texture.ImageViewport attribute), 1257

alpha (bpy.types.CompositorNodeMapUV attribute), 326

alpha (bpy.types.GPencilLayer attribute), 446

alpha (bpy.types.Material attribute), 547

alpha (bpy.types.SmokeDomainSettings attribute), 833

alpha\_factor (bpy.types.MaterialTextureSlot attribute), 564

alpha\_influence (bpy.types.ParticleFluidSettings attribute), 679

alpha\_mode (bpy.types.RenderSettings attribute), 755

alt (bpy.types.KeyMapItem attribute), 500

AlwaysSensor (class in bpy.types), 185

ambient (bpy.types.Material attribute), 547

ambient\_color (bpy.types.World attribute), 1056

ambient\_factor (bpy.types.MaterialTextureSlot attribute), 564

amplify (bpy.types.SmokeDomainSettings attribute), 834

amplitude (bpy.types.FModifierFunctionGenerator attribute), 422

AndController (class in bpy.types), 186

angle (bge.types.KX\_RadarSensor attribute), 1200

angle (bpy.types.BrushTextureSlot attribute), 265

angle (bpy.types.Camera attribute), 267

angle (bpy.types.CompositorNodeDBlur attribute), 309

angle (bpy.types.CompositorNodeDefocus attribute), 310

angle (bpy.types.RadarSensor attribute), 738

angle (bpy.types.ScrewModifier attribute), 790

angle (bpy.types.WipeSequence attribute), 1052

angle (mathutils.Quaternion attribute), 1091

angle\_limit (bpy.types.BevelModifier attribute), 209

angle\_max (bpy.types.ConstraintActuator attribute), 354

angle\_min (bpy.types.ConstraintActuator attribute), 354

angle\_offset (bpy.types.CompositorNodeGlare attribute), 317

ANGULAR\_CONSTRAINT (in module bge.constraints), 1270

angular\_velocity (bpy.types>EditObjectActuator attribute), 396

angular\_velocity (bpy.types.ObjectActuator attribute), 648

angular\_velocity (bpy.types.Particle attribute), 674

angular\_velocity (bpy.types.ParticleKey attribute), 683

angular\_velocity\_factor (bpy.types.ParticleSettings attribute), 684

angular\_velocity\_mode (bpy.types.ParticleSettings attribute), 685

angularVelocity (bge.types.KX\_SCA\_AddObjectActuator attribute), 1202

angV (bge.types.KX\_ObjectActuator attribute), 1191

animation\_cancel() (in module bpy.ops.screen), 120

animation\_data\_clear() (bpy.types.ID method), 473

animation\_data\_create() (bpy.types.ID method), 473

animation\_offset\_end (bpy.types.AdjustmentSequence attribute), 182

animation\_offset\_end (bpy.types.ImageSequence attribute), 481

animation\_offset\_end (bpy.types.MetaSequence attribute), 604

animation\_offset\_end (bpy.types.MovieSequence attribute), 613

animation\_offset\_end (bpy.types.MulticamSequence attribute), 615

animation\_offset\_end (bpy.types.SceneSequence attribute), 784

animation\_offset\_end (bpy.types.SoundSequence attribute), 848

animation\_offset\_start (bpy.types.AdjustmentSequence attribute), 182

animation\_offset\_start (bpy.types.ImageSequence attribute), 481

animation\_offset\_start (bpy.types.MetaSequence attribute), 604

animation\_offset\_start (bpy.types.MovieSequence attribute), 613

animation\_offset\_start (bpy.types.MulticamSequence attribute), 616  
animation\_offset\_start (bpy.types.SceneSequence attribute), 784  
animation\_offset\_start (bpy.types.SoundSequence attribute), 848  
animation\_play() (in module bpy.ops.screen), 120  
animation\_player (bpy.types.UserPreferencesFilePath attribute), 1019  
animation\_player\_preset (bpy.types.UserPreferencesFilePath attribute), 1019  
animation\_step() (in module bpy.ops.screen), 120  
AnimData (class in bpy.types), 186  
AnimData.drivers (in module bpy.types), 187  
AnimData.nla\_tracks (in module bpy.types), 187  
animdata\_operation() (in module bpy.ops.outliner), 109  
AnimDataDrivers (class in bpy.types), 188  
AnimViz (class in bpy.types), 189  
AnimViz.motion\_path (in module bpy.types), 189  
AnimViz.onion\_skin\_frames (in module bpy.types), 189  
AnimVizMotionPaths (class in bpy.types), 190  
AnimVizOnionSkinning (class in bpy.types), 191  
anisotropic\_filter (bpy.types.UserPreferencesSystem attribute), 1023  
antialiasing\_samples (bpy.types.RenderSettings attribute), 756  
any (bpy.types.KeyMapItem attribute), 500  
AnyType (class in bpy.types), 192  
ao\_blend\_type (bpy.types.WorldLighting attribute), 1058  
ao\_factor (bpy.types.WorldLighting attribute), 1058  
appconfig\_activate() (in module bpy.ops.wm), 160  
appconfig\_default() (in module bpy.ops.wm), 160  
append() (bge.types.CListValue method), 1171  
append() (bpy.types.Header class method), 468  
append() (bpy.types.IDMaterials method), 474  
append() (bpy.types.Menu class method), 574  
append() (bpy.types.Panel class method), 672  
apply\_effector\_to\_children (bpy.types.ParticleSettings attribute), 685  
apply\_guide\_to\_children (bpy.types.ParticleSettings attribute), 685  
apply\_pose() (in module bpy.ops.poselib), 118  
apply\_scale() (in module bpy.ops.nla), 87  
apply\_to\_children (bpy.types.FCurveActuator attribute), 414  
apply\_to\_children (bpy.types.VisibilityActuator attribute), 1039  
apply\_to\_hair\_growing (bpy.types.EffectorWeights attribute), 400  
apply\_to\_location (bpy.types.FieldSettings attribute), 429  
apply\_to\_rotation (bpy.types.FieldSettings attribute), 429  
applyBraking() (bge.types.KX\_VehicleWrapper method), 1208  
applyEngineForce() (bge.types.KX\_VehicleWrapper method), 1208  
applyForce() (bge.types.KX\_GameObject method), 1178  
applyImpulse() (bge.types.KX\_GameObject method), 1180  
applyMovement() (bge.types.KX\_GameObject method), 1178  
applyRotation() (bge.types.KX\_GameObject method), 1178  
applyTorque() (bge.types.KX\_GameObject method), 1179  
Area (class in bpy.types), 194  
Area.height (in module bpy.types), 194  
Area.regions (in module bpy.types), 194  
Area.spaces (in module bpy.types), 194  
Area.width (in module bpy.types), 194  
area\_dupli() (in module bpy.ops.screen), 120  
area\_join() (in module bpy.ops.screen), 121  
area\_move() (in module bpy.ops.screen), 121  
area\_options() (in module bpy.ops.screen), 121  
area\_split() (in module bpy.ops.screen), 121  
area\_swap() (in module bpy.ops.screen), 121  
area\_tri() (in module mathutils.geometry), 1112  
AreaLamp (class in bpy.types), 195  
AreaSpaces (class in bpy.types), 197  
AreaSpaces.active (in module bpy.types), 197  
arm\_head (bge.types.BL\_ArmatureBone attribute), 1234  
arm\_mat (bge.types.BL\_ArmatureBone attribute), 1234  
arm\_tail (bge.types.BL\_ArmatureBone attribute), 1234  
armature (bpy.types.MaskModifier attribute), 546  
Armature (class in bpy.types), 198  
armature (in module bpy.context), 29  
Armature.animation\_data (in module bpy.types), 198  
Armature.bones (in module bpy.types), 198  
Armature.edit\_bones (in module bpy.types), 198  
armature\_add() (in module bpy.ops.object), 94  
armature\_apply() (in module bpy.ops.pose), 114  
armature\_layers() (in module bpy.ops.armature), 38  
armature\_layers() (in module bpy.ops.pose), 114  
ArmatureActuator (class in bpy.types), 201  
ArmatureBones (class in bpy.types), 202  
ArmatureEditBones (class in bpy.types), 202  
ArmatureModifier (class in bpy.types), 203  
ArmatureSensor (class in bpy.types), 205  
array\_index (bpy.types.FCurve attribute), 412  
array\_index (bpy.types.KeyingSetPath attribute), 515  
ArrayModifier (class in bpy.types), 206  
as\_keywords() (bpy.types.Operator method), 661  
as\_pointer() (bpy.types.bpy\_struct method), 1068  
as\_string() (bpy.types.Text static method), 901  
aspect() (in module blf), 1147  
aspect\_correction (bpy.types.CompositorNodeBlur attribute), 295  
aspect\_x (bpy.types.UVProjectModifier attribute), 1009

aspect\_y (bpy.types.UVProjectModifier attribute), 1009  
 asymmetry (bpy.types.MaterialVolume attribute), 570  
 atmosphere\_distance\_factor (bpy.types.LampSkySettings attribute), 524  
 atmosphere\_extinction (bpy.types.LampSkySettings attribute), 524  
 atmosphere\_inscattering (bpy.types.LampSkySettings attribute), 525  
 atmosphere\_turbidity (bpy.types.LampSkySettings attribute), 525  
 attenuation (aud.Handle attribute), 1156  
 attenuation (bpy.types.SoundSequence attribute), 848  
 attraction\_radius (bpy.types.ControlFluidSettings attribute), 359  
 attraction\_strength (bpy.types.ControlFluidSettings attribute), 359  
 attrDict (bge.types.KX\_GameObject attribute), 1177  
 aud (module), 1149  
 AUD\_DEVICE\_JACK (in module aud), 1149  
 AUD\_DEVICE\_NULL (in module aud), 1149  
 AUD\_DEVICE\_OPENGL (in module aud), 1149  
 AUD\_DEVICE SDL (in module aud), 1149  
 AUD\_DISTANCE\_MODEL\_EXPONENT (in module aud), 1149  
 AUD\_DISTANCE\_MODEL\_EXPONENT\_CLAMPED (in module aud), 1149  
 AUD\_DISTANCE\_MODEL\_INVALID (in module aud), 1149  
 AUD\_DISTANCE\_MODEL\_INVERSE (in module aud), 1149  
 AUD\_DISTANCE\_MODEL\_INVERSE\_CLAMPED (in module aud), 1149  
 AUD\_DISTANCE\_MODEL\_LINEAR (in module aud), 1149  
 AUD\_DISTANCE\_MODEL\_LINEAR\_CLAMPED (in module aud), 1149  
 AUD\_FORMAT\_FLOAT32 (in module aud), 1150  
 AUD\_FORMAT\_FLOAT64 (in module aud), 1150  
 AUD\_FORMAT\_INVALID (in module aud), 1150  
 AUD\_FORMAT\_S16 (in module aud), 1150  
 AUD\_FORMAT\_S24 (in module aud), 1150  
 AUD\_FORMAT\_S32 (in module aud), 1150  
 AUD\_FORMAT\_U8 (in module aud), 1150  
 AUD\_STATUS\_INVALID (in module aud), 1150  
 AUD\_STATUS\_PAUSED (in module aud), 1150  
 AUD\_STATUS\_PLAYING (in module aud), 1150  
 audio\_channels (bpy.types.UserPreferencesSystem attribute), 1023  
 audio\_device (bpy.types.UserPreferencesSystem attribute), 1024  
 audio\_distance\_model (bpy.types.Scene attribute), 770  
 audio\_doppler\_factor (bpy.types.Scene attribute), 770  
 audio\_doppler\_speed (bpy.types.Scene attribute), 770  
 audio\_mixing\_buffer (bpy.types.UserPreferencesSystem attribute), 1024  
 audio\_sample\_format (bpy.types.UserPreferencesSystem attribute), 1024  
 audio\_sample\_rate (bpy.types.UserPreferencesSystem attribute), 1024  
 audio\_strip (bpy.types.ThemeSequenceEditor attribute), 957  
 author (bpy.types.UserPreferencesSystem attribute), 1024  
 auto\_keying\_mode (bpy.types.ToolSettings attribute), 975  
 auto\_keying\_mode (bpy.types.UserPreferencesEdit attribute), 1016  
 auto\_save\_time (bpy.types.UserPreferencesFilePaths attribute), 1019  
 auto\_smooth\_angle (bpy.types.Mesh attribute), 575  
 auto\_smooth\_factor (bpy.types.Brush attribute), 259  
 auto\_snap (bpy.types.SpaceDopeSheetEditor attribute), 852  
 auto\_snap (bpy.types.SpaceGraphEditor attribute), 854  
 auto\_snap (bpy.types.SpaceNLA attribute), 860  
 autocomplete() (in module bpy.ops.console), 43  
 autodesk\_3ds() (in module bpy.ops.export\_scene), 51  
 autodesk\_3ds() (in module bpy.ops.import\_scene), 69  
 autoside\_names() (in module bpy.ops.armature), 38  
 autoside\_names() (in module bpy.ops.pose), 115  
 auxiliary\_target (bpy.types.ShrinkwrapModifier attribute), 830  
 average\_islands\_scale() (in module bpy.ops.uv), 148  
 average\_separation (bpy.types.WorldStarsSettings attribute), 1061  
 axis (bge.types.KX\_RadarSensor attribute), 1200  
 axis (bge.types.KX\_RaySensor attribute), 1201  
 axis (bge.types.SCA\_JoystickSensor attribute), 1215  
 axis (bpy.types.CameraActuator attribute), 270  
 axis (bpy.types.CompositorNodeFlip attribute), 316  
 axis (bpy.types.CompositorNodeSplitViewer attribute), 340  
 axis (bpy.types.ParticleInstanceModifier attribute), 681  
 axis (bpy.types.RadarSensor attribute), 738  
 axis (bpy.types.RaySensor attribute), 742  
 axis (bpy.types.ScrewModifier attribute), 790  
 axis (mathutils.Quaternion attribute), 1091  
 axis\_conversion() (in module bpy\_extras.io\_utils), 1158  
 axis\_conversion\_ensure() (in module bpy\_extras.io\_utils), 1158  
 axis\_direction (bpy.types.JoystickSensor attribute), 493  
 axis\_number (bpy.types.JoystickSensor attribute), 493  
 axis\_threshold (bpy.types.JoystickSensor attribute), 493  
 axis\_x (bpy.types.RigidBodyJointConstraint attribute), 765  
 axis\_y (bpy.types.RigidBodyJointConstraint attribute), 765

axis\_z (bpy.types.RigidBodyJointConstraint attribute), 765  
axisSingle (bge.types.SCA\_JoystickSensor attribute), 1214  
axisValues (bge.types.SCA\_JoystickSensor attribute), 1214

**B**

b (bge.types.KX\_VertexProxy attribute), 1211  
b (mathutils.Color attribute), 1083  
back (bpy.types.MaterialSubsurfaceScattering attribute), 563  
back (bpy.types.ThemeAudioWindow attribute), 934  
back (bpy.types.ThemeConsole attribute), 936  
back (bpy.types.ThemeDopeSheet attribute), 938  
back (bpy.types.ThemeFileBrowser attribute), 940  
back (bpy.types.ThemeGraphEditor attribute), 943  
back (bpy.types.ThemeImageEditor attribute), 946  
back (bpy.types.ThemeInfo attribute), 948  
back (bpy.types.ThemeLogicEditor attribute), 949  
back (bpy.types.ThemeNLAEditor attribute), 950  
back (bpy.types.ThemeNodeEditor attribute), 952  
back (bpy.types.ThemeOutliner attribute), 954  
back (bpy.types.ThemeProperties attribute), 956  
back (bpy.types.ThemeSequenceEditor attribute), 957  
back (bpy.types.ThemeTextEditor attribute), 960  
back (bpy.types.ThemeTimeline attribute), 962  
back (bpy.types.ThemeUserPreferences attribute), 965  
back (bpy.types.ThemeView3D attribute), 966  
back\_to\_previous() (in module bpy.ops.screen), 121  
backdrop\_channels (bpy.types.SpaceNodeEditor attribute), 861  
backdrop\_x (bpy.types.SpaceNodeEditor attribute), 861  
backdrop\_y (bpy.types.SpaceNodeEditor attribute), 861  
backdrop\_zoom (bpy.types.SpaceNodeEditor attribute), 861  
background (bge.texture.ImageMirror attribute), 1256  
background (bge.texture.ImageRender attribute), 1257  
background (in module bpy.app), 1075  
background\_image\_add() (in module bpy.ops.view3d), 155  
background\_image\_remove() (in module bpy.ops.view3d), 155  
background\_set (bpy.types.Scene attribute), 770  
BackgroundImage (class in bpy.types), 208  
BackgroundImage.image\_user (in module bpy.types), 208  
backimage\_move() (in module bpy.ops.node), 90  
backimage\_sample() (in module bpy.ops.node), 90  
backimage\_zoom() (in module bpy.ops.node), 90  
backscattered\_light (bpy.types.LampSkySettings attribute), 525  
BACKSLASHKEY (in module bge.events), 1264  
BACKSPACEKEY (in module bge.events), 1264

bake() (in module bpy.ops.fluid), 56  
bake() (in module bpy.ops.graph), 60  
bake() (in module bpy.ops.nla), 87  
bake() (in module bpy.ops.ptcache), 119  
bake\_aa\_mode (bpy.types.RenderSettings attribute), 756  
bake\_all() (in module bpy.ops.ptcache), 119  
bake\_bias (bpy.types.RenderSettings attribute), 756  
bake\_distance (bpy.types.RenderSettings attribute), 756  
bake\_from\_cache() (in module bpy.ops.ptcache), 119  
bake\_image() (in module bpy.ops.object), 94  
bake\_location (bpy.types.AnimVizMotionPaths attribute), 190  
bake\_margin (bpy.types.RenderSettings attribute), 756  
bake\_normal\_space (bpy.types.RenderSettings attribute), 756  
bake\_quad\_split (bpy.types.RenderSettings attribute), 756  
bake\_type (bpy.types.RenderSettings attribute), 756  
ball\_damp (bpy.types.SoftBodySettings attribute), 840  
ball\_size (bpy.types.SoftBodySettings attribute), 840  
ball\_stiff (bpy.types.SoftBodySettings attribute), 840  
bank (bpy.types.BoidSettings attribute), 249  
banner() (in module bpy.ops.console), 44  
bars (bpy.types.ThemeNLAEditor attribute), 950  
bars\_selected (bpy.types.ThemeNLAEditor attribute), 950  
barycentric\_transform() (in module mathutils.geometry), 1112  
basename() (in module bpy.path), 1074  
bbone\_in (bpy.types.Bone attribute), 252  
bbone\_in (bpy.types.EditBone attribute), 392  
bbone\_out (bpy.types.Bone attribute), 252  
bbone\_out (bpy.types.EditBone attribute), 392  
bbone\_segments (bge.types.BL\_ArmatureBone attribute), 1234  
bbone\_segments (bpy.types.Bone attribute), 252  
bbone\_segments (bpy.types.EditBone attribute), 392  
bbone\_x (bpy.types.Bone attribute), 252  
bbone\_x (bpy.types.EditBone attribute), 392  
bbone\_z (bpy.types.Bone attribute), 252  
bbone\_z (bpy.types.EditBone attribute), 392  
beautify\_fill() (in module bpy.ops.mesh), 75  
begin\_result() (bpy.types.RenderEngine method), 747  
bend (bpy.types.SoftBodySettings attribute), 840  
bending\_stiffness (bpy.types.ClothSettings attribute), 279  
bending\_stiffness\_max (bpy.types.ClothSettings attribute), 279  
beta (bpy.types.SmokeDomainSettings attribute), 834  
bevel\_depth (bpy.types.Curve attribute), 367  
bevel\_object (bpy.types.Curve attribute), 367  
bevel\_resolution (bpy.types.Curve attribute), 367  
bevel\_weight (bpy.types.MeshEdge attribute), 583  
bevel\_weight (bpy.types.MeshVertex attribute), 596  
BevelModifier (class in bpy.types), 209

BezierSplinePoint (class in bpy.types), 210  
**bge.constraints** (module), 1265  
**bge.events** (module), 1260  
**bge.logic** (module), 1235  
**bge.render** (module), 1249  
**bge.texture** (module), 1252  
**bge.types** (module), 1163  
**bgl** (module), 1116  
bias (bpy.types.WorldLighting attribute), 1058  
billboard\_align (bpy.types.ParticleSettings attribute), 685  
billboard\_animation (bpy.types.ParticleSettings attribute), 685  
billboard\_normal\_uv (bpy.types.ParticleSystem attribute), 701  
billboard\_object (bpy.types.ParticleSettings attribute), 685  
billboard\_offset (bpy.types.ParticleSettings attribute), 685  
billboard\_offset\_split (bpy.types.ParticleSettings attribute), 685  
billboard\_size (bpy.types.ParticleSettings attribute), 685  
billboard\_split\_uv (bpy.types.ParticleSystem attribute), 701  
billboard\_tilt (bpy.types.ParticleSettings attribute), 685  
billboard\_tilt\_random (bpy.types.ParticleSettings attribute), 685  
billboard\_time\_index\_uv (bpy.types.ParticleSystem attribute), 701  
billboard\_uv\_split (bpy.types.ParticleSettings attribute), 685  
billboard\_velocity\_head (bpy.types.ParticleSettings attribute), 685  
billboard\_velocity\_tail (bpy.types.ParticleSettings attribute), 686  
binary\_path (in module bpy.app), 1075  
bindId (bge.texture.Texture attribute), 1258  
birth\_time (bpy.types.Particle attribute), 674  
BKEY (in module bge.events), 1261  
BL\_ActionActuator (class in bge.types), 1166  
BL\_ArmatureActuator (class in bge.types), 1224  
BL\_ArmatureActuator.KX\_ACT\_ARMATURE\_DISABLE (in module bge.types), 1225  
BL\_ArmatureActuator.KX\_ACT\_ARMATURE\_ENABLE (in module bge.types), 1225  
BL\_ArmatureActuator.KX\_ACT\_ARMATURE\_RUN (in module bge.types), 1224  
BL\_ArmatureActuator.KX\_ACT\_ARMATURE\_SETTARGET (in module bge.types), 1225  
BL\_ArmatureActuator.KX\_ACT\_ARMATURE\_SETWEIGHT (in module bge.types), 1225  
BL\_ArmatureBone (class in bge.types), 1233  
BL\_ArmatureChannel (class in bge.types), 1229  
BL\_ArmatureChannel.PCHAN\_ROT\_QUAT (in module bge.types), 1229  
BL\_ArmatureChannel.PCHAN\_ROT\_XYZ (in module bge.types), 1229  
BL\_ArmatureChannel.PCHAN\_ROT\_XZY (in module bge.types), 1229  
BL\_ArmatureChannel.PCHAN\_ROT\_YXZ (in module bge.types), 1229  
BL\_ArmatureChannel.PCHAN\_ROT\_YZX (in module bge.types), 1229  
BL\_ArmatureChannel.PCHAN\_ROT\_ZXY (in module bge.types), 1229  
BL\_ArmatureConstraint (class in bge.types), 1226  
BL\_ArmatureConstraint.CONSTRAINT\_IK\_COPYPOSE (in module bge.types), 1227  
BL\_ArmatureConstraint.CONSTRAINT\_IK\_DISTANCE (in module bge.types), 1227  
BL\_ArmatureConstraint.CONSTRAINT\_IK\_FLAG\_POS (in module bge.types), 1227  
BL\_ArmatureConstraint.CONSTRAINT\_IK\_FLAG\_ROT (in module bge.types), 1227  
BL\_ArmatureConstraint.CONSTRAINT\_IK\_FLAG\_STRETCH (in module bge.types), 1227  
BL\_ArmatureConstraint.CONSTRAINT\_IK\_FLAG\_TIP (in module bge.types), 1227  
BL\_ArmatureConstraint.CONSTRAINT\_IK\_MODE\_INSIDE (in module bge.types), 1227  
BL\_ArmatureConstraint.CONSTRAINT\_IK\_MODE\_OUTSIDE (in module bge.types), 1227  
BL\_ArmatureConstraint.CONSTRAINT\_TYPE\_CLAMPTO (in module bge.types), 1227  
BL\_ArmatureConstraint.CONSTRAINT\_TYPE\_DISTLIMIT (in module bge.types), 1227  
BL\_ArmatureConstraint.CONSTRAINT\_TYPE\_KINEMATIC (in module bge.types), 1226  
BL\_ArmatureConstraint.CONSTRAINT\_TYPE\_LOCKTRACK (in module bge.types), 1227  
BL\_ArmatureConstraint.CONSTRAINT\_TYPE\_LOCLIKE (in module bge.types), 1226  
BL\_ArmatureConstraint.CONSTRAINT\_TYPE\_MINMAX (in module bge.types), 1227  
BL\_ArmatureConstraint.CONSTRAINT\_TYPE\_ROTLIKE (in module bge.types), 1226  
BL\_ArmatureConstraint.CONSTRAINT\_TYPE\_SIZELIKE (in module bge.types), 1227  
BL\_ArmatureConstraint.CONSTRAINT\_TYPE\_STRETCHTO (in module bge.types), 1227  
BL\_ArmatureConstraint.CONSTRAINT\_TYPE\_TRACKTO (in module bge.types), 1226  
BL\_ArmatureConstraint.CONSTRAINT\_TYPE\_TRANSFORM (in module bge.types), 1227  
BL\_ArmatureObject (class in bge.types), 1224

bl\_context (bpy.types.Panel attribute), 671  
bl\_description (bpy.types.Macro attribute), 540  
bl\_description (bpy.types.Operator attribute), 660  
BL\_DST\_ALPHA (in module bge.logic), 1249  
BL\_DST\_COLOR (in module bge.logic), 1249  
bl\_idname (bpy.types.Header attribute), 468  
bl\_idname (bpy.types.KeyingSetInfo attribute), 514  
bl\_idname (bpy.types.Macro attribute), 541  
bl\_idname (bpy.types.Menu attribute), 574  
bl\_idname (bpy.types.Operator attribute), 660  
bl\_idname (bpy.types.Panel attribute), 671  
bl\_idname (bpy.types.RenderEngine attribute), 747  
bl\_label (bpy.types.KeyingSetInfo attribute), 514  
bl\_label (bpy.types.Macro attribute), 541  
bl\_label (bpy.types.Menu attribute), 574  
bl\_label (bpy.types.Operator attribute), 660  
bl\_label (bpy.types.Panel attribute), 671  
bl\_label (bpy.types.RenderEngine attribute), 747  
BL\_ONE (in module bge.logic), 1249  
BL\_ONE\_MINUS\_DST\_ALPHA (in module bge.logic), 1249  
BL\_ONE\_MINUS\_DST\_COLOR (in module bge.logic), 1249  
BL\_ONE\_MINUS\_SRC\_ALPHA (in module bge.logic), 1249  
BL\_ONE\_MINUS\_SRC\_COLOR (in module bge.logic), 1249  
bl\_options (bpy.types.KeyingSet attribute), 513  
bl\_options (bpy.types.KeyingSetInfo attribute), 514  
bl\_options (bpy.types.KeyingSetPath attribute), 515  
bl\_options (bpy.types.Macro attribute), 541  
bl\_options (bpy.types.Operator attribute), 660  
bl\_options (bpy.types.Panel attribute), 671  
bl\_region\_type (bpy.types.Panel attribute), 671  
BL\_Shader (class in bge.types), 1167  
BL\_ShapeActionActuator (class in bge.types), 1170  
bl\_space\_type (bpy.types.Header attribute), 468  
bl\_space\_type (bpy.types.Panel attribute), 671  
BL\_SRC\_ALPHA (in module bge.logic), 1249  
BL\_SRC\_ALPHA\_SATURATE (in module bge.logic), 1249  
BL\_SRC\_COLOR (in module bge.logic), 1249  
bl\_use\_postprocess (bpy.types.RenderEngine attribute), 747  
bl\_use\_preview (bpy.types.RenderEngine attribute), 747  
BL\_ZERO (in module bge.logic), 1249  
black\_level (bpy.types.CurveMapping attribute), 372  
blend (bpy.types.Brush attribute), 260  
blend (bpy.types.ThemeWidgetStateColors attribute), 971  
blend\_alpha (bpy.types.Sequence attribute), 794  
blend\_distance (bpy.types.MaterialStrand attribute), 561  
blend\_factor (bpy.types.WorldTextureSlot attribute), 1062  
blend\_from\_shape() (in module bpy.ops.mesh), 75  
blend\_in (bpy.types.NlaStrip attribute), 623  
blend\_out (bpy.types.NlaStrip attribute), 624  
blend\_paths() (in module bpy.utils), 1072  
blend\_type (bpy.types.CompositorNodeMixRGB attribute), 329  
blend\_type (bpy.types.FModifierNoise attribute), 426  
blend\_type (bpy.types.MeshTextureFace attribute), 593  
blend\_type (bpy.types.NlaStrip attribute), 624  
blend\_type (bpy.types.Sequence attribute), 794  
blend\_type (bpy.types.ShaderNodeMixRGB attribute), 812  
blend\_type (bpy.types.TextureNodeMixRGB attribute), 921  
blend\_type (bpy.types.TextureSlot attribute), 930  
BlendData (class in bpy.types), 212  
BlendData.actions (in module bpy.types), 212  
BlendData.armatures (in module bpy.types), 212  
BlendData.brushes (in module bpy.types), 212  
BlendData.cameras (in module bpy.types), 212  
BlendData.curves (in module bpy.types), 212  
BlendData.filepath (in module bpy.types), 212  
BlendData.fonts (in module bpy.types), 212  
BlendData.grease\_pencil (in module bpy.types), 212  
BlendData.groups (in module bpy.types), 212  
BlendData.images (in module bpy.types), 212  
BlendData.is\_dirty (in module bpy.types), 213  
BlendData.is\_saved (in module bpy.types), 213  
BlendData.lamps (in module bpy.types), 213  
BlendData.lattices (in module bpy.types), 213  
BlendData.libraries (in module bpy.types), 213  
BlendData.materials (in module bpy.types), 213  
BlendData.meshes (in module bpy.types), 213  
BlendData.metaballs (in module bpy.types), 213  
BlendData.node\_groups (in module bpy.types), 213  
BlendData.objects (in module bpy.types), 213  
BlendData.particles (in module bpy.types), 213  
BlendData.scenes (in module bpy.types), 213  
BlendData.screens (in module bpy.types), 213  
BlendData.scripts (in module bpy.types), 214  
BlendData.shape\_keys (in module bpy.types), 214  
BlendData.sounds (in module bpy.types), 214  
BlendData.texts (in module bpy.types), 214  
BlendData.textures (in module bpy.types), 214  
BlendData.window\_managers (in module bpy.types), 214  
BlendData.worlds (in module bpy.types), 214  
BlendDataActions (class in bpy.types), 215  
BlendDataArmatures (class in bpy.types), 216  
BlendDataBrushes (class in bpy.types), 217  
BlendDataCameras (class in bpy.types), 218  
BlendDataCurves (class in bpy.types), 219  
BlendDataFonts (class in bpy.types), 220  
BlendDataGreasePencils (class in bpy.types), 221  
BlendDataGroups (class in bpy.types), 221  
BlendDataImages (class in bpy.types), 222

BlendDataLamps (class in bpy.types), 224  
 BlendDataLattices (class in bpy.types), 225  
 BlendDataLibraries (class in bpy.types), 226  
 BlendDataMaterials (class in bpy.types), 227  
 BlendDataMeshes (class in bpy.types), 228  
 BlendDataMetaBalls (class in bpy.types), 229  
 BlendDataNodeTrees (class in bpy.types), 230  
 BlendDataObjects (class in bpy.types), 231  
 BlendDataParticles (class in bpy.types), 232  
 BlendDataScenes (class in bpy.types), 233  
 BlendDataScreens (class in bpy.types), 234  
 BlendDataSounds (class in bpy.types), 235  
 BlendDataTexts (class in bpy.types), 236  
 BlendDataTextures (class in bpy.types), 237  
 BlendDataWindowManagers (class in bpy.types), 238  
 BlendDataWorlds (class in bpy.types), 239  
 BlenderRNA (class in bpy.types), 241  
 BlenderRNA.structs (in module bpy.types), 241  
 blendIn (bge.types.BL\_ActionActuator attribute), 1166  
 blendIn (bge.types.BL\_ShapeActionActuator attribute), 1170  
 BlendTexture (class in bpy.types), 240  
 BlendTexture.users\_material (in module bpy.types), 240  
 BlendTexture.users\_object\_modifier (in module bpy.types), 240  
 blendTime (bge.types.BL\_ActionActuator attribute), 1166  
 blendTime (bge.types.BL\_ShapeActionActuator attribute), 1171  
 blf (module), 1146  
 blur() (in module blf), 1147  
 blur\_max (bpy.types.CompositorNodeDefocus attribute), 311  
 blur\_radius (bpy.types.GlowSequence attribute), 460  
 blur\_width (bpy.types.WipeSequence attribute), 1052  
 bodies (bge.types.KX\_NetworkMessageSensor attribute), 1190  
 body (bge.types.KX\_NetworkMessageActuator attribute), 1190  
 body (bpy.types.ConsoleLine attribute), 351  
 body (bpy.types.TextCurve attribute), 904  
 body (bpy.types.TextLine attribute), 907  
 body\_message (bpy.types.MessageActuator attribute), 598  
 body\_property (bpy.types.MessageActuator attribute), 598  
 body\_type (bpy.types.MessageActuator attribute), 598  
 boid (bpy.types.EffectorWeights attribute), 400  
 BoidRule (class in bpy.types), 242  
 BoidRule.type (in module bpy.types), 242  
 BoidRuleAverageSpeed (class in bpy.types), 243  
 BoidRuleAvoid (class in bpy.types), 244  
 BoidRuleAvoidCollision (class in bpy.types), 244  
 BoidRuleFight (class in bpy.types), 245  
 BoidRuleFollowLeader (class in bpy.types), 246  
 BoidRuleGoal (class in bpy.types), 247  
 BoidSettings (class in bpy.types), 248  
 BoidSettings.active\_boid\_state (in module bpy.types), 248  
 BoidSettings.states (in module bpy.types), 249  
 BoidState (class in bpy.types), 250  
 BoidState.active\_boid\_rule (in module bpy.types), 251  
 BoidState.rules (in module bpy.types), 251  
 bokeh (bpy.types.CompositorNodeDefocus attribute), 311  
 bone (bge.types.BL\_ArmatureChannel attribute), 1229  
 bone (bpy.types.ArmatureActuator attribute), 201  
 bone (bpy.types.ArmatureSensor attribute), 205  
 Bone (class in bpy.types), 252  
 bone (in module bpy.context), 30  
 Bone.basename (in module bpy.types), 254  
 Bone.center (in module bpy.types), 254  
 Bone.children (in module bpy.types), 252, 254  
 Bone.children\_recursive (in module bpy.types), 254  
 Bone.children\_recursive\_basename (in module bpy.types), 254  
 Bone.parent (in module bpy.types), 253  
 Bone.parent\_recursive (in module bpy.types), 254  
 Bone.use\_connect (in module bpy.types), 254  
 Bone.vector (in module bpy.types), 254  
 Bone.x\_axis (in module bpy.types), 254  
 Bone.y\_axis (in module bpy.types), 255  
 Bone.z\_axis (in module bpy.types), 255  
 bone\_group (bpy.types.PoseBone attribute), 722  
 bone\_group\_index (bpy.types.PoseBone attribute), 722  
 bone\_layers() (in module bpy.ops.armature), 39  
 bone\_layers() (in module bpy.ops.pose), 115  
 bone\_mat (bge.types.BL\_ArmatureBone attribute), 1234  
 bone\_pose (bpy.types.ThemeView3D attribute), 966  
 bone\_primitive\_add() (in module bpy.ops.armature), 39  
 bone\_solid (bpy.types.ThemeView3D attribute), 966  
 bone\_target (bpy.types.DriverTarget attribute), 388  
 BoneGroup (class in bpy.types), 256  
 BoneGroup.colors (in module bpy.types), 256  
 BoneGroups (class in bpy.types), 257  
 bookmark\_add() (in module bpy.ops.file), 54  
 bookmark\_toggle() (in module bpy.ops.file), 54  
 BooleanModifier (class in bpy.types), 257  
 BooleanProperty (class in bpy.types), 258  
 BooleanProperty.array\_length (in module bpy.types), 258  
 BooleanProperty.default (in module bpy.types), 258  
 BooleanProperty.default\_array (in module bpy.types), 258  
 BoolProperty() (in module bpy.props), 1078  
 BoolVectorProperty() (in module bpy.props), 1078  
 boost\_factor (bpy.types.GlowSequence attribute), 460  
 border\_max\_x (bpy.types.RenderSettings attribute), 756  
 border\_max\_y (bpy.types.RenderSettings attribute), 756

border\_min\_x (bpy.types.RenderSettings attribute), 756  
border\_min\_y (bpy.types.RenderSettings attribute), 756  
box() (bpy.typesUILayout method), 987  
box\_pack\_2d() (in module mathutils.geometry), 1113  
boxInsideFrustum() (bge.types.KX\_Camera method), 1222  
bpy (module), 31  
bpy.app (module), 1075  
bpy.context (module), 27  
bpy.ops.action (module), 32  
bpy.ops.anim (module), 35  
bpy.ops.armature (module), 38  
bpy.ops.boid (module), 41  
bpy.ops.brush (module), 41  
bpy.ops.buttons (module), 42  
bpy.ops.cloth (module), 43  
bpy.ops.console (module), 43  
bpy.ops.constraint (module), 45  
bpy.ops.curve (module), 46  
bpy.ops.ed (module), 50  
bpy.ops.export\_anim (module), 50  
bpy.ops.export\_mesh (module), 51  
bpy.ops.export\_scene (module), 51  
bpy.ops.file (module), 54  
bpy.ops.fluid (module), 56  
bpy.ops.font (module), 56  
bpy.ops.gpencil (module), 59  
bpy.ops.graph (module), 60  
bpy.ops.group (module), 64  
bpy.ops.help (module), 64  
bpy.ops.image (module), 64  
bpy.ops.import\_anim (module), 68  
bpy.ops.import\_curve (module), 68  
bpy.ops.import\_mesh (module), 69  
bpy.ops.import\_scene (module), 69  
bpy.ops.info (module), 70  
bpy.ops.lamp (module), 71  
bpy.ops.lattice (module), 71  
bpy.ops.logic (module), 71  
bpy.ops.marker (module), 73  
bpy.ops.material (module), 74  
bpy.ops.mball (module), 74  
bpy.ops.mesh (module), 75  
bpy.ops.nla (module), 87  
bpy.ops.node (module), 89  
bpy.ops.object (module), 93  
bpy.ops.outliner (module), 109  
bpy.ops.paint (module), 111  
bpy.ops.particle (module), 113  
bpy.ops.pose (module), 114  
bpy.ops.poselib (module), 118  
bpy.ops.ptcache (module), 119  
bpy.ops.render (module), 119  
bpy.ops.scene (module), 120  
bpy.ops.screen (module), 120  
bpy.ops.script (module), 123  
bpy.ops.sculpt (module), 123  
bpy.ops.sequencer (module), 124  
bpy.ops.sketch (module), 131  
bpy.ops.sound (module), 132  
bpy.ops.surface (module), 132  
bpy.ops.text (module), 135  
bpy.ops.texture (module), 138  
bpy.ops.time (module), 139  
bpy.ops.transform (module), 140  
bpy.ops.ui (module), 148  
bpy.ops.uv (module), 148  
bpy.ops.view2d (module), 153  
bpy.ops.view3d (module), 155  
bpy.ops.wm (module), 159  
bpy.ops.world (module), 170  
bpy.path (module), 1074  
bpy.props (module), 1076  
bpy.types (module), 170, 172–175, 177, 178, 180–182, 185, 186, 188–192, 194, 195, 197, 198, 201–203, 205, 206, 208–210, 212, 215–222, 224–248, 250, 252, 256–259, 265–267, 270–273, 275–279, 282–286, 288–292, 294, 295, 297, 298, 300–306, 308–310, 312–317, 319–321, 323–352, 354, 356, 357, 359, 360, 362, 363, 365–367, 370–372, 374–378, 380, 381, 384, 387–392, 396, 397, 400, 402–405, 407, 410–412, 414–423, 425–429, 433, 435–437, 439–443, 445–452, 456–460, 462, 463, 465–472, 474–476, 480, 481, 484, 487–489, 491, 493, 494, 496–499, 503, 507, 509, 512–515, 517–520, 522, 524, 526, 528–534, 536, 538–540, 542–544, 546, 547, 554, 556, 557, 559–561, 563, 564, 569, 570, 572, 575, 580–593, 595–600, 602–604, 607, 608, 610–613, 615, 618, 619, 621–623, 626–635, 637, 648, 651–655, 662–669, 672, 673, 675–677, 679–681, 683, 684, 697, 700, 701, 705–710, 712, 714, 717, 718, 720–722, 727, 728, 730, 731, 733–739, 741–744, 746, 748, 753–755, 765, 767, 769, 774, 775, 779, 780, 784, 787, 788, 790, 791, 793, 794, 797–822, 824–831, 833, 836–840, 844, 845, 847, 848, 850–854, 856, 858–862, 864–866, 868, 869, 871, 872, 875, 877, 880, 882–884, 887–889, 891, 892, 894–896, 898–900, 902–904, 907, 909, 911–930, 932, 934–936, 938, 940, 942, 943, 946, 948–950, 952, 954, 955, 957, 959, 960, 962, 963, 965, 966, 970–975, 979–981, 984–986, 1009, 1011–1015, 1019, 1021, 1023, 1027, 1030–1040, 1042, 1043, 1045, 1046, 1049, 1052, 1054, 1056, 1058, 1060–1062, 1064–1067  
bpy.utils (module), 1072

bpy\_extras (module), 1157  
 bpy\_extras.image\_utils (module), 1159  
 bpy\_extras.io\_utils (module), 1158  
 bpy\_extras.mesh\_utils (module), 1160  
 bpy\_extras.object\_utils (module), 1157  
 bpy\_extras.view3d\_utils (module), 1161  
 bpy\_prop\_collection (class in bpy.types), 1066  
 bpy\_struct (class in bpy.types), 1068  
 branch\_threshold (bpy.types.ParticleSettings attribute), 686  
 breakdown() (in module bpy.ops.pose), 115  
 brownian\_factor (bpy.types.ParticleSettings attribute), 686  
 browse\_interactive() (in module bpy.ops.poselib), 118  
 brush (bpy.types.Paint attribute), 668  
 Brush (class in bpy.types), 259  
 brush (in module bpy.context), 30  
 Brush.curve (in module bpy.types), 260  
 Brush.texture\_slot (in module bpy.types), 262  
 brush\_edit() (in module bpy.ops.particle), 113  
 brush\_stroke() (in module bpy.ops.sculpt), 123  
 BrushTextureSlot (class in bpy.types), 265  
 buffer\_paste() (in module bpy.ops.font), 56  
 build\_cflags (in module bpy.app), 1075  
 build\_cxxflags (in module bpy.app), 1075  
 build\_date (in module bpy.app), 1075  
 build\_linkflags (in module bpy.app), 1075  
 build\_platform (in module bpy.app), 1075  
 build\_revision (in module bpy.app), 1075  
 build\_system (in module bpy.app), 1075  
 build\_time (in module bpy.app), 1075  
 build\_type (in module bpy.app), 1075  
 BuildModifier (class in bpy.types), 266  
 bulge (bpy.types.StretchToConstraint attribute), 888  
 bump\_method (bpy.types.MaterialTextureSlot attribute), 564  
 bump\_objectspace (bpy.types.MaterialTextureSlot attribute), 565  
 buoyancy (bpy.types.SPHFluidSettings attribute), 767  
 button (bge.types.SCA\_JoystickSensor attribute), 1215  
 button (bpy.types.ThemeAudioWindow attribute), 934  
 button (bpy.types.ThemeConsole attribute), 936  
 button (bpy.types.ThemeDopeSheet attribute), 938  
 button (bpy.types.ThemeFileBrowser attribute), 940  
 button (bpy.types.ThemeGraphEditor attribute), 943  
 button (bpy.types.ThemeImageEditor attribute), 946  
 button (bpy.types.ThemeInfo attribute), 948  
 button (bpy.types.ThemeLogicEditor attribute), 949  
 button (bpy.types.ThemeNLAEditor attribute), 950  
 button (bpy.types.ThemeNodeEditor attribute), 952  
 button (bpy.types.ThemeOutliner attribute), 954  
 button (bpy.types.ThemeProperties attribute), 956  
 button (bpy.types.ThemeSequenceEditor attribute), 957  
 button (bpy.types.ThemeTextEditor attribute), 960  
 button (bpy.types.ThemeTimeline attribute), 962  
 button (bpy.types.ThemeUserPreferences attribute), 965  
 button (bpy.types.ThemeView3D attribute), 966  
 button\_number (bpy.types.JoystickSensor attribute), 493  
 button\_text (bpy.types.ThemeAudioWindow attribute), 934  
 button\_text (bpy.types.ThemeConsole attribute), 936  
 button\_text (bpy.types.ThemeDopeSheet attribute), 938  
 button\_text (bpy.types.ThemeFileBrowser attribute), 940  
 button\_text (bpy.types.ThemeGraphEditor attribute), 943  
 button\_text (bpy.types.ThemeImageEditor attribute), 946  
 button\_text (bpy.types.ThemeInfo attribute), 948  
 button\_text (bpy.types.ThemeLogicEditor attribute), 949  
 button\_text (bpy.types.ThemeNLAEditor attribute), 950  
 button\_text (bpy.types.ThemeNodeEditor attribute), 952  
 button\_text (bpy.types.ThemeOutliner attribute), 954  
 button\_text (bpy.types.ThemeProperties attribute), 956  
 button\_text (bpy.types.ThemeSequenceEditor attribute), 957  
 button\_text (bpy.types.ThemeTextEditor attribute), 960  
 button\_text\_hi (bpy.types.ThemeAudioWindow attribute), 934  
 button\_text\_hi (bpy.types.ThemeConsole attribute), 936  
 button\_text\_hi (bpy.types.ThemeDopeSheet attribute), 938  
 button\_text\_hi (bpy.types.ThemeFileBrowser attribute), 940  
 button\_text\_hi (bpy.types.ThemeGraphEditor attribute), 943  
 button\_text\_hi (bpy.types.ThemeImageEditor attribute), 946  
 button\_text\_hi (bpy.types.ThemeInfo attribute), 948  
 button\_text\_hi (bpy.types.ThemeLogicEditor attribute), 949  
 button\_text\_hi (bpy.types.ThemeNLAEditor attribute), 951  
 button\_text\_hi (bpy.types.ThemeNodeEditor attribute), 952  
 button\_text\_hi (bpy.types.ThemeOutliner attribute), 954  
 button\_text\_hi (bpy.types.ThemeProperties attribute), 956  
 button\_text\_hi (bpy.types.ThemeSequenceEditor attribute), 957  
 button\_text\_hi (bpy.types.ThemeTextEditor attribute), 960  
 button\_text\_hi (bpy.types.ThemeTimeline attribute), 962  
 button\_text\_hi (bpy.types.ThemeUserPreferences attribute), 965  
 button\_text\_hi (bpy.types.ThemeView3D attribute), 966  
 button\_title (bpy.types.ThemeAudioWindow attribute), 934

button\_title (bpy.types.ThemeConsole attribute), 936  
button\_title (bpy.types.ThemeDopeSheet attribute), 938  
button\_title (bpy.types.ThemeFileBrowser attribute), 940  
button\_title (bpy.types.ThemeGraphEditor attribute), 943  
button\_title (bpy.types.ThemeImageEditor attribute), 946  
button\_title (bpy.types.ThemeInfo attribute), 948  
button\_title (bpy.types.ThemeLogicEditor attribute), 949  
button\_title (bpy.types.ThemeNLAEditor attribute), 951  
button\_title (bpy.types.ThemeNodeEditor attribute), 952  
button\_title (bpy.types.ThemeOutliner attribute), 954  
button\_title (bpy.types.ThemeProperties attribute), 956  
button\_title (bpy.types.ThemeSequenceEditor attribute), 957  
button\_title (bpy.types.ThemeTextEditor attribute), 960  
button\_title (bpy.types.ThemeTimeline attribute), 962  
button\_title (bpy.types.ThemeUserPreferences attribute), 965  
button\_title (bpy.types.ThemeView3D attribute), 966  
bvh() (in module bpy.ops.export\_anim), 50  
bvh() (in module bpy.ops.import\_anim), 68

## C

cache\_cloth (bpy.types.SpaceTimeline attribute), 868  
cache\_particles (bpy.types.SpaceTimeline attribute), 868  
cache\_resolution (bpy.types.MaterialVolume attribute), 570  
cache\_smoke (bpy.types.SpaceTimeline attribute), 868  
cache\_softbody (bpy.types.SpaceTimeline attribute), 868  
calc\_normals() (bpy.types.Mesh method), 578  
calculate\_roll() (in module bpy.ops.armature), 39  
call\_menu() (in module bpy.ops.wm), 160  
CAM\_POS (in module bge.logic), 1248  
camera (bge.types.KX\_SceneActuator attribute), 1206  
camera (bpy.types.Scene attribute), 770  
camera (bpy.types.SceneActuator attribute), 774  
camera (bpy.types.SpaceView3D attribute), 872  
camera (bpy.types.TimelineMarker attribute), 972  
Camera (class in bpy.types), 267  
camera (in module bpy.context), 30  
Camera.animation\_data (in module bpy.types), 267  
camera\_add() (in module bpy.ops.object), 94  
camera\_bind() (in module bpy.ops.marker), 73  
camera\_to\_view() (in module bpy.ops.view3d), 155  
camera\_to\_world (bge.types.KX\_Camera attribute), 1221  
CameraActuator (class in bpy.types), 270  
cameras (bge.types.KX\_Scene attribute), 1204  
cancel() (bpy.types.Operator method), 661  
cancel() (in module bpy.ops.file), 54  
cancel\_stroke() (in module bpy.ops.sketch), 131  
capsize (bge.texture.ImageMirror attribute), 1256  
capsize (bge.texture.ImageRender attribute), 1257  
capsize (bge.texture.ImageViewport attribute), 1257  
CAPSLOCKKEY (in module bge.events), 1262  
case\_set() (in module bpy.ops.font), 57

case\_toggle() (in module bpy.ops.font), 57  
cast\_type (bpy.types.CastModifier attribute), 271  
CastModifier (class in bpy.types), 271  
center\_x (bpy.types.CompositorNodeDBlur attribute), 309  
center\_y (bpy.types.CompositorNodeDBlur attribute), 309  
chain\_count (bpy.types.KinematicConstraint attribute), 520  
chain\_count (bpy.types.SplineIKConstraint attribute), 880  
chance (bpy.types.RandomActuator attribute), 739  
change\_character() (in module bpy.ops.font), 57  
change\_effect\_input() (in module bpy.ops.sequencer), 124  
change\_effect\_type() (in module bpy.ops.sequencer), 124  
change\_frame() (in module bpy.ops.anim), 35  
change\_path() (in module bpy.ops.sequencer), 124  
change\_spacing() (in module bpy.ops.font), 57  
channel (bpy.types.CompositorNodeColorSpill attribute), 302  
channel (bpy.types.CompositorNodeLevels attribute), 324  
channel (bpy.types.Sequence attribute), 794  
channel\_group (bpy.types.ThemeDopeSheet attribute), 938  
channel\_group (bpy.types.ThemeGraphEditor attribute), 943  
channel\_matrix (bge.types.BL\_ArmatureChannel attribute), 1231  
ChannelDriverVariables (class in bpy.types), 272  
channelNames (bge.types.BL\_ActionActuator attribute), 1166  
channels (aud.Device attribute), 1151  
channels (bge.types.BL\_ArmatureObject attribute), 1224  
channels (bpy.types.ThemeDopeSheet attribute), 938  
channels\_click() (in module bpy.ops.anim), 35  
channels\_click() (in module bpy.ops.nla), 87  
channelsCollapse() (in module bpy.ops.anim), 35  
channels\_delete() (in module bpy.ops.anim), 35  
channels\_editable\_toggle() (in module bpy.ops.anim), 35  
channels\_expand() (in module bpy.ops.anim), 35  
channels\_fcycles\_enable() (in module bpy.ops.anim), 35  
channels\_move() (in module bpy.ops.anim), 35  
channels\_region (bpy.types.ThemeGraphEditor attribute), 943  
channels\_select\_all\_toggle() (in module bpy.ops.anim), 36  
channels\_select\_border() (in module bpy.ops.anim), 36  
channels\_selected (bpy.types.ThemeDopeSheet attribute), 938  
channels\_setting\_disable() (in module bpy.ops.anim), 36  
channels\_setting\_enable() (in module bpy.ops.anim), 36  
channels\_setting\_toggle() (in module bpy.ops.anim), 36  
channels\_visibility\_set() (in module bpy.ops.anim), 36

**channels\_visibility\_toggle()** (in module bpy.ops.anim), [36](#)  
**charge** (bpy.types.EffectorWeights attribute), [400](#)  
**check()** (bpy.types.Operator method), [660](#)  
**checker\_distance** (bpy.types.ImageTexture attribute), [484](#)  
**child** (bpy.types.RigidBodyJointConstraint attribute), [765](#)  
**child\_length** (bpy.types.ParticleSettings attribute), [686](#)  
**child\_length\_threshold** (bpy.types.ParticleSettings attribute), [686](#)  
**child\_nbr** (bpy.types.ParticleSettings attribute), [686](#)  
**child\_parting\_factor** (bpy.types.ParticleSettings attribute), [686](#)  
**child\_parting\_max** (bpy.types.ParticleSettings attribute), [686](#)  
**child\_parting\_min** (bpy.types.ParticleSettings attribute), [686](#)  
**child\_radius** (bpy.types.ParticleSettings attribute), [686](#)  
**child\_roundness** (bpy.types.ParticleSettings attribute), [686](#)  
**child\_seed** (bpy.types.ParticleSystem attribute), [701](#)  
**child\_size** (bpy.types.ParticleSettings attribute), [686](#)  
**child\_size\_random** (bpy.types.ParticleSettings attribute), [687](#)  
**child\_type** (bpy.types.ParticleSettings attribute), [687](#)  
**childof\_clear\_inverse()** (in module bpy.ops.constraint), [45](#)  
**childof\_set\_inverse()** (in module bpy.ops.constraint), [45](#)  
**ChildOfConstraint** (class in bpy.types), [273](#)  
**ChildParticle** (class in bpy.types), [275](#)  
**children** (bge.types.BL\_ArmatureBone attribute), [1235](#)  
**children** (bge.types.KX\_GameObject attribute), [1177](#)  
**childrenRecursive** (bge.types.KX\_GameObject attribute), [1177](#)  
**choke** (bpy.types.SoftBodySettings attribute), [840](#)  
**cineon\_black** (bpy.types.RenderSettings attribute), [756](#)  
**cineon\_gamma** (bpy.types.RenderSettings attribute), [756](#)  
**cineon\_white** (bpy.types.RenderSettings attribute), [757](#)  
**circle\_select()** (in module bpy.ops.uv), [148](#)  
**CKEY** (in module bge.events), [1261](#)  
**clamp** (bpy.types.GlowSequence attribute), [460](#)  
**ClampToConstraint** (class in bpy.types), [276](#)  
**clean()** (in module bpy.ops.action), [32](#)  
**clean()** (in module bpy.ops.graph), [60](#)  
**clean\_name()** (in module bpy.path), [1074](#)  
**clear()** (bpy.types.KeyingSetPaths method), [517](#)  
**clear()** (bpy.types.LampTextureSlots class method), [528](#)  
**clear()** (bpy.types.MaterialTextureSlots class method), [570](#)  
**clear()** (bpy.types.ParticleSettingsTextureSlots class method), [700](#)  
**clear()** (bpy.types.Text method), [901](#)  
**clear()** (bpy.types.WorldTextureSlots class method), [1064](#)  
**clear()** (in module bpy.ops.console), [44](#)  
**clear\_scale()** (in module bpy.ops.nla), [87](#)  
**click\_extrude()** (in module bpy.ops.armature), [39](#)  
**click\_insert()** (in module bpy.ops.graph), [60](#)  
**click\_select()** (in module bpy.ops.nla), [87](#)  
**clickselect()** (in module bpy.ops.action), [32](#)  
**clickselect()** (in module bpy.ops.graph), [60](#)  
**clip** (bge.texture.ImageMirror attribute), [1256](#)  
**clip\_border()** (in module bpy.ops.view3d), [155](#)  
**clip\_end** (bpy.types.Camera attribute), [267](#)  
**clip\_end** (bpy.types.EnvironmentMap attribute), [404](#)  
**clip\_end** (bpy.types.SpaceView3D attribute), [872](#)  
**clip\_max\_x** (bpy.types.CurveMapping attribute), [372](#)  
**clip\_max\_y** (bpy.types.CurveMapping attribute), [372](#)  
**clip\_min\_x** (bpy.types.CurveMapping attribute), [372](#)  
**clip\_min\_y** (bpy.types.CurveMapping attribute), [372](#)  
**clip\_start** (bpy.types.Camera attribute), [268](#)  
**clip\_start** (bpy.types.EnvironmentMap attribute), [404](#)  
**clip\_start** (bpy.types.SpaceView3D attribute), [872](#)  
**clipboard** (bpy.types.WindowManager attribute), [1050](#)  
**CLIPPING** (in module blf), [1146](#)  
**clipping()** (in module blf), [1147](#)  
**CListValue** (class in bge.types), [1171](#)  
**clone\_alpha** (bpy.types.Brush attribute), [260](#)  
**clone\_cursor\_set()** (in module bpy.ops.paint), [111](#)  
**clone\_image** (bpy.types.Brush attribute), [260](#)  
**clone\_offset** (bpy.types.Brush attribute), [260](#)  
**close()** (bge.texture.Texture method), [1258](#)  
**closest\_point\_on\_mesh()** (bpy.types.Object method), [645](#)  
**cloth** (in module bpy.context), [30](#)  
**ClothCollisionSettings** (class in bpy.types), [277](#)  
**ClothModifier** (class in bpy.types), [278](#)  
**ClothModifier.collision\_settings** (in module bpy.types), [278](#)  
**ClothModifier.point\_cache** (in module bpy.types), [278](#)  
**ClothModifier.settings** (in module bpy.types), [278](#)  
**ClothSettings** (class in bpy.types), [279](#)  
**ClothSettings.effector\_weights** (in module bpy.types), [280](#)  
**cloud\_type** (bpy.types.CloudsTexture attribute), [282](#)  
**CloudsTexture** (class in bpy.types), [282](#)  
**CloudsTexture.users\_material** (in module bpy.types), [282](#)  
**CloudsTexture.users\_object\_modifier** (in module bpy.types), [282](#)  
**clump\_factor** (bpy.types.ParticleSettings attribute), [687](#)  
**clump\_factor** (bpy.types.ParticleSettingsTextureSlot attribute), [697](#)  
**clump\_shape** (bpy.types.ParticleSettings attribute), [687](#)  
**cluster\_iterations** (bpy.types.GameSoftBodySettings attribute), [457](#)  
**co** (bpy.types.BezierSplinePoint attribute), [210](#)  
**co** (bpy.types.FCurveSample attribute), [417](#)  
**co** (bpy.types.GPencilStrokePoint attribute), [448](#)  
**co** (bpy.types.Keyframe attribute), [512](#)  
**co** (bpy.types.MeshSticky attribute), [590](#)  
**co** (bpy.types.MeshVertex attribute), [596](#)

co (bpy.types.MetaElement attribute), 603  
co (bpy.types.MotionPathVert attribute), 611  
co (bpy.types.ParticleHairKey attribute), 680  
co (bpy.types.ShapeKeyBezierPoint attribute), 827  
co (bpy.types.ShapeKeyCurvePoint attribute), 827  
co (bpy.types.ShapeKeyPoint attribute), 828  
co (bpy.types.SplinePoint attribute), 882  
co\_deform (bpy.types.LatticePoint attribute), 531  
co\_hair\_space (bpy.types.ParticleHairKey attribute), 680  
coefficients (bpy.types.FModifierGenerator attribute), 424  
col\_size (mathutils.Matrix attribute), 1089  
CollectionProperty (class in bpy.types), 283  
CollectionProperty() (in module bpy.props), 1079  
CollectionProperty.fixed\_type (in module bpy.types), 283  
collide (bge.types.KX\_PolyProxy attribute), 1194  
collider\_friction (bpy.types.ClothSettings attribute), 280  
collision (in module bpy.context), 30  
collision\_bounds\_type (bpy.types.GameObjectSettings attribute), 452  
collision\_extents (bpy.types.SmokeDomainSettings attribute), 834  
collision\_group (bpy.types.SmokeDomainSettings attribute), 834  
collision\_margin (bpy.types.GameObjectSettings attribute), 452  
collision\_margin (bpy.types.GameSoftBodySettings attribute), 457  
collision\_quality (bpy.types.ClothCollisionSettings attribute), 277  
collision\_type (bpy.types.SoftBodySettings attribute), 840  
CollisionModifier (class in bpy.types), 284  
CollisionModifier.settings (in module bpy.types), 284  
CollisionSensor (class in bpy.types), 285  
CollisionSettings (class in bpy.types), 286  
color (bge.texture.FilterBlueScreen attribute), 1258  
color (bge.types.KX\_GameObject attribute), 1175  
color (bge.types.KX\_LightObject attribute), 1186  
color (bge.types.KX\_VertexProxy attribute), 1210  
color (bpy.types.Brush attribute), 260  
color (bpy.types.ColorRampElement attribute), 289  
color (bpy.types.ColorSequence attribute), 291  
color (bpy.types.FCurve attribute), 412  
color (bpy.types.GPencilLayer attribute), 446  
color (bpy.types.Lamp attribute), 523  
color (bpy.types.MaterialSubsurfaceScattering attribute), 563  
color (bpy.types.Object attribute), 638  
color (bpy.types.TextMarker attribute), 908  
color (bpy.types.TextureSlot attribute), 930  
Color (class in mathutils), 1083  
Color.copy() (in module mathutils), 1083  
color1 (bpy.types.MeshColor attribute), 580  
color2 (bpy.types.MeshColor attribute), 580  
color3 (bpy.types.MeshColor attribute), 580  
color4 (bpy.types.MeshColor attribute), 580  
color\_factor (bpy.types.LampTextureSlot attribute), 526  
color\_factor (bpy.types.MaterialSubsurfaceScattering attribute), 563  
color\_hue (bpy.types.CompositorNodeColorMatte attribute), 301  
color\_hue (bpy.types.CompositorNodeHueSat attribute), 320  
color\_layer (bpy.types.ShaderNodeGeometry attribute), 807  
color\_maximum (bpy.types.ParticleSettings attribute), 687  
color\_mode (bpy.types.FCurve attribute), 412  
color\_mode (bpy.types.RenderSettings attribute), 757  
color\_mode (bpy.types.VoronoiTexture attribute), 1040  
color\_modulation (bpy.types.CompositorNodeGlare attribute), 318  
color\_multiply (bpy.types.AdjustmentSequence attribute), 183  
color\_multiply (bpy.types.EffectSequence attribute), 398  
color\_multiply (bpy.types.ImageSequence attribute), 481  
color\_multiply (bpy.types.MetaSequence attribute), 604  
color\_multiply (bpy.types.MovieSequence attribute), 613  
color\_multiply (bpy.types.MulticamSequence attribute), 616  
color\_multiply (bpy.types.SceneSequence attribute), 784  
color\_picker\_type (bpy.types.UserPreferencesSystem attribute), 1024  
color\_random (bpy.types.WorldStarsSettings attribute), 1061  
color\_range (bpy.types.World attribute), 1056  
color\_saturation (bpy.types.AdjustmentSequence attribute), 183  
color\_saturation (bpy.types.CompositorNodeColorMatte attribute), 301  
color\_saturation (bpy.types.CompositorNodeHueSat attribute), 320  
color\_saturation (bpy.types.EffectSequence attribute), 398  
color\_saturation (bpy.types.ImageSequence attribute), 481  
color\_saturation (bpy.types.MetaSequence attribute), 604  
color\_saturation (bpy.types.MovieSequence attribute), 613  
color\_saturation (bpy.types.MulticamSequence attribute), 616  
color\_saturation (bpy.types.SceneSequence attribute), 784  
color\_set (bpy.types.BoneGroup attribute), 256  
color\_source (bpy.types.PointDensity attribute), 714  
color\_space (bpy.types.CompositorNodeChannelMatte attribute), 297

color\_value (bpy.types.CompositorNodeColorMatte attribute), 301  
 color\_value (bpy.types.CompositorNodeHueSat attribute), 320  
 colorIdx (bge.texture.FilterNormal attribute), 1259  
 ColorRamp (class in bpy.types), 288  
 ColorRamp.elements (in module bpy.types), 288  
 ColorRampElement (class in bpy.types), 289  
 ColorRampElements (class in bpy.types), 290  
 colors\_mirror() (in module bpy.ops.mesh), 75  
 colors\_rotate() (in module bpy.ops.mesh), 75  
 ColorSequence (class in bpy.types), 291  
 colour (bge.types.KX\_LightObject attribute), 1185  
 colour (bge.types.KX\_VertexProxy attribute), 1210  
 column() (bpy.typesUILayout method), 987  
 column\_flow() (bpy.typesUILayout method), 987  
 COMMAKEY (in module bge.events), 1264  
 comment() (in module bpy.ops.text), 135  
 compare() (bpy.types.KeyMapItem method), 502  
 CompositorNode (class in bpy.types), 293  
 CompositorNode.type (in module bpy.types), 293  
 CompositorNodeAlphaOver (class in bpy.types), 294  
 CompositorNodeBilateralblur (class in bpy.types), 294  
 CompositorNodeBlur (class in bpy.types), 295  
 CompositorNodeBrightContrast (class in bpy.types), 297  
 CompositorNodeChannelMatte (class in bpy.types), 297  
 CompositorNodeChromaMatte (class in bpy.types), 298  
 CompositorNodeColorBalance (class in bpy.types), 300  
 CompositorNodeColorMatte (class in bpy.types), 301  
 CompositorNodeColorSpill (class in bpy.types), 302  
 CompositorNodeCombHSVA (class in bpy.types), 303  
 CompositorNodeCombRGBA (class in bpy.types), 304  
 CompositorNodeCombYCCA (class in bpy.types), 304  
 CompositorNodeCombYUVA (class in bpy.types), 305  
 CompositorNodeComposite (class in bpy.types), 306  
 CompositorNodeCrop (class in bpy.types), 306  
 CompositorNodeCurveRGB (class in bpy.types), 308  
 CompositorNodeCurveRGB.mapping (in module bpy.types), 308  
 CompositorNodeCurveVec (class in bpy.types), 309  
 CompositorNodeCurveVec.mapping (in module bpy.types), 309  
 CompositorNodeDBlur (class in bpy.types), 309  
 CompositorNodeDefocus (class in bpy.types), 310  
 CompositorNodeDiffMatte (class in bpy.types), 312  
 CompositorNodeDilateErode (class in bpy.types), 313  
 CompositorNodeDisplace (class in bpy.types), 314  
 CompositorNodeDistanceMatte (class in bpy.types), 314  
 CompositorNodeFilter (class in bpy.types), 315  
 CompositorNodeFlip (class in bpy.types), 316  
 CompositorNodeGamma (class in bpy.types), 317  
 CompositorNodeGlare (class in bpy.types), 317  
 CompositorNodeHueCorrect (class in bpy.types), 319  
 CompositorNodeHueCorrect.mapping (in module bpy.types), 319  
 CompositorNodeHueSat (class in bpy.types), 320  
 CompositorNodeIDMask (class in bpy.types), 321  
 CompositorNodeImage (class in bpy.types), 321  
 CompositorNodeInvert (class in bpy.types), 323  
 CompositorNodeLensdist (class in bpy.types), 323  
 CompositorNodeLevels (class in bpy.types), 324  
 CompositorNodeLumaMatte (class in bpy.types), 325  
 CompositorNodeMapUV (class in bpy.types), 326  
 CompositorNodeMapView (class in bpy.types), 327  
 CompositorNodeMath (class in bpy.types), 328  
 CompositorNodeMixRGB (class in bpy.types), 329  
 CompositorNodeNormal (class in bpy.types), 329  
 CompositorNodeNormalize (class in bpy.types), 330  
 CompositorNodeOutputFile (class in bpy.types), 331  
 CompositorNodePremulKey (class in bpy.types), 332  
 CompositorNodeRGB (class in bpy.types), 333  
 CompositorNodeRGBToBW (class in bpy.types), 333  
 CompositorNodeRLayers (class in bpy.types), 334  
 CompositorNodeRotate (class in bpy.types), 335  
 CompositorNodes (class in bpy.types), 350  
 CompositorNodeScale (class in bpy.types), 336  
 CompositorNodeSepHSVA (class in bpy.types), 337  
 CompositorNodeSepRGBA (class in bpy.types), 337  
 CompositorNodeSepYCCA (class in bpy.types), 338  
 CompositorNodeSepYUVA (class in bpy.types), 339  
 CompositorNodeSetAlpha (class in bpy.types), 339  
 CompositorNodeSplitViewer (class in bpy.types), 340  
 CompositorNodeTexture (class in bpy.types), 341  
 CompositorNodeTime (class in bpy.types), 342  
 CompositorNodeTime.curve (in module bpy.types), 342  
 CompositorNodeTonemap (class in bpy.types), 343  
 CompositorNodeTranslate (class in bpy.types), 344  
 CompositorNodeTree (class in bpy.types), 345  
 CompositorNodeTree.nodes (in module bpy.types), 345  
 CompositorNodeValToRGB (class in bpy.types), 346  
 CompositorNodeValToRGB.color\_ramp (in module bpy.types), 346  
 CompositorNodeValue (class in bpy.types), 346  
 CompositorNodeVecBlur (class in bpy.types), 347  
 CompositorNodeViewer (class in bpy.types), 348  
 CompositorNodeZcombine (class in bpy.types), 349  
 compound (bge.types.KX\_ParentActuator attribute), 1192  
 compressibility (bpy.types.DomainFluidSettings attribute), 381  
 compression (bpy.types.PointCache attribute), 712  
 compression\_threshold (bpy.types.SpotLamp attribute), 884  
 cone\_angle\_inner (aud.Handle attribute), 1156  
 cone\_angle\_outer (aud.Handle attribute), 1156  
 cone\_inner\_angle\_3d (bpy.types.SoundActuator attribute), 847

cone\_outer\_angle\_3d (bpy.types.SoundActuator attribute), 847  
cone\_outer\_gain\_3d (bpy.types.SoundActuator attribute), 847  
cone\_volume\_outer (aud.Handle attribute), 1156  
coneOrigin (bge.types.KX\_RadarSensor attribute), 1200  
coneTarget (bge.types.KX\_RadarSensor attribute), 1200  
CONETWIST\_CONSTRAINT (in module bge.constraints), 1271  
connect\_hair() (in module bpy.ops.particle), 113  
connected (bge.types.BL\_ArmatureBone attribute), 1234  
connected (bge.types.SCA\_JoystickSensor attribute), 1215  
ConsoleLine (class in bpy.types), 351  
constant\_offset\_displace (bpy.types.ArrayModifier attribute), 206  
CONSTANT\_TIMER (in module bge.logic), 1248  
constraint (bge.types.BL\_ArmatureActuator attribute), 1225  
constraint (bge.types.KX\_ArmatureSensor attribute), 1226  
constraint (bpy.types.ArmatureActuator attribute), 201  
constraint (bpy.types.ArmatureSensor attribute), 205  
Constraint (class in bpy.types), 352  
Constraint.error\_location (in module bpy.types), 352  
Constraint.error\_rotation (in module bpy.types), 352  
Constraint.is\_valid (in module bpy.types), 352  
Constraint.type (in module bpy.types), 353  
constraint\_add() (in module bpy.ops.object), 95  
constraint\_add() (in module bpy.ops.pose), 115  
constraint\_add\_with\_targets() (in module bpy.ops.object), 95  
constraint\_add\_with\_targets() (in module bpy.ops.pose), 115  
ConstraintActuator (class in bpy.types), 354  
constraints (bge.types.BL\_ArmatureObject attribute), 1224  
constraints\_clear() (in module bpy.ops.object), 95  
constraints\_clear() (in module bpy.ops.pose), 115  
constraints\_copy() (in module bpy.ops.object), 95  
constraints\_copy() (in module bpy.ops.pose), 115  
ConstraintTarget (class in bpy.types), 356  
context (bpy.types.SpaceProperties attribute), 864  
Context (class in bpy.types), 357  
Context.area (in module bpy.types), 357  
Context.blend\_data (in module bpy.types), 357  
Context.mode (in module bpy.types), 357  
Context.region (in module bpy.types), 357  
Context.region\_data (in module bpy.types), 357  
Context.scene (in module bpy.types), 357  
Context.screen (in module bpy.types), 358  
Context.space\_data (in module bpy.types), 358  
Context.tool\_settings (in module bpy.types), 358  
Context.user\_preferences (in module bpy.types), 358  
Context.window (in module bpy.types), 358  
Context.window\_manager (in module bpy.types), 358  
context\_collection\_boolean\_set() (in module bpy.ops.wm), 160  
context\_cycle\_array() (in module bpy.ops.wm), 160  
context\_cycle\_enum() (in module bpy.ops.wm), 160  
context\_cycle\_int() (in module bpy.ops.wm), 161  
context\_menu\_enum() (in module bpy.ops.wm), 161  
context\_modal\_mouse() (in module bpy.ops.wm), 161  
context\_pointer\_set() (bpy.typesUILayout method), 1005  
context\_scale\_int() (in module bpy.ops.wm), 161  
context\_set\_boolean() (in module bpy.ops.wm), 161  
context\_set\_enum() (in module bpy.ops.wm), 161  
context\_set\_float() (in module bpy.ops.wm), 162  
context\_set\_id() (in module bpy.ops.wm), 162  
context\_set\_int() (in module bpy.ops.wm), 162  
context\_set\_string() (in module bpy.ops.wm), 162  
context\_set\_value() (in module bpy.ops.wm), 162  
context\_toggle() (in module bpy.ops.wm), 162  
context\_toggle\_enum() (in module bpy.ops.wm), 163  
contrast (bpy.types.CompositorNodeTonemap attribute), 343  
contrast (bpy.types.Texture attribute), 909  
ControlFluidSettings (class in bpy.types), 359  
Controller (class in bpy.types), 360  
controller\_add() (in module bpy.ops.logic), 72  
controller\_move() (in module bpy.ops.logic), 72  
controller\_remove() (in module bpy.ops.logic), 72  
controllers (bge.types.KX\_GameObject attribute), 1177  
convert() (in module bpy.ops.gpencil), 59  
convert() (in module bpy.ops.object), 95  
convert() (in module bpy.ops.sketch), 131  
convert\_whitespace() (in module bpy.ops.text), 135  
converter\_node (bpy.types.ThemeNodeEditor attribute), 952  
copy() (bpy.types.Context static method), 358  
copy() (bpy.types.ID method), 472  
copy() (in module bpy.ops.action), 33  
copy() (in module bpy.ops.console), 44  
copy() (in module bpy.ops.graph), 60  
copy() (in module bpy.ops.material), 74  
copy() (in module bpy.ops.pose), 115  
copy() (in module bpy.ops.sequencer), 124  
copy() (in module bpy.ops.text), 135  
copy() (mathutils.Matrix method), 1086  
copy\_data\_path\_button() (in module bpy.ops.ui), 148  
copy\_driver\_button() (in module bpy.ops.anim), 36  
copy\_prev\_settings() (in module bpy.ops.wm), 163  
copy\_to\_selected\_button() (in module bpy.ops.ui), 148  
CopyLocationConstraint (class in bpy.types), 362  
CopyRotationConstraint (class in bpy.types), 363  
CopyScaleConstraint (class in bpy.types), 365  
CopyTransformsConstraint (class in bpy.types), 366

correction (bpy.types.CompositorNodeTonemap attribute), 343  
 correction (bpy.types.WorldLighting attribute), 1058  
 correction\_method (bpy.types.CompositorNodeColorBalance attribute), 300  
 count (bpy.types.ArrayModifier attribute), 206  
 count (bpy.types.ParticleBrush attribute), 675  
 count (bpy.types.ParticleDupliWeight attribute), 676  
 count (bpy.types.ParticleSettings attribute), 687  
 count() (bge.types.CListValue method), 1171  
 CPropValue (class in bge.types), 1163  
 crease (bpy.types.MeshEdge attribute), 583  
 crease\_pinch\_factor (bpy.types.Brush attribute), 260  
 create() (bpy.types.LampTextureSlots class method), 528  
 create() (bpy.types.MaterialTextureSlots class method), 569  
 create() (bpy.types.ParticleSettingsTextureSlots class method), 700  
 create() (bpy.types.WorldTextureSlots class method), 1064  
 create() (in module bpy.ops.group), 64  
 create\_derived\_objects() (in module bpy\_extras.io\_utils), 1158  
 create\_long\_hair\_children (bpy.types.ParticleSettings attribute), 687  
 create\_orientation() (in module bpy.ops.transform), 140  
 createConstraint() (in module bge.constraints), 1265  
 crop\_max\_x (bpy.types.ImageTexture attribute), 484  
 crop\_max\_y (bpy.types.ImageTexture attribute), 484  
 crop\_min\_x (bpy.types.ImageTexture attribute), 484  
 crop\_min\_y (bpy.types.ImageTexture attribute), 484  
 cross() (mathutils.Quaternion method), 1090  
 cross() (mathutils.Vector method), 1093  
 crossfade\_sounds() (in module bpy.ops.sequencer), 124  
 ctrl (bpy.types.KeyMapItem attribute), 500  
 cube\_project() (in module bpy.ops.uv), 149  
 cull\_face (bpy.types.ShrinkwrapModifier attribute), 830  
 current\_character (bpy.types.ConsoleLine attribute), 351  
 cursor (bpy.types.ThemeConsole attribute), 936  
 cursor (bpy.types.ThemeTextEditor attribute), 960  
 cursor3d() (in module bpy.ops.view3d), 155  
 cursor\_color\_add (bpy.types.Brush attribute), 260  
 cursor\_color\_subtract (bpy.types.Brush attribute), 260  
 cursor\_location (bpy.types.Scene attribute), 770  
 cursor\_location (bpy.types.SpaceUVEditor attribute), 869  
 cursor\_location (bpy.types.SpaceView3D attribute), 872  
 cursor\_position\_y (bpy.types.SpaceGraphEditor attribute), 854  
 cursor\_set() (in module bpy.ops.graph), 60  
 cursor\_set() (in module bpy.ops.text), 135  
 cursor\_set() (in module bpy.ops.uv), 149  
 curve (bpy.types.ArrayModifier attribute), 206  
 Curve (class in bpy.types), 367  
 curve (in module bpy.context), 29  
 at-  
 Curve.animation\_data (in module bpy.types), 367  
 Curve.materials (in module bpy.types), 367  
 Curve.shape\_keys (in module bpy.types), 368  
 Curve.splines (in module bpy.types), 368  
 curve\_guide (bpy.types.EffectorWeights attribute), 400  
 curve\_preset() (in module bpy.ops.brush), 41  
 CurveMap (class in bpy.types), 370  
 CurveMap.extend (in module bpy.types), 370  
 CurveMap.points (in module bpy.types), 370  
 CurveMapping (class in bpy.types), 372  
 CurveMapping.curves (in module bpy.types), 372  
 CurveMapPoint (class in bpy.types), 371  
 CurveMapPoint.handle\_type (in module bpy.types), 371  
 CurveMapPoint.location (in module bpy.types), 371  
 CurveModifier (class in bpy.types), 374  
 curves\_point\_set() (in module bpy.ops.image), 64  
 CurveSplines (class in bpy.types), 375  
 custom\_color (bpy.types.ActionGroup attribute), 175  
 custom\_shape (bpy.types.PoseBone attribute), 722  
 custom\_shape\_transform (bpy.types.PoseBone attribute), 722  
 cut() (in module bpy.ops.sequencer), 124  
 cut() (in module bpy.ops.text), 135  
 cut\_multicam() (in module bpy.ops.sequencer), 125  
 CValue (class in bge.types), 1163  
 cycle\_render\_slot() (in module bpy.ops.image), 64  
 cycles\_after (bpy.types.FModifierCycles attribute), 419  
 cycles\_before (bpy.types.FModifierCycles attribute), 420  
 cyclic\_toggle() (in module bpy.ops.curve), 46  
 cylinder\_project() (in module bpy.ops.uv), 149

## D

damp (bge.types.KX\_ConstraintActuator attribute), 1173  
 damp\_factor (bpy.types.ParticleSettingsTextureSlot attribute), 697  
 DampedTrackConstraint (class in bpy.types), 376  
 damping (bge.types.KX\_CameraActuator attribute), 1172  
 damping (bge.types.KX\_ObjectActuator attribute), 1192  
 damping (bpy.types.CameraActuator attribute), 270  
 damping (bpy.types.CollisionSettings attribute), 286  
 damping (bpy.types.ConstraintActuator attribute), 354  
 damping (bpy.types.GameObjectSettings attribute), 452  
 damping (bpy.types.ObjectActuator attribute), 648  
 damping (bpy.types.ParticleSettings attribute), 687  
 damping (bpy.types.SoftBodySettings attribute), 840  
 damping\_epsilon (bpy.types.Itasc attribute), 491  
 damping\_factor (bpy.types.CollisionSettings attribute), 286  
 damping\_max (bpy.types.Itasc attribute), 491  
 damping\_random (bpy.types.CollisionSettings attribute), 287  
 damping\_rotation (bpy.types.ConstraintActuator attribute), 354  
 damping\_time (bpy.types.WaveModifier attribute), 1046

darkness (bpy.types.Material attribute), 547  
data (bpy.types.Object attribute), 638  
data (in module bpy), 31  
data\_add() (in module bpy.ops.gpencil), 59  
data\_operation() (in module bpy.ops.outliner), 109  
data\_path (bpy.types.DriverTarget attribute), 388  
data\_path (bpy.types.FCurve attribute), 412  
data\_path (bpy.types.KeyingSetPath attribute), 516  
data\_unlink() (in module bpy.ops.gpencil), 59  
DBG\_DISABLEBULLETLCP (in module bge.constraints), 1270  
DBG\_DRAWAABB (in module bge.constraints), 1269  
DBG\_DRAWCONSTRAINTLIMITS (in module bge.constraints), 1270  
DBG\_DRAWCONSTRAINTS (in module bge.constraints), 1270  
DBG\_DRAWCONTACTPOINTS (in module bge.constraints), 1269  
DBG\_DRAWFREATURESTEXT (in module bge.constraints), 1269  
DBG\_DRAWTEXT (in module bge.constraints), 1269  
DBG\_DRAWWIREFRAME (in module bge.constraints), 1268  
DBG\_ENABLECCD (in module bge.constraints), 1270  
DBG\_ENABLESATCOMPARISION (in module bge.constraints), 1269  
DBG\_FASTWIREFRAME (in module bge.constraints), 1270  
DBG\_NODEBUG (in module bge.constraints), 1268  
DBG\_NOHELPTEXT (in module bge.constraints), 1269  
DBG\_PROFILETIMINGS (in module bge.constraints), 1269  
dbvt\_culling (bge.types.KX\_Scene attribute), 1205  
de\_select\_first() (in module bpy.ops.curve), 46  
de\_select\_last() (in module bpy.ops.curve), 46  
deactivate() (bge.types.SCA\_PythonController method), 1218  
debug (in module bpy.app), 1075  
debug\_menu() (in module bpy.ops.wm), 163  
debug\_value (in module bpy.app), 1075  
DecimateModifier (class in bpy.types), 377  
DecimateModifier.face\_count (in module bpy.types), 377  
decompose() (mathutils.Matrix method), 1087  
default\_key\_count (bpy.types.ParticleEdit attribute), 677  
default\_max (bpy.types.FModifierEnvelope attribute), 421  
default\_min (bpy.types.FModifierEnvelope attribute), 421  
default\_value (bpy.types.RGBANodeSocket attribute), 737  
default\_value (bpy.types.TextureSlot attribute), 931  
default\_value (bpy.types.ValueNodeSocket attribute), 1031  
default\_value (bpy.types.VectorNodeSocket attribute), 1033  
define() (bpy.types.Macro method), 541  
deform\_axis (bpy.types.CurveModifier attribute), 374  
deform\_method (bpy.types.SimpleDeformModifier attribute), 831  
deinterlace (bge.texture.VideoFFmpeg attribute), 1254  
deinterlace\_selected\_movies() (in module bpy.ops.sequencer), 125  
delay (bge.types.SCA\_DelaySensor attribute), 1214  
delay (bpy.types.DelaySensor attribute), 377  
DelaySensor (class in bpy.types), 377  
delete() (in module bpy.ops.action), 33  
delete() (in module bpy.ops.armature), 39  
delete() (in module bpy.ops.console), 44  
delete() (in module bpy.ops.constraint), 45  
delete() (in module bpy.ops.curve), 46  
delete() (in module bpy.ops.file), 54  
delete() (in module bpy.ops.font), 57  
delete() (in module bpy.ops.graph), 60  
delete() (in module bpy.ops.marker), 73  
delete() (in module bpy.ops.mesh), 75  
delete() (in module bpy.ops.nla), 87  
delete() (in module bpy.ops.node), 90  
delete() (in module bpy.ops.object), 95  
delete() (in module bpy.ops.particle), 113  
delete() (in module bpy.ops.scene), 120  
delete() (in module bpy.ops.screen), 121  
delete() (in module bpy.ops.sequencer), 125  
delete() (in module bpy.ops.sketch), 131  
delete() (in module bpy.ops.text), 135  
delete\_bookmark() (in module bpy.ops.file), 54  
delete\_edgeloop() (in module bpy.ops.mesh), 75  
delete\_metaelems() (in module bpy.ops.mball), 74  
delete\_orientation() (in module bpy.ops.transform), 140  
delete\_reconnect() (in module bpy.ops.node), 90  
delete\_tracks() (in module bpy.ops.nla), 88  
DELKEY (in module bge.events), 1264  
delSource() (bge.types.BL\_Shader method), 1167  
delta\_location (bpy.types.Object attribute), 638  
delta\_rotation\_euler (bpy.types.Object attribute), 638  
delta\_rotation\_quaternion (bpy.types.Object attribute), 638  
delta\_scale (bpy.types.Object attribute), 638  
density (bpy.types.MaterialVolume attribute), 570  
density (bpy.types.SmokeFlowSettings attribute), 836  
density\_factor (bpy.types.MaterialTextureSlot attribute), 565  
density\_factor (bpy.types.ParticleSettingsTextureSlot attribute), 697  
density\_scale (bpy.types.MaterialVolume attribute), 571  
depth (bge.texture.FilterNormal attribute), 1259  
depth (bpy.types.EnvironmentMap attribute), 404  
depth (bpy.types.FModifierNoise attribute), 426  
depth (bpy.types.MaterialRaytraceMirror attribute), 557

depth (bpy.types.MaterialRaytraceTransparency attribute), 559  
 depth (bpy.types.SceneGameData attribute), 776  
 depth (bpy.types.WorldMistSettings attribute), 1060  
 depth\_max (bpy.types.MaterialRaytraceTransparency attribute), 559  
 depth\_threshold (bpy.types.MaterialVolume attribute), 571  
 derivate\_coefficient (bpy.types.ObjectActuator attribute), 648  
 determinant() (mathutils.Matrix method), 1087  
 Device (class in aud), 1150  
 die\_time (bpy.types.Particle attribute), 674  
 diffuse (bge.types.KX\_PolygonMaterial attribute), 1198  
 diffuse\_color (bpy.types.Material attribute), 547  
 diffuse\_color (bpy.types.UserSolidLight attribute), 1030  
 diffuse\_color\_factor (bpy.types.MaterialTextureSlot attribute), 565  
 diffuse\_factor (bpy.types.MaterialTextureSlot attribute), 565  
 diffuse\_fresnel (bpy.types.Material attribute), 547  
 diffuse\_fresnel\_factor (bpy.types.Material attribute), 548  
 diffuse\_intensity (bpy.types.Material attribute), 548  
 diffuse\_ramp\_blend (bpy.types.Material attribute), 548  
 diffuse\_ramp\_factor (bpy.types.Material attribute), 548  
 diffuse\_ramp\_input (bpy.types.Material attribute), 548  
 diffuse\_shader (bpy.types.Material attribute), 548  
 diffuse\_toon\_size (bpy.types.Material attribute), 548  
 diffuse\_toon\_smooth (bpy.types.Material attribute), 548  
 dimension\_max (bpy.types.MusgraveTexture attribute), 619  
 dimensions (bpy.types.Curve attribute), 367  
 dimensions (bpy.types.Object attribute), 638  
 dimensions (in module bgl), 1145  
 dimensions() (in module blf), 1147  
 direction (bge.types.KX\_ConstraintActuator attribute), 1173  
 direction (bpy.types.Brush attribute), 260  
 direction (bpy.types.ConstraintActuator attribute), 354  
 direction (bpy.types.DisplaceModifier attribute), 379  
 direction (bpy.types.UserSolidLight attribute), 1030  
 direction (bpy.types.WipeSequence attribute), 1052  
 direction\_axis (bpy.types.ConstraintActuator attribute), 354  
 direction\_axis\_pos (bpy.types.ConstraintActuator attribute), 354  
 directory (bpy.types.FileSelectParams attribute), 433  
 directory (bpy.types.ImageSequence attribute), 482  
 directory (bpy.types.SequenceProxy attribute), 801  
 directory() (in module bpy.ops.file), 54  
 directory\_browse() (in module bpy.ops.buttons), 42  
 directory\_new() (in module bpy.ops.file), 54  
 disable() (in module blf), 1147  
 disableMist() (in module bge.render), 1251  
 at-  
 disableMotionBlur (bge.types.SCA\_2DFilterActuator attribute), 1213  
 disableMotionBlur() (in module bge.render), 1252  
 disableRigidBody() (bge.types.KX\_GameObject method), 1181  
 disconnect\_hair() (in module bpy.ops.particle), 113  
 displacement\_factor (bpy.types.MaterialTextureSlot attribute), 565  
 DisplaceModifier (class in bpy.types), 378  
 display\_aspect (bpy.types.Image attribute), 476  
 display\_channel (bpy.types.SpaceSequenceEditor attribute), 865  
 display\_mode (bpy.types.RenderSettings attribute), 757  
 display\_mode (bpy.types.SpaceOutliner attribute), 863  
 display\_mode (bpy.types.SpaceSequenceEditor attribute), 865  
 display\_name() (in module bpy.path), 1074  
 display\_name\_from\_filepath() (in module bpy.path), 1074  
 display\_type (bpy.types.FileSelectParams attribute), 433  
 dissolve\_speed (bpy.types.SmokeDomainSettings attribute), 834  
 distance (bge.types.KX\_ConstraintActuator attribute), 1173  
 distance (bge.types.KX\_LightObject attribute), 1185  
 distance (bge.types.KX\_NearSensor attribute), 1190  
 distance (bge.types.KX\_RadarSensor attribute), 1200  
 distance (bpy.types.BoidRuleFight attribute), 245  
 distance (bpy.types.BoidRuleFollowLeader attribute), 246  
 distance (bpy.types.CompositorNodeDBlur attribute), 310  
 distance (bpy.types.CompositorNodeDilateErode attribute), 313  
 distance (bpy.types.ConstraintActuator attribute), 354  
 distance (bpy.types.KinematicConstraint attribute), 520  
 distance (bpy.types.Lamp attribute), 523  
 distance (bpy.types.LimitDistanceConstraint attribute), 533  
 distance (bpy.types.MaterialRaytraceMirror attribute), 558  
 distance (bpy.types.NearSensor attribute), 622  
 distance (bpy.types.RadarSensor attribute), 738  
 distance (bpy.types.ShrinkwrapConstraint attribute), 829  
 distance (bpy.types.WorldLighting attribute), 1058  
 distance\_3d\_max (bpy.types.SoundActuator attribute), 847  
 distance\_3d\_reference (bpy.types.SoundActuator attribute), 847  
 distance\_max (bpy.types.FieldSettings attribute), 429  
 distance\_maximum (aud.Handle attribute), 1156  
 distance\_metric (bpy.types.VoronoiTexture attribute), 1040

distance\_min (bpy.types.ClothCollisionSettings attribute), 277  
distance\_min (bpy.types.FieldSettings attribute), 429  
distance\_min (bpy.types.WorldStarsSettings attribute), 1061  
distance\_model (aud.Device attribute), 1151  
distance\_reference (aud.Handle attribute), 1156  
distance\_repel (bpy.types.ClothCollisionSettings attribute), 277  
DistortedNoiseTexture (class in bpy.types), 380  
DistortedNoiseTexture.users\_material (in module bpy.types), 380  
DistortedNoiseTexture.users\_object\_modifier (in module bpy.types), 380  
distortion (bpy.types.DistortedNoiseTexture attribute), 380  
distribution (bge.types.SCA\_RandomActuator attribute), 1218  
distribution (bpy.types.ParticleSettings attribute), 687  
distribution (bpy.types.RandomActuator attribute), 739  
dither\_intensity (bpy.types.RenderSettings attribute), 757  
DKEY (in module bge.events), 1261  
dLoc (bge.types.KX\_ObjectActuator attribute), 1191  
doc\_edit() (in module bpy.ops.wm), 163  
doc\_view() (in module bpy.ops.wm), 163  
dof\_distance (bpy.types.Camera attribute), 268  
dof\_object (bpy.types.Camera attribute), 268  
dolly() (in module bpy.ops.view3d), 155  
domain\_object (bpy.types.VoxelData attribute), 1042  
DomainFluidSettings (class in bpy.types), 381  
DomainFluidSettings.fluid\_mesh\_vertices (in module bpy.types), 382  
DomainFluidSettings.memory\_estimate (in module bpy.types), 382  
dome\_angle (bpy.types.SceneGameData attribute), 776  
dome\_buffer\_resolution (bpy.types.SceneGameData attribute), 776  
dome\_mode (bpy.types.SceneGameData attribute), 776  
dome\_tesselation (bpy.types.SceneGameData attribute), 776  
dome\_text (bpy.types.SceneGameData attribute), 776  
dome\_tilt (bpy.types.SceneGameData attribute), 776  
DopeSheet (class in bpy.types), 384  
DopeSheet.source (in module bpy.types), 386  
dopesheet\_channel (bpy.types.ThemeDopeSheet attribute), 938  
dopesheet\_channel (bpy.types.ThemeGraphEditor attribute), 943  
dopesheet\_subchannel (bpy.types.ThemeDopeSheet attribute), 938  
dopesheet\_subchannel (bpy.types.ThemeGraphEditor attribute), 943  
doppler\_factor (aud.Device attribute), 1151  
dot() (mathutils.Quaternion method), 1090  
dot() (mathutils.Vector method), 1093  
double (bpy.types.PropertyGroupItem attribute), 733  
double\_array (bpy.types.PropertyGroupItem attribute), 733  
DOWNARROWKEY (in module bge.events), 1263  
dpi (bpy.types.UserPreferencesSystem attribute), 1024  
drag (bpy.types.EffectorWeights attribute), 400  
drag\_factor (bpy.types.ParticleSettings attribute), 687  
drag\_threshold (bpy.types.UserPreferencesInput attribute), 1021  
draw() (bpy.types.Header method), 468  
draw() (bpy.types.Macro method), 541  
draw() (bpy.types.Menu method), 574  
draw() (bpy.types.Operator method), 661  
draw() (bpy.types.Panel method), 672  
draw() (in module blf), 1147  
draw() (in module bpy.ops.gpencil), 59  
draw\_action (bpy.types.ThemeSequenceEditor attribute), 957  
draw\_bounds\_type (bpy.types.Object attribute), 639  
draw\_channels (bpy.types.SpaceImageEditor attribute), 856  
draw\_color (bpy.types.ParticleSettings attribute), 687  
draw\_header() (bpy.types.Panel method), 672  
draw\_method (bpy.types.ParticleSettings attribute), 687  
draw\_mode (bpy.types.GreasePencil attribute), 462  
draw\_overexposed (bpy.types.SpaceSequenceEditor attribute), 865  
draw\_percentage (bpy.types.ParticleSettings attribute), 687  
draw\_preset() (bpy.types.Menu method), 574  
draw\_preview() (in module bpy.ops.sketch), 131  
draw\_size (bpy.types.Camera attribute), 268  
draw\_size (bpy.types.ParticleSettings attribute), 687  
draw\_step (bpy.types.ParticleEdit attribute), 677  
draw\_step (bpy.types.ParticleSettings attribute), 688  
draw\_stretch\_type (bpy.types.SpaceUVEditor attribute), 869  
draw\_stroke() (in module bpy.ops.sketch), 131  
draw\_type (bpy.types.Armature attribute), 198  
draw\_type (bpy.types.Object attribute), 639  
drawingmode (bge.types.KX\_PolygonMaterial attribute), 1198  
drawLine() (in module bge.render), 1252  
Driver (class in bpy.types), 387  
Driver.variables (in module bpy.types), 387  
driver\_add() (bpy.types.bpy\_struct method), 1069  
driver\_button\_add() (in module bpy.ops.anim), 36  
driver\_button\_remove() (in module bpy.ops.anim), 36  
driver\_namespace (in module bpy.app), 1075  
driver\_remove() (bpy.types.bpy\_struct method), 1069  
drivers\_add\_selected() (in module bpy.ops.outliner), 109  
drivers\_delete\_selected() (in module bpy.ops.outliner), 109

DriverTarget (class in bpy.types), 388  
 DriverVariable (class in bpy.types), 389  
 DriverVariable.targets (in module bpy.types), 389  
 drop\_named\_image() (in module bpy.ops.mesh), 75  
 drop\_named\_material() (in module bpy.ops.object), 95  
 dRot (bge.types.KX\_ObjectActuator attribute), 1191  
 dupli\_extrude\_cursor() (in module bpy.ops.mesh), 75  
 dupli\_faces\_scale (bpy.types.Object attribute), 639  
 dupli\_frames\_end (bpy.types.Object attribute), 639  
 dupli\_frames\_off (bpy.types.Object attribute), 639  
 dupli\_frames\_on (bpy.types.Object attribute), 639  
 dupli\_frames\_start (bpy.types.Object attribute), 639  
 dupli\_group (bpy.types.Object attribute), 639  
 dupli\_group (bpy.types.ParticleSettings attribute), 688  
 dupli\_list\_clear() (bpy.types.Object method), 645  
 dupli\_list\_create() (bpy.types.Object method), 645  
 dupli\_object (bpy.types.ParticleSettings attribute), 688  
 dupli\_offset (bpy.types.Group attribute), 464  
 dupli\_type (bpy.types.Object attribute), 639  
 duplicate() (in module bpy.ops.action), 33  
 duplicate() (in module bpy.ops.armature), 39  
 duplicate() (in module bpy.ops.curve), 46  
 duplicate() (in module bpy.ops.graph), 60  
 duplicate() (in module bpy.ops.marker), 73  
 duplicate() (in module bpy.ops.mesh), 75  
 duplicate() (in module bpy.ops.nla), 88  
 duplicate() (in module bpy.ops.node), 90  
 duplicate() (in module bpy.ops.object), 95  
 duplicate() (in module bpy.ops.sequencer), 125  
 duplicate\_metaelems() (in module bpy.ops.mball), 74  
 duplicate\_move() (in module bpy.ops.action), 33  
 duplicate\_move() (in module bpy.ops.armature), 39  
 duplicate\_move() (in module bpy.ops.graph), 60  
 duplicate\_move() (in module bpy.ops.mesh), 76  
 duplicate\_move() (in module bpy.ops.node), 90  
 duplicate\_move() (in module bpy.ops.object), 96  
 duplicate\_move\_keep\_inputs() (in module bpy.ops.node), 90  
 duplicate\_move\_linked() (in module bpy.ops.object), 96  
 duplicates\_make\_real() (in module bpy.ops.object), 96  
 dupliob\_copy() (in module bpy.ops.particle), 113  
 dupliob\_move\_down() (in module bpy.ops.particle), 113  
 dupliob\_move\_up() (in module bpy.ops.particle), 113  
 dupliob\_remove() (in module bpy.ops.particle), 113  
 DupliObject (class in bpy.types), 390  
 DupliObject.object (in module bpy.types), 390  
 duration (bge.types.SCA\_DelaySensor attribute), 1214  
 duration (bpy.types.DelaySensor attribute), 378  
 duration (bpy.types.ParticleTarget attribute), 707  
 dynamic\_friction (bpy.types.GameSoftBodySettings attribute), 457  
 dynamic\_operation (bpy.types.EditObjectActuator attribute), 396

## E

edge\_color (bpy.types.RenderSettings attribute), 757  
 edge\_cream (bpy.types.ThemeView3D attribute), 967  
 edge\_cream() (in module bpy.ops.transform), 140  
 edge\_cream\_inner (bpy.types.SolidifyModifier attribute), 844  
 edge\_cream\_outer (bpy.types.SolidifyModifier attribute), 844  
 edge\_cream\_rim (bpy.types.SolidifyModifier attribute), 844  
 edge\_draw\_type (bpy.types.SpaceUVEditor attribute), 869  
 edge\_face\_add() (in module bpy.ops.mesh), 76  
 edge\_face\_count() (in module bpy\_extras.mesh\_utils), 1160  
 edge\_face\_count\_dict() (in module bpy\_extras.mesh\_utils), 1160  
 edge\_facesel (bpy.types.ThemeView3D attribute), 967  
 edge\_flip() (in module bpy.ops.mesh), 76  
 edge\_loops\_from\_edges() (in module bpy\_extras.mesh\_utils), 1160  
 edge\_loops\_from\_faces() (in module bpy\_extras.mesh\_utils), 1160  
 edge\_path\_live\_unwrap (bpy.types.ToolSettings attribute), 975  
 edge\_path\_mode (bpy.types.ToolSettings attribute), 975  
 edge\_rotate() (in module bpy.ops.mesh), 76  
 edge\_seam (bpy.types.ThemeView3D attribute), 967  
 edge\_select (bpy.types.ThemeView3D attribute), 967  
 edge\_sharp (bpy.types.ThemeView3D attribute), 967  
 edge\_slide() (in module bpy.ops.transform), 140  
 edge\_threshold (bpy.types.RenderSettings attribute), 757  
 edge\_weight\_method (bpy.types.BevelModifier attribute), 209  
 edgering\_select() (in module bpy.ops.mesh), 76  
 edges\_select\_sharp() (in module bpy.ops.mesh), 76  
 EdgeSplitModifier (class in bpy.types), 391  
 edit\_bone (in module bpy.context), 30  
 edit\_image (in module bpy.context), 31  
 edit\_mesh\_extrude\_individual\_move() (in module bpy.ops.view3d), 155  
 edit\_mesh\_extrude\_move\_normal() (in module bpy.ops.view3d), 156  
 edit\_object (in module bpy.context), 28  
 edit\_text (in module bpy.context), 31  
 editable\_bones (in module bpy.context), 27  
 EditBone (class in bpy.types), 392  
 EditBone.basename (in module bpy.types), 394  
 EditBone.center (in module bpy.types), 394  
 EditBone.children (in module bpy.types), 394  
 EditBone.children\_recursive (in module bpy.types), 394  
 EditBone.children\_recursive\_basename (in module bpy.types), 394  
 EditBone.matrix (in module bpy.types), 393

EditBone.parent\_recursive (in module bpy.types), 394  
EditBone.vector (in module bpy.types), 394  
EditBone.x\_axis (in module bpy.types), 394  
EditBone.y\_axis (in module bpy.types), 394  
EditBone.z\_axis (in module bpy.types), 395  
edited\_clear() (in module bpy.ops.particle), 113  
editmesh\_active (bpy.types.ThemeImageEditor attribute), 946  
editmesh\_active (bpy.types.ThemeView3D attribute), 967  
editmode\_toggle() (in module bpy.ops.object), 96  
EditObjectActuator (class in bpy.types), 396  
effect\_fader (bpy.types.Sequence attribute), 795  
effect\_hair (bpy.types.ParticleSettings attribute), 688  
effect\_strip (bpy.types.ThemeSequenceEditor attribute), 957  
effect\_strip\_add() (in module bpy.ops.sequencer), 125  
effector\_add() (in module bpy.ops.object), 96  
effector\_amount (bpy.types.ParticleSettings attribute), 688  
effector\_group (bpy.types.SmokeDomainSettings attribute), 834  
EffectorWeights (class in bpy.types), 400  
EffectSequence (class in bpy.types), 397  
EffectSequence.color\_balance (in module bpy.types), 398  
EffectSequence.crop (in module bpy.types), 398  
EffectSequence.proxy (in module bpy.types), 398  
EffectSequence.transform (in module bpy.types), 398  
EIGHTKEY (in module bge.events), 1262  
EKEY (in module bge.events), 1261  
elasticity (bpy.types.MaterialPhysics attribute), 556  
emission (bpy.types.MaterialVolume attribute), 571  
emission\_color (bpy.types.MaterialVolume attribute), 571  
emission\_color\_factor (bpy.types.MaterialTextureSlot attribute), 565  
emission\_factor (bpy.types.MaterialTextureSlot attribute), 565  
emit (bpy.types.Material attribute), 548  
emit\_factor (bpy.types.MaterialTextureSlot attribute), 565  
emit\_from (bpy.types.ParticleSettings attribute), 688  
emitter\_distance (bpy.types.ParticleEdit attribute), 677  
empty\_draw\_size (bpy.types.Object attribute), 639  
empty\_draw\_type (bpy.types.Object attribute), 639  
empty\_image\_offset (bpy.types.Object attribute), 639  
enable() (in module blf), 1147  
enable\_manipulator() (in module bpy.ops.view3d), 156  
enabled (bpy.typesUILayout attribute), 987  
enableMotionBlur() (in module bge.render), 1252  
enableRigidBody() (bge.types.KX\_GameObject method), 1180  
enableVisibility() (in module bge.render), 1250  
end() (bge.types.KX\_Scene method), 1205  
end\_cap (bpy.types.ArrayModifier attribute), 206  
end\_frame\_set() (in module bpy.ops.time), 139  
end\_result() (bpy.types.RenderEngine method), 747  
end\_time (bpy.types.ControlFluidSettings attribute), 359  
end\_time (bpy.types.DomainFluidSettings attribute), 382  
endGame() (in module bge.logic), 1237  
ENDKEY (in module bge.events), 1264  
endObject() (bge.types.KX\_GameObject method), 1177  
energy (bge.types.KX\_LightObject attribute), 1185  
energy (bpy.types.Lamp attribute), 523  
enforce (bge.types.BL\_ArmatureConstraint attribute), 1228  
engine (bpy.types.RenderSettings attribute), 757  
ensure\_ext() (in module bpy.path), 1074  
ENTERKEY (in module bge.events), 1264  
EnumProperty (class in bpy.types), 402  
EnumProperty() (in module bpy.props), 1079  
EnumProperty.default (in module bpy.types), 402  
EnumProperty.default\_flag (in module bpy.types), 402  
EnumProperty.enum\_items (in module bpy.types), 402  
EnumPropertyItem (class in bpy.types), 403  
EnumPropertyItem.description (in module bpy.types), 403  
EnumPropertyItem.identifier (in module bpy.types), 403  
EnumPropertyItem.name (in module bpy.types), 403  
EnumPropertyItem.value (in module bpy.types), 403  
envelope\_distance (bpy.types.Bone attribute), 252  
envelope\_distance (bpy.types.EditBone attribute), 392  
envelope\_weight (bpy.types.Bone attribute), 252  
envelope\_weight (bpy.types.EditBone attribute), 392  
environment\_color (bpy.types.WorldLighting attribute), 1058  
environment\_energy (bpy.types.WorldLighting attribute), 1058  
EnvironmentMap (class in bpy.types), 404  
EnvironmentMapTexture (class in bpy.types), 405  
EnvironmentMapTexture.environment\_map (in module bpy.types), 405  
EnvironmentMapTexture.image\_user (in module bpy.types), 406  
EnvironmentMapTexture.users\_material (in module bpy.types), 406  
EnvironmentMapTexture.users\_object\_modifier (in module bpy.types), 406  
envmap\_clear() (in module bpy.ops.texture), 138  
envmap\_clear\_all() (in module bpy.ops.texture), 138  
envmap\_save() (in module bpy.ops.texture), 138  
EQUALKEY (in module bge.events), 1264  
error (class in aud), 1157  
error (in module bge.constraints), 1266  
error\_threshold (bpy.types.MaterialSubsurfaceScattering attribute), 563  
error\_threshold (bpy.types.SoftBodySettings attribute), 841  
error\_threshold (bpy.types.WorldLighting attribute), 1058  
ESCKEY (in module bge.events), 1264

etch\_adaptive\_limit (bpy.types.ToolSettings attribute), 976  
 etch\_convert\_mode (bpy.types.ToolSettings attribute), 976  
 etch\_length\_limit (bpy.types.ToolSettings attribute), 976  
 etch\_number (bpy.types.ToolSettings attribute), 976  
 etch\_roll\_mode (bpy.types.ToolSettings attribute), 976  
 etch\_side (bpy.types.ToolSettings attribute), 976  
 etch\_subdivision\_number (bpy.types.ToolSettings attribute), 976  
 etch\_template (bpy.types.ToolSettings attribute), 976  
 Euler (class in mathutils), 1084  
 Euler.copy() (in module mathutils), 1084  
 euler\_filter() (in module bpy.ops.graph), 61  
 eval\_time (bpy.types.Curve attribute), 367  
 evaluate() (bpy.types.ColorRamp method), 288  
 evaluate() (bpy.types.FCurve method), 413  
 evaluate\_envelope() (bpy.types.Bone method), 255  
 evaluate\_envelope() (bpy.types.PoseBone method), 726  
 evaluation\_type (bpy.types.PropertySensor attribute), 734  
 Event (class in bpy.types), 407  
 Event.alt (in module bpy.types), 407  
 Event.ascii (in module bpy.types), 407  
 Event.ctrl (in module bpy.types), 408  
 Event.mouse\_prev\_x (in module bpy.types), 408  
 Event.mouse\_prev\_y (in module bpy.types), 408  
 Event.mouse\_region\_x (in module bpy.types), 408  
 Event.mouse\_region\_y (in module bpy.types), 408  
 Event.mouse\_x (in module bpy.types), 408  
 Event.mouse\_y (in module bpy.types), 408  
 Event.oskey (in module bpy.types), 408  
 Event.shift (in module bpy.types), 408  
 Event.type (in module bpy.types), 408  
 Event.value (in module bpy.types), 409  
 event\_timer\_add() (bpy.types.WindowManager method), 1050  
 event\_timer\_remove() (bpy.types.WindowManager method), 1050  
 event\_type (bpy.types.JoystickSensor attribute), 493  
 events (bge.types.SCA\_KeyboardSensor attribute), 1216  
 events (bge.types.SCA\_PythonKeyboard attribute), 1164  
 events (bge.types.SCA\_PythonMouse attribute), 1164  
 EventToCharacter() (in module bge.events), 1261  
 EventToString() (in module bge.events), 1260  
 exclude\_ambient\_occlusion  
     (bpy.types.SceneRenderLayer attribute), 780  
 exclude\_emit (bpy.types.SceneRenderLayer attribute), 781  
 exclude\_environment (bpy.types.SceneRenderLayer attribute), 781  
 exclude\_indirect (bpy.types.SceneRenderLayer attribute), 781  
 exclude\_reflection (bpy.types.SceneRenderLayer attribute), 781  
 exclude\_refraction (bpy.types.SceneRenderLayer attribute), 781  
 exclude\_shadow (bpy.types.SceneRenderLayer attribute), 781  
 exclude\_specular (bpy.types.SceneRenderLayer attribute), 781  
 execute() (bpy.types.Operator method), 660  
 execute() (in module bpy.ops.console), 44  
 execute() (in module bpy.ops.file), 55  
 execute\_preset() (in module bpy.ops.script), 123  
 executePriority (bge.types.SCAILogicBrick attribute), 1163  
 expanded\_toggle() (in module bpy.ops.outliner), 109  
 expandPath() (in module bge.logic), 1239  
 explode\_refresh() (in module bpy.ops.object), 96  
 ExplodeModifier (class in bpy.types), 410  
 export\_layout() (in module bpy.ops.uv), 149  
 exportBulletFile() (in module bge.constraints), 1266  
 ExportHelper (class in bpy\_extras.io\_utils), 1159  
 expose() (bpy.types.GroupInputs method), 465  
 expose() (bpy.types.GroupOutputs method), 467  
 exposure (bpy.types.World attribute), 1056  
 expression (bpy.types.Driver attribute), 387  
 expression (bpy.types.ExpressionController attribute), 411  
 ExpressionController (class in bpy.types), 411  
 exr\_codec (bpy.types.CompositorNodeOutputFile attribute), 331  
 extension (bpy.types.ImageTexture attribute), 484  
 extension (bpy.types.VoxelData attribute), 1042  
 external\_edit() (in module bpy.ops.image), 64  
 extra\_edge\_len (bpy.types.ThemeView3D attribute), 967  
 extra\_face\_angle (bpy.types.ThemeView3D attribute), 967  
 extra\_face\_area (bpy.types.ThemeView3D attribute), 967  
 extrapolation (bpy.types.FCurve attribute), 412  
 extrapolation (bpy.types.NlaStrip attribute), 624  
 extrapolation\_type() (in module bpy.ops.action), 33  
 extrapolation\_type() (in module bpy.ops.graph), 61  
 extrude (bpy.types.Curve attribute), 367  
 extrude() (in module bpy.ops.armature), 39  
 extrude() (in module bpy.ops.curve), 46  
 extrude() (in module bpy.ops.mesh), 76  
 extrude\_edges\_move() (in module bpy.ops.mesh), 76  
 extrude\_faces\_move() (in module bpy.ops.mesh), 76  
 extrude\_forked() (in module bpy.ops.armature), 39  
 extrude\_move() (in module bpy.ops.armature), 39  
 extrude\_region\_move() (in module bpy.ops.mesh), 77  
 extrude\_repeat() (in module bpy.ops.mesh), 77  
 extrude\_vertices\_move() (in module bpy.ops.mesh), 77  
 eyedropper() (in module bpy.ops.ui), 148

## F

F10KEY (in module bge.events), 1263  
F11KEY (in module bge.events), 1263  
F12KEY (in module bge.events), 1264  
F13KEY (in module bge.events), 1264  
F14KEY (in module bge.events), 1264  
F15KEY (in module bge.events), 1264  
F16KEY (in module bge.events), 1264  
F17KEY (in module bge.events), 1264  
F18KEY (in module bge.events), 1264  
F19KEY (in module bge.events), 1264  
F1KEY (in module bge.events), 1263  
F2KEY (in module bge.events), 1263  
F3KEY (in module bge.events), 1263  
F4KEY (in module bge.events), 1263  
F5KEY (in module bge.events), 1263  
F6KEY (in module bge.events), 1263  
F7KEY (in module bge.events), 1263  
F8KEY (in module bge.events), 1263  
F9KEY (in module bge.events), 1263  
f\_stop (bpy.types.CompositorNodeDefocus attribute), 311  
face (bpy.types.ThemeImageEditor attribute), 946  
face (bpy.types.ThemeView3D attribute), 967  
face\_dot (bpy.types.ThemeImageEditor attribute), 946  
face\_dot (bpy.types.ThemeView3D attribute), 967  
face\_random\_points() (in module bpy\_extras.mesh\_utils), 1161  
face\_select (bpy.types.ThemeImageEditor attribute), 946  
face\_select (bpy.types.ThemeView3D attribute), 967  
face\_select\_all() (in module bpy.ops.paint), 111  
face\_select\_hide() (in module bpy.ops.paint), 111  
face\_select\_inverse() (in module bpy.ops.paint), 111  
face\_select\_linked() (in module bpy.ops.paint), 111  
face\_select\_linked\_pick() (in module bpy.ops.paint), 111  
face\_select\_reveal() (in module bpy.ops.paint), 111  
facedot\_size (bpy.types.ThemeImageEditor attribute), 946  
facedot\_size (bpy.types.ThemeView3D attribute), 967  
faces\_mirror\_uv() (in module bpy.ops.mesh), 77  
faces\_select\_interior() (in module bpy.ops.mesh), 77  
faces\_select\_linked\_flat() (in module bpy.ops.mesh), 77  
faces\_shade\_flat() (in module bpy.ops.mesh), 77  
faces\_shade\_smooth() (in module bpy.ops.mesh), 77  
factor (bpy.types.CastModifier attribute), 271  
factor (bpy.types.CompositorNodeBlur attribute), 295  
factor (bpy.types.CompositorNodeSplitViewer attribute), 340  
factor (bpy.types.CompositorNodeVecBlur attribute), 347  
factor (bpy.types.SimpleDeformModifier attribute), 832  
factor (bpy.types.SmoothModifier attribute), 838  
factor\_blue (bpy.types.Texture attribute), 909  
factor\_density (bpy.types.SPHFluidSettings attribute), 767  
factor\_green (bpy.types.Texture attribute), 909  
factor\_radius (bpy.types.SPHFluidSettings attribute), 768  
factor\_random (bpy.types.ParticleSettings attribute), 688  
factor\_red (bpy.types.Texture attribute), 909  
factor\_repulsion (bpy.types.SPHFluidSettings attribute), 768  
factor\_rest\_length (bpy.types.SPHFluidSettings attribute), 768  
factor\_stiff\_viscosity (bpy.types.SPHFluidSettings attribute), 768  
factor\_x (bpy.types.CompositorNodeBlur attribute), 295  
factor\_y (bpy.types.CompositorNodeBlur attribute), 295  
Factory (class in aud), 1151  
fade (bpy.types.CompositorNodeGlare attribute), 318  
fade\_frames (bpy.types.ParticleEdit attribute), 678  
fade\_to (bpy.types.MaterialRaytraceMirror attribute), 558  
falloff (bpy.types.BoidState attribute), 251  
falloff (bpy.types.CompositorNodeDiffMatte attribute), 312  
falloff (bpy.types.CompositorNodeDistanceMatte attribute), 314  
falloff (bpy.types.HookModifier attribute), 471  
falloff (bpy.types.MaterialRaytraceTransparency attribute), 559  
falloff (bpy.types.PointDensity attribute), 715  
falloff (bpy.types.WorldMistSettings attribute), 1060  
falloff\_power (bpy.types.FieldSettings attribute), 429  
falloff\_radius (bpy.types.WarpModifier attribute), 1045  
falloff\_radius (bpy.types.WaveModifier attribute), 1046  
falloff\_soft (bpy.types.PointDensity attribute), 715  
falloff\_speed\_scale (bpy.types.PointDensity attribute), 715  
falloff\_strength (bpy.types.WorldLighting attribute), 1058  
falloff\_type (bpy.types.FieldSettings attribute), 429  
falloff\_type (bpy.types.PointLamp attribute), 718  
falloff\_type (bpy.types.SpotLamp attribute), 884  
falloff\_type (bpy.types.WarpModifier attribute), 1045  
family (bpy.types.TextCurve attribute), 904  
far (bge.types.KX\_Camera attribute), 1221  
fbx() (in module bpy.ops.export\_scene), 52  
FCurve (class in bpy.types), 412  
FCurve.driver (in module bpy.types), 412  
FCurve.keyframe\_points (in module bpy.types), 412  
FCurve.modifiers (in module bpy.types), 413  
FCurve.sampled\_points (in module bpy.types), 413  
FCurveActuator (class in bpy.types), 414  
FCurveKeyframePoints (class in bpy.types), 415  
FCurveModifiers (class in bpy.types), 416  
FCurveSample (class in bpy.types), 417  
fear\_factor (bpy.types.BoidRuleAvoid attribute), 244  
feedback (bpy.types.Itasc attribute), 491  
fgon\_clear() (in module bpy.ops.mesh), 77  
fgon\_make() (in module bpy.ops.mesh), 77  
fh\_damping (bpy.types.ConstraintActuator attribute), 354

fh\_damping (bpy.types.MaterialPhysics attribute), 556  
fh\_distance (bpy.types.MaterialPhysics attribute), 556  
fh\_force (bpy.types.ConstraintActuator attribute), 354  
fh\_force (bpy.types.MaterialPhysics attribute), 557  
fh\_height (bpy.types.ConstraintActuator attribute), 354  
field\_factor (bpy.types.ParticleSettingsTextureSlot attribute), 697  
field\_order (bpy.types.Image attribute), 476  
field\_order (bpy.types.RenderSettings attribute), 757  
fields\_per\_frame (bpy.types.ImageUser attribute), 487  
FieldSettings (class in bpy.types), 429  
file\_browse() (in module bpy.ops.buttons), 43  
file\_format (bpy.types.Image attribute), 476  
file\_format (bpy.types.RenderSettings attribute), 757  
file\_format (bpy.types.VoxelData attribute), 1042  
file\_paste() (in module bpy.ops.font), 57  
file\_quality (bpy.types.RenderSettings attribute), 757  
fileName (bge.types.KX\_GameActuator attribute), 1174  
fileName (bge.types.KX\_SoundActuator attribute), 1206  
filename (bpy.types.FileSelectParams attribute), 433  
filename (bpy.types.GameActuator attribute), 449  
filename (bpy.types.SequenceElement attribute), 801  
filenum() (in module bpy.ops.file), 55  
filepath (bpy.types.CompositorNodeOutputFile attribute), 331  
filepath (bpy.types.DomainFluidSettings attribute), 382  
filepath (bpy.types.Image attribute), 476  
filepath (bpy.types.Library attribute), 532  
filepath (bpy.types.MovieSequence attribute), 613  
filepath (bpy.types.MultiresModifier attribute), 618  
filepath (bpy.types.ParticleFluidSettings attribute), 679  
filepath (bpy.types.PointCache attribute), 712  
filepath (bpy.types.RenderSettings attribute), 757  
filepath (bpy.types.SequenceProxy attribute), 802  
filepath (bpy.types.Sound attribute), 845  
filepath (bpy.types.SoundSequence attribute), 848  
filepath (bpy.types.Text attribute), 900  
filepath (bpy.types.TextureNodeOutput attribute), 922  
filepath (bpy.types.VoxelData attribute), 1042  
filepath\_raw (bpy.types.Image attribute), 476  
fileselect\_add() (bpy.types.WindowManager class method), 1050  
FileSelectParams (class in bpy.types), 433  
FileSelectParams.title (in module bpy.types), 433  
fill() (in module bpy.ops.armature), 40  
fill() (in module bpy.ops.mesh), 77  
filter (bge.texture.ImageBuff attribute), 1255  
filter (bge.texture.ImageFFmpeg attribute), 1255  
filter (bge.texture.ImageMirror attribute), 1256  
filter (bge.texture.ImageMix attribute), 1256  
filter (bge.texture.ImageRender attribute), 1257  
filter (bge.texture.ImageViewport attribute), 1257  
filter (bge.texture.VideoFFmpeg attribute), 1254  
filter (bpy.types.MaterialRaytraceTransparency attribute), 559  
Filter2DActuator (class in bpy.types), 435  
filter\_eccentricity (bpy.types.EnvironmentMapTexture attribute), 405  
filter\_eccentricity (bpy.types.ImageTexture attribute), 484  
filter\_fcurve\_name (bpy.types.DopeSheet attribute), 384  
filter\_glob (bpy.types.FileSelectParams attribute), 433  
filter\_group (bpy.types.DopeSheet attribute), 384  
filter\_pass (bpy.types.Filter2DActuator attribute), 435  
filter\_probes (bpy.types.EnvironmentMapTexture attribute), 406  
filter\_probes (bpy.types.ImageTexture attribute), 484  
filter\_size (bpy.types.EnvironmentMapTexture attribute), 406  
filter\_size (bpy.types.ImageTexture attribute), 485  
filter\_size (bpy.types.RenderSettings attribute), 757  
filter\_text (bpy.types.SpaceOutliner attribute), 863  
filter\_text (bpy.types.SpaceUserPreferences attribute), 871  
filter\_type (bpy.types.CompositorNodeBlur attribute), 296  
filter\_type (bpy.types.CompositorNodeFilter attribute), 315  
filter\_type (bpy.types.CompositorNodeRotate attribute), 335  
filter\_type (bpy.types.EnvironmentMapTexture attribute), 406  
filter\_type (bpy.types.ImageTexture attribute), 485  
FilterBGR24 (class in bge.texture), 1258  
FilterBlueScreen (class in bge.texture), 1258  
FilterColor (class in bge.texture), 1258  
FilterGray (class in bge.texture), 1258  
FilterLevel (class in bge.texture), 1258  
FilterNormal (class in bge.texture), 1259  
FilterRGB24 (class in bge.texture), 1259  
FilterRGBA32 (class in bge.texture), 1259  
find() (bpy.types.KeyMaps method), 507  
find() (in module bpy.ops.text), 135  
find\_armature() (bpy.types.Object method), 645  
find\_missing\_files() (in module bpy.ops.file), 55  
find\_modal() (bpy.types.KeyMaps method), 508  
find\_set\_selected() (in module bpy.ops.text), 135  
find\_text (bpy.types.SpaceTextEditor attribute), 866  
finish\_stroke() (in module bpy.ops.sketch), 131  
fit\_length (bpy.types.ArrayModifier attribute), 206  
fit\_type (bpy.types.ArrayModifier attribute), 206  
FIVEKEY (in module bge.events), 1262  
FKEY (in module bge.events), 1261  
flare\_boost (bpy.types.MaterialHalo attribute), 554  
flare\_seed (bpy.types.MaterialHalo attribute), 554  
flare\_size (bpy.types.MaterialHalo attribute), 554  
flare\_subflare\_count (bpy.types.MaterialHalo attribute), 554

flare\_subflare\_size (bpy.types.MaterialHalo attribute), 555  
flee\_distance (bpy.types.BoidRuleFight attribute), 245  
flip (bge.texture.ImageBuff attribute), 1255  
flip (bge.texture.ImageFFmpeg attribute), 1255  
flip (bge.texture.ImageMirror attribute), 1256  
flip (bge.texture.ImageMix attribute), 1256  
flip (bge.texture.ImageRender attribute), 1257  
flip (bge.texture.ImageViewport attribute), 1257  
flip (bge.texture.VideoFFmpeg attribute), 1254  
flip\_names() (in module bpy.ops.armature), 40  
flip\_names() (in module bpy.ops.pose), 115  
flip\_normals() (in module bpy.ops.mesh), 78  
float (bpy.types.PropertyGroupItem attribute), 733  
float\_array (bpy.types.PropertyGroupItem attribute), 733  
float\_max (bpy.types.RandomActuator attribute), 739  
float\_mean (bpy.types.RandomActuator attribute), 739  
float\_min (bpy.types.RandomActuator attribute), 739  
float\_value (bpy.types.RandomActuator attribute), 739  
FloatProperty (class in bpy.types), 436  
FloatProperty() (in module bpy.props), 1079  
FloatProperty.array\_length (in module bpy.types), 436  
FloatProperty.default (in module bpy.types), 436  
FloatProperty.default\_array (in module bpy.types), 436  
FloatProperty.hard\_max (in module bpy.types), 436  
FloatProperty.hard\_min (in module bpy.types), 436  
FloatProperty.precision (in module bpy.types), 436  
FloatProperty.soft\_max (in module bpy.types), 436  
FloatProperty.soft\_min (in module bpy.types), 436  
FloatProperty.step (in module bpy.types), 437  
FloatVectorProperty() (in module bpy.props), 1079  
floor\_location (bpy.types.FloorConstraint attribute), 437  
FloorConstraint (class in bpy.types), 437  
flow (bpy.types.FieldSettings attribute), 429  
fluid (in module bpy.context), 30  
fluid\_group (bpy.types.SmokeDomainSettings attribute), 834  
fluid\_radius (bpy.types.SPHFluidSettings attribute), 768  
FluidFluidSettings (class in bpy.types), 439  
FluidMeshVertex (class in bpy.types), 440  
FluidMeshVertex.velocity (in module bpy.types), 440  
FluidSettings (class in bpy.types), 440  
FluidSimulationModifier (class in bpy.types), 441  
FluidSimulationModifier.settings (in module bpy.types), 441  
fly() (in module bpy.ops.view3d), 156  
FModifier (class in bpy.types), 418  
FModifier.is\_valid (in module bpy.types), 418  
FModifier.type (in module bpy.types), 419  
fmodifier\_add() (in module bpy.ops.graph), 61  
fmodifier\_add() (in module bpy.ops.nla), 88  
fmodifier\_copy() (in module bpy.ops.graph), 61  
fmodifier\_copy() (in module bpy.ops.nla), 88  
fmodifier\_paste() (in module bpy.ops.graph), 61  
fmodifier\_paste() (in module bpy.ops.nla), 88  
FModifierCycles (class in bpy.types), 419  
FModifierEnvelope (class in bpy.types), 420  
FModifierEnvelope.control\_points (in module bpy.types), 420  
FModifierEnvelopeControlPoint (class in bpy.types), 421  
FModifierFunctionGenerator (class in bpy.types), 422  
FModifierGenerator (class in bpy.types), 423  
FModifierLimits (class in bpy.types), 425  
FModifierNoise (class in bpy.types), 426  
FModifierPython (class in bpy.types), 427  
FModifierStepped (class in bpy.types), 428  
follow\_active\_quads() (in module bpy.ops.uv), 150  
follow\_curve (bpy.types.TextCurve attribute), 904  
FollowPathConstraint (class in bpy.types), 442  
font (bpy.types.TextCurve attribute), 904  
font\_bold (bpy.types.TextCurve attribute), 904  
font\_bold\_italic (bpy.types.TextCurve attribute), 904  
font\_directory (bpy.types.UserPreferencesFilePaths attribute), 1019  
font\_italic (bpy.types.TextCurve attribute), 904  
font\_kerning\_style (bpy.types.ThemeFontStyle attribute), 942  
font\_size (bpy.types.SpaceConsole attribute), 851  
font\_size (bpy.types.SpaceTextEditor attribute), 866  
force (bge.types.KX\_ObjectActuator attribute), 1191  
force (bpy.types.EffectorWeights attribute), 400  
force (bpy.types.HookModifier attribute), 471  
force (bpy.types.ObjectActuator attribute), 648  
force\_max\_x (bpy.types.ObjectActuator attribute), 649  
force\_max\_y (bpy.types.ObjectActuator attribute), 649  
force\_max\_z (bpy.types.ObjectActuator attribute), 649  
force\_min\_x (bpy.types.ObjectActuator attribute), 649  
force\_min\_y (bpy.types.ObjectActuator attribute), 649  
force\_min\_z (bpy.types.ObjectActuator attribute), 649  
forcefield\_toggle() (in module bpy.ops.object), 97  
forceLimitX (bge.types.KX\_ObjectActuator attribute), 1192  
forceLimitY (bge.types.KX\_ObjectActuator attribute), 1192  
forceLimitZ (bge.types.KX\_ObjectActuator attribute), 1192  
foreach\_get() (bpy.types.bpy\_prop\_collection method), 1066  
foreach\_set() (bpy.types.bpy\_prop\_collection method), 1067  
form\_factor (bpy.types.GameObjectSettings attribute), 452  
format (aud.Device attribute), 1151  
forward\_axis (bpy.types.FollowPathConstraint attribute), 442  
FOURKEY (in module bge.events), 1262  
fps (bpy.types.Image attribute), 476  
fps (bpy.types.RenderSettings attribute), 758

fps (bpy.types.SceneGameData attribute), 776  
 fps\_base (bpy.types.RenderSettings attribute), 758  
 frame (bge.types.BL\_ActionActuator attribute), 1166  
 frame (bge.types.BL\_ShapeActionActuator attribute), 1170  
 frame (bpy.types.FModifierEnvelopeControlPoint attribute), 421  
 frame (bpy.types.TimelineMarker attribute), 972  
 frame\_after (bpy.types.AnimVizMotionPaths attribute), 190  
 frame\_after (bpy.types.AnimVizOnionSkinning attribute), 191  
 frame\_before (bpy.types.AnimVizMotionPaths attribute), 190  
 frame\_before (bpy.types.AnimVizOnionSkinning attribute), 191  
 frame\_blend\_in (bpy.types.ActionActuator attribute), 172  
 frame\_blend\_in (bpy.types.ShapeActionActuator attribute), 824  
 frame\_color (bpy.types.SceneGameData attribute), 776  
 frame\_current (bpy.types.Scene attribute), 770  
 frame\_current (bpy.types.ThemeAudioWindow attribute), 934  
 frame\_current (bpy.types.ThemeDopeSheet attribute), 938  
 frame\_current (bpy.types.ThemeGraphEditor attribute), 944  
 frame\_current (bpy.types.ThemeNLAEditor attribute), 951  
 frame\_current (bpy.types.ThemeSequenceEditor attribute), 957  
 frame\_current (bpy.types.ThemeTimeline attribute), 962  
 frame\_current (bpy.types.ThemeView3D attribute), 967  
 frame\_duration (bpy.types.BuildModifier attribute), 266  
 frame\_duration (bpy.types.CompositorNodeImage attribute), 321  
 frame\_duration (bpy.types.ImageUser attribute), 487  
 frame\_end (bpy.types.ActionActuator attribute), 172  
 frame\_end (bpy.types.ActionConstraint attribute), 173  
 frame\_end (bpy.types.AnimVizMotionPaths attribute), 190  
 frame\_end (bpy.types.AnimVizOnionSkinning attribute), 191  
 frame\_end (bpy.types.CompositorNodeOutputFile attribute), 331  
 frame\_end (bpy.types.CompositorNodeType attribute), 342  
 frame\_end (bpy.types.FCurveActuator attribute), 414  
 frame\_end (bpy.types.FModifierStepped attribute), 428  
 frame\_end (bpy.types.Image attribute), 476  
 frame\_end (bpy.types.NlaStrip attribute), 624  
 frame\_end (bpy.types.ParticleSettings attribute), 688  
 frame\_end (bpy.types.PointCache attribute), 712  
 frame\_end (bpy.types.Scene attribute), 770  
 frame\_end (bpy.types.ShapeActionActuator attribute), 824  
 frame\_end (bpy.types.TextureNodeCurveTime attribute), 916  
 frame\_final\_duration (bpy.types.Sequence attribute), 795  
 frame\_final\_end (bpy.types.Sequence attribute), 795  
 frame\_final\_start (bpy.types.Sequence attribute), 795  
 frame\_jump() (in module bpy.ops.action), 33  
 frame\_jump() (in module bpy.ops.graph), 61  
 frame\_jump() (in module bpy.ops.screen), 121  
 frame\_map\_new (bpy.types.RenderSettings attribute), 758  
 frame\_map\_old (bpy.types.RenderSettings attribute), 758  
 frame\_number (bpy.types.GPencilFrame attribute), 445  
 frame\_offset (bpy.types.CompositorNodeImage attribute), 321  
 frame\_offset (bpy.types.FModifierStepped attribute), 428  
 frame\_offset (bpy.types.ImageUser attribute), 487  
 frame\_offset() (in module bpy.ops.screen), 121  
 frame\_path() (bpy.types.RenderSettings method), 764  
 frame\_preview\_end (bpy.types.Scene attribute), 770  
 frame\_preview\_start (bpy.types.Scene attribute), 770  
 frame\_property (bpy.types.ActionActuator attribute), 172  
 frame\_property (bpy.types.FCurveActuator attribute), 414  
 frame\_property (bpy.types.ShapeActionActuator attribute), 824  
 frame\_server\_port (bpy.types.UserPreferencesSystem attribute), 1024  
 frame\_set() (bpy.types.Scene method), 772  
 frame\_start (bpy.types.ActionActuator attribute), 172  
 frame\_start (bpy.types.ActionConstraint attribute), 173  
 frame\_start (bpy.types.AnimVizMotionPaths attribute), 190  
 frame\_start (bpy.types.AnimVizOnionSkinning attribute), 192  
 frame\_start (bpy.types.BuildModifier attribute), 266  
 frame\_start (bpy.types.CompositorNodeImage attribute), 322  
 frame\_start (bpy.types.CompositorNodeOutputFile attribute), 331  
 frame\_start (bpy.types.CompositorNodeType attribute), 342  
 frame\_start (bpy.types.FCurveActuator attribute), 414  
 frame\_start (bpy.types.FModifierStepped attribute), 428  
 frame\_start (bpy.types.Image attribute), 477  
 frame\_start (bpy.types.ImageUser attribute), 487  
 frame\_start (bpy.types.NlaStrip attribute), 624  
 frame\_start (bpy.types.ParticleSettings attribute), 688  
 frame\_start (bpy.types.PointCache attribute), 712  
 frame\_start (bpy.types.Scene attribute), 770  
 frame\_start (bpy.types.Sequence attribute), 795  
 frame\_start (bpy.types.ShapeActionActuator attribute),

frame\_start (bpy.types.TextureNodeCurveTime attribute), 916  
frame\_step (bpy.types.AnimVizMotionPaths attribute), 190  
frame\_step (bpy.types.AnimVizOnionSkinning attribute), 192  
frame\_step (bpy.types.FModifierStepped attribute), 428  
frame\_step (bpy.types.PointCache attribute), 712  
frame\_step (bpy.types.Scene attribute), 770  
frame\_type (bpy.types.SceneGameData attribute), 776  
frameEnd (bge.types.BL\_ActionActuator attribute), 1166  
frameEnd (bge.types.BL\_ShapeActionActuator attribute), 1170  
frameEnd (bge.types.KX\_IpoActuator attribute), 1184  
frameMessageCount (bge.types.KX\_NetworkMessageSens attribute), 1190  
framePropName (bge.types.BL\_ActionActuator attribute), 1166  
framePropName (bge.types.BL\_ShapeActionActuator attribute), 1171  
framePropName (bge.types.KX\_IpoActuator attribute), 1184  
framerate (bge.texture.VideoFFmpeg attribute), 1254  
frameStart (bge.types.BL\_ActionActuator attribute), 1166  
frameStart (bge.types.BL\_ShapeActionActuator attribute), 1170  
frameStart (bge.types.KX\_IpoActuator attribute), 1184  
free\_axis (bpy.types.MaintainVolumeConstraint attribute), 543  
free\_bake() (in module bpy.ops.ptcache), 119  
free\_bake\_all() (in module bpy.ops.ptcache), 119  
free\_derived\_objects() (in module bpy\_extras.io\_utils), 1158  
frequency (bge.types.SCA\_ISensor attribute), 1164  
frequency (bpy.types.SceneGameData attribute), 776  
frequency (bpy.types.Sensor attribute), 793  
fresnel (bpy.types.MaterialRaytraceMirror attribute), 558  
fresnel (bpy.types.MaterialRaytraceTransparency attribute), 559  
fresnel\_factor (bpy.types.MaterialRaytraceMirror attribute), 558  
fresnel\_factor (bpy.types.MaterialRaytraceTransparency attribute), 559  
friction (bpy.types.ClothCollisionSettings attribute), 277  
friction (bpy.types.MaterialPhysics attribute), 557  
friction (bpy.types.SoftBodySettings attribute), 841  
friction\_coefficients (bpy.types.GameObjectSettings attribute), 453  
friction\_factor (bpy.types.CollisionSettings attribute), 287  
friction\_random (bpy.types.CollisionSettings attribute), 287  
from\_existing() (bpy.types.AnimDataDrivers method), 188  
from\_id() (bge.types.CListValue method), 1171  
from\_id() (bpy.types.KeyMapItems method), 506  
from\_max\_x (bpy.types.TransformConstraint attribute), 981  
from\_max\_y (bpy.types.TransformConstraint attribute), 982  
from\_max\_z (bpy.types.TransformConstraint attribute), 982  
from\_min\_x (bpy.types.TransformConstraint attribute), 982  
from\_min\_y (bpy.types.TransformConstraint attribute), 982  
from\_min\_z (bpy.types.TransformConstraint attribute), 982  
from\_pydata() (bpy.types.Mesh method), 579  
from\_string() (bpy.types.Text method), 901  
front (bpy.types.MaterialSubsurfaceScattering attribute), 563  
frustum\_culling (bge.types.KX\_Camera attribute), 1221  
Function (class in bpy.types), 443  
Function.description (in module bpy.types), 444  
Function.identifier (in module bpy.types), 444  
Function.is\_registered (in module bpy.types), 444  
Function.is\_registered\_optional (in module bpy.types), 444  
Function.parameters (in module bpy.types), 444  
Function.use\_self (in module bpy.types), 444  
function\_type (bpy.types.FModifierFunctionGenerator attribute), 422  
fuzzy (bpy.types.SoftBodySettings attribute), 841

## G

g (bge.types.KX\_VertexProxy attribute), 1211  
g (mathutils.Color attribute), 1083  
gain (bpy.types.CompositorNodeChromaMatte attribute), 298  
gain (bpy.types.CompositorNodeColorBalance attribute), 300  
gain (bpy.types.MusgraveTexture attribute), 620  
gain (bpy.types.SequenceColorBalance attribute), 797  
gain\_3d\_max (bpy.types.SoundActuator attribute), 847  
gain\_3d\_min (bpy.types.SoundActuator attribute), 847  
game\_property\_clear() (in module bpy.ops.object), 97  
game\_property\_copy() (in module bpy.ops.object), 97  
game\_property\_new() (in module bpy.ops.object), 97  
game\_property\_remove() (in module bpy.ops.object), 97  
game\_start() (in module bpy.ops.view3d), 156  
GameActuator (class in bpy.types), 449  
GameBooleanProperty (class in bpy.types), 450  
GameFloatProperty (class in bpy.types), 451  
GameIntProperty (class in bpy.types), 451  
GameObjectSettings (class in bpy.types), 452

GameObjectSettings.actuators (in module bpy.types), 452  
 GameObjectSettings.controllers (in module bpy.types), 452  
 GameObjectSettings.properties (in module bpy.types), 453  
 GameObjectSettings.sensors (in module bpy.types), 453  
 GameObjectSettings.soft\_body (in module bpy.types), 454  
 GameObjectSettings.used\_states (in module bpy.types), 455  
 GameProperty (class in bpy.types), 456  
 GameSoftBodySettings (class in bpy.types), 457  
 GameStringProperty (class in bpy.types), 458  
 GameTimerProperty (class in bpy.types), 459  
 gamma (bpy.types.AreaLamp attribute), 195  
 gamma (bpy.types.CompositorNodeColorBalance attribute), 300  
 gamma (bpy.types.CompositorNodeTonemap attribute), 343  
 gamma (bpy.types.SequenceColorBalance attribute), 797  
 gather\_method (bpy.types.WorldLighting attribute), 1058  
 generate() (bpy.types.KeyingSetInfo method), 515  
 generate\_particles (bpy.types.DomainFluidSettings attribute), 382  
 generated\_height (bpy.types.Image attribute), 477  
 generated\_type (bpy.types.Image attribute), 477  
 generated\_width (bpy.types.Image attribute), 477  
 gesture() (in module bpy.ops.sketch), 131  
 get() (bge.types.CListValue method), 1171  
 get() (bge.types.KX\_GameObject method), 1184  
 get() (bge.types.KX\_Scene method), 1205  
 get() (bpy.types.bpy\_prop\_collection method), 1067  
 get() (bpy.types.bpy\_struct method), 1069  
 getAngularVelocity() (bge.types.KX\_GameObject method), 1179  
 getAppliedImpulse() (in module bge.constraints), 1266  
 getAverageFrameRate() (in module bge.logic), 1240  
 getAxisVect() (bge.types.KX\_GameObject method), 1178  
 getBlendFileList() (in module bge.logic), 1240  
 getButtonActiveList() (bge.types.SCA\_JoystickSensor method), 1216  
 getButtonStatus() (bge.types.SCA\_JoystickSensor method), 1216  
 getButtonStatus() (bge.types.SCA\_MouseSensor method), 1188  
 getCameraToWorld() (bge.types.KX\_Camera method), 1223  
 getChannel() (bge.types.BL\_ActionActuator method), 1167  
 getConeHeight() (bge.types.KX\_RadarSensor method), 1200  
 getConstraintId() (bge.types.KX\_ConstraintWrapper method), 1173  
 getConstraintId() (bge.types.KX\_VehicleWrapper method), 1208  
 getConstraintType() (bge.types.KX\_VehicleWrapper method), 1208  
 getCurrentController() (in module bge.logic), 1237  
 getCurrentScene() (in module bge.logic), 1237  
 getDistanceTo() (bge.types.KX\_GameObject method), 1181  
 getEyeSeparation() (in module bge.render), 1251  
 getFocalLength() (in module bge.render), 1251  
 getFragmentProg() (bge.types.BL\_Shader method), 1167  
 getGLSLMaterialSetting() (in module bge.render), 1251  
 getKeyStatus() (bge.types.SCA\_KeyboardSensor method), 1216  
 getLastDraw() (bge.types.SCA\_RandomSensor method), 1220  
 getLastError() (in module bge.texture), 1259  
 getLinearVelocity() (bge.types.KX\_GameObject method), 1179  
 getLogicTicRate() (in module bge.logic), 1239  
 getMaterial() (bge.types.KX\_PolyProxy method), 1194  
 getMaterialIndex() (bge.types.KX\_BlenderMaterial method), 1172  
 getMaterialIndex() (bge.types.KX\_PolyProxy method), 1194  
 getMaterialMode() (in module bge.render), 1251  
 getMaterialName() (bge.types.KX\_MeshProxy method), 1187  
 getMaterialName() (bge.types.KX\_PolyProxy method), 1194  
 getMaxLogicFrame() (in module bge.logic), 1238  
 getMaxPhysicsFrame() (in module bge.logic), 1239  
 getMesh() (bge.types.KX\_PolyProxy method), 1195  
 getNormal() (bge.types.KX\_VertexProxy method), 1212  
 getNumMaterials() (bge.types.KX\_MeshProxy method), 1187  
 getNumPolygons() (bge.types.KX\_MeshProxy method), 1188  
 getNumVertex() (bge.types.KX\_PolyProxy method), 1194  
 getNumWheels() (bge.types.KX\_VehicleWrapper method), 1208  
 getPhysicsId() (bge.types.KX\_GameObject method), 1181  
 getPhysicsTicRate() (in module bge.logic), 1239  
 getPolygon() (bge.types.KX\_MeshProxy method), 1188  
 getPropertyNames() (bge.types.KX\_GameObject method), 1181  
 getRandomFloat() (in module bge.logic), 1240  
 getReactionForce() (bge.types.KX\_GameObject method), 1180  
 getRGBA() (bge.types.KX\_VertexProxy method), 1212  
 getSceneList() (in module bge.logic), 1237

getScreenPosition() (bge.types.KX\_Camera method), 1223  
getScreenRay() (bge.types.KX\_Camera method), 1224  
getScreenVect() (bge.types.KX\_Camera method), 1223  
getSeed() (bge.types.SCA\_RandomSensor method), 1220  
getShader() (bge.types.KX\_BlenderMaterial method), 1172  
getSource() (bge.texture.ImageMix method), 1256  
getSpectrum() (in module bge.logic), 1238  
getStripElem() ( bpy.types.Sequence method), 796  
getTextureName() (bge.types.KX\_MeshProxy method), 1187  
getTextureName() (bge.types.KX\_PolyProxy method), 1194  
getUV() (bge.types.KX\_VertexProxy method), 1211  
getUV2() (bge.types.KX\_VertexProxy method), 1211  
getVectTo() (bge.types.KX\_GameObject method), 1181  
getVehicleConstraint() (in module bge.constraints), 1266  
getVelocity() (bge.types.KX\_GameObject method), 1180  
getVertex() (bge.types.KX\_MeshProxy method), 1187  
getVertexArrayLength() (bge.types.KX\_MeshProxy method), 1187  
getVertexIndex() (bge.types.KX\_PolyProxy method), 1194  
getVertexProg() (bge.types.BL\_Shader method), 1167  
getWeight() (bge.texture.ImageMix method), 1256  
getWheelOrientationQuaternion() (bge.types.KX\_VehicleWrapper method), 1208  
getWheelPosition() (bge.types.KX\_VehicleWrapper method), 1209  
getWheelRotation() (bge.types.KX\_VehicleWrapper method), 1209  
getWindowHeight() (in module bge.render), 1250  
getWindowWidth() (in module bge.render), 1250  
getWorldToCamera() (bge.types.KX\_Camera method), 1223  
getXYZ() (bge.types.KX\_VertexProxy method), 1211  
ghost (bge.types.KX\_ParentActuator attribute), 1192  
ghost\_curves\_clear() (in module bpy.ops.graph), 61  
ghost\_curves\_create() (in module bpy.ops.graph), 61  
ghost\_frame\_end (bpy.types.Armature attribute), 198  
ghost\_frame\_start (bpy.types.Armature attribute), 198  
ghost\_range\_max (bpy.types.GPencilLayer attribute), 446  
ghost\_size (bpy.types.Armature attribute), 198  
ghost\_step (bpy.types.Armature attribute), 198  
ghost\_type (bpy.types.Armature attribute), 199  
GKEY (in module bge.events), 1261  
gl\_clip\_alpha (bpy.types.UserPreferencesSystem attribute), 1024  
gl\_free() (bpy.types.Image method), 479  
gl\_load() (bpy.types.Image method), 478  
gl\_texture (bge.types.KX\_PolygonMaterial attribute), 1197  
gl\_texture\_limit ( bpy.types.UserPreferencesSystem attribute), 1024  
glare\_type ( bpy.types.CompositorNodeGlare attribute), 318  
globalDict (in module bge.logic), 1236  
gloss\_anisotropic ( bpy.types.MaterialRaytraceMirror attribute), 558  
gloss\_factor ( bpy.types.MaterialRaytraceMirror attribute), 558  
gloss\_factor ( bpy.types.MaterialRaytraceTransparency attribute), 560  
gloss\_samples ( bpy.types.MaterialRaytraceMirror attribute), 558  
gloss\_samples ( bpy.types.MaterialRaytraceTransparency attribute), 560  
gloss\_threshold ( bpy.types.MaterialRaytraceMirror attribute), 558  
gloss\_threshold ( bpy.types.MaterialRaytraceTransparency attribute), 560  
GlowSequence (class in bpy.types), 460  
glsl\_shader ( bpy.types.Filter2DActuator attribute), 435  
goal\_default ( bpy.types.ClothSettings attribute), 280  
goal\_default ( bpy.types.SoftBodySettings attribute), 841  
goal\_friction ( bpy.types.ClothSettings attribute), 280  
goal\_friction ( bpy.types.SoftBodySettings attribute), 841  
goal\_max ( bpy.types.ClothSettings attribute), 280  
goal\_max ( bpy.types.SoftBodySettings attribute), 841  
goal\_min ( bpy.types.ClothSettings attribute), 280  
goal\_min ( bpy.types.SoftBodySettings attribute), 841  
goal\_spring ( bpy.types.ClothSettings attribute), 280  
goal\_spring ( bpy.types.SoftBodySettings attribute), 841  
GPencilFrame (class in bpy.types), 445  
GPencilFrame.strokes (in module bpy.types), 445  
GPencilLayer (class in bpy.types), 446  
GPencilLayer.active\_frame (in module bpy.types), 446  
GPencilLayer.frames (in module bpy.types), 446  
GPencilStroke (class in bpy.types), 447  
GPencilStroke.points (in module bpy.types), 447  
GPencilStrokePoint (class in bpy.types), 448  
grab\_clone() (in module bpy.ops.paint), 111  
gravity ( bpy.types.ClothSettings attribute), 280  
gravity ( bpy.types.DomainFluidSettings attribute), 382  
gravity ( bpy.types.EffectorWeights attribute), 401  
gravity ( bpy.types.Scene attribute), 771  
gravity ( bpy.types.SoftBodySettings attribute), 841  
gravity\_factor ( bpy.types.ParticleSettingsTextureSlot attribute), 697  
grease\_pencil ( bpy.types.NodeTree attribute), 634  
grease\_pencil ( bpy.types.Object attribute), 640  
grease\_pencil ( bpy.types.Scene attribute), 771  
grease\_pencil ( bpy.types.SpaceImageEditor attribute), 856

grease\_pencil\_eraser\_radius  
 (bpy.types.UserPreferencesEdit attribute), 1016

grease\_pencil\_euclidean\_distance  
 (bpy.types.UserPreferencesEdit attribute), 1016

grease\_pencil\_manhattan\_distance  
 (bpy.types.UserPreferencesEdit attribute), 1016

GreasePencil (class in bpy.types), 462

GreasePencil.layers (in module bpy.types), 462

GreasePencilLayers (class in bpy.types), 463

grid (bpy.types.ThemeAudioWindow attribute), 934

grid (bpy.types.ThemeDopeSheet attribute), 938

grid (bpy.types.ThemeGraphEditor attribute), 944

grid (bpy.types.ThemeNLAEditor attribute), 951

grid (bpy.types.ThemeSequenceEditor attribute), 957

grid (bpy.types.ThemeTimeline attribute), 962

grid (bpy.types.ThemeView3D attribute), 967

grid\_levels (bpy.types.DomainFluidSettings attribute), 382

grid\_lines (bpy.types.SpaceView3D attribute), 872

grid\_random (bpy.types.ParticleSettings attribute), 689

grid\_resolution (bpy.types.ParticleSettings attribute), 689

grid\_scale (bpy.types.SpaceView3D attribute), 872

grid\_subdivisions (bpy.types.SpaceView3D attribute), 872

group (bpy.types.ClothCollisionSettings attribute), 277

group (bpy.types.EffectorWeights attribute), 401

group (bpy.types.FCurve attribute), 412

group (bpy.types.KeyingSetPath attribute), 516

Group (class in bpy.types), 463

Group.objects (in module bpy.types), 464

Group.users\_dupli\_group (in module bpy.types), 464

group\_add() (in module bpy.ops.object), 97

group\_add() (in module bpy.ops.pose), 116

group\_assign() (in module bpy.ops.pose), 116

group\_deselect() (in module bpy.ops.pose), 116

group\_edit() (in module bpy.ops.node), 90

group\_instance\_add() (in module bpy.ops.object), 97

group\_link() (in module bpy.ops.object), 97

group\_make() (in module bpy.ops.node), 90

group\_method (bpy.types.KeyingSetPath attribute), 516

group\_node (bpy.types.ThemeNodeEditor attribute), 952

group\_operation() (in module bpy.ops.outliner), 110

group\_remove() (in module bpy.ops.object), 97

group\_remove() (in module bpy.ops.pose), 116

group\_select() (in module bpy.ops.pose), 116

group\_socket\_add() (in module bpy.ops.node), 90

group\_socket\_move\_down() (in module bpy.ops.node), 91

group\_socket\_move\_up() (in module bpy.ops.node), 91

group\_socket\_remove() (in module bpy.ops.node), 91

group\_unassign() (in module bpy.ops.pose), 116

group\_ungroup() (in module bpy.ops.node), 91

GroupInputs (class in bpy.types), 465

GroupObjects (class in bpy.types), 466

GroupOutputs (class in bpy.types), 467

guide\_clump\_amount (bpy.types.FieldSettings attribute), 429

guide\_clump\_shape (bpy.types.FieldSettings attribute), 429

guide\_free (bpy.types.FieldSettings attribute), 429

guide\_kink\_amplitude (bpy.types.FieldSettings attribute), 430

guide\_kink\_axis (bpy.types.FieldSettings attribute), 430

guide\_kink\_frequency (bpy.types.FieldSettings attribute), 430

guide\_kink\_shape (bpy.types.FieldSettings attribute), 430

guide\_kink\_type (bpy.types.FieldSettings attribute), 430

guide\_minimum (bpy.types.FieldSettings attribute), 430

## H

h (mathutils.Color attribute), 1084

hair\_length (bpy.types.ParticleSettings attribute), 689

hair\_step (bpy.types.ParticleSettings attribute), 689

half\_life\_time (bpy.types.RandomActuator attribute), 740

halo\_intensity (bpy.types.SpotLamp attribute), 884

halo\_step (bpy.types.SpotLamp attribute), 884

Handle (class in aud), 1155

handle\_align (bpy.types.ThemeGraphEditor attribute), 944

handle\_align (bpy.types.ThemeView3D attribute), 967

handle\_auto (bpy.types.ThemeGraphEditor attribute), 944

handle\_auto (bpy.types.ThemeView3D attribute), 967

handle\_free (bpy.types.ThemeGraphEditor attribute), 944

handle\_free (bpy.types.ThemeView3D attribute), 967

handle\_left (bpy.types.BezierSplinePoint attribute), 210

handle\_left (bpy.types.Keyframe attribute), 512

handle\_left (bpy.types.ShapeKeyBezierPoint attribute), 827

handle\_left\_type (bpy.types.BezierSplinePoint attribute), 210

handle\_left\_type (bpy.types.Keyframe attribute), 512

handle\_right (bpy.types.BezierSplinePoint attribute), 210

handle\_right (bpy.types.Keyframe attribute), 512

handle\_right (bpy.types.ShapeKeyBezierPoint attribute), 827

handle\_right\_type (bpy.types.BezierSplinePoint attribute), 211

handle\_right\_type (bpy.types.Keyframe attribute), 512

handle\_sel\_align (bpy.types.ThemeGraphEditor attribute), 944

handle\_sel\_align (bpy.types.ThemeView3D attribute), 968

handle\_sel\_auto (bpy.types.ThemeGraphEditor attribute), 944

handle\_sel\_auto (bpy.types.ThemeView3D attribute), 968  
handle\_sel\_free (bpy.types.ThemeGraphEditor attribute), 944  
handle\_sel\_free (bpy.types.ThemeView3D attribute), 968  
handle\_sel\_vect (bpy.types.ThemeGraphEditor attribute), 944  
handle\_sel\_vect (bpy.types.ThemeView3D attribute), 968  
handle\_type() (in module bpy.ops.action), 33  
handle\_type() (in module bpy.ops.graph), 61  
handle\_type\_set() (in module bpy.ops.curve), 46  
handle\_vect (bpy.types.ThemeGraphEditor attribute), 944  
handle\_vect (bpy.types.ThemeView3D attribute), 968  
handle\_vertex (bpy.types.ThemeGraphEditor attribute), 944  
handle\_vertex\_select (bpy.types.ThemeGraphEditor attribute), 944  
handle\_vertex\_size (bpy.types.ThemeGraphEditor attribute), 944  
handlers (in module bpy.app), 1075  
handles\_view\_toggle() (in module bpy.ops.graph), 61  
hardness (bpy.types.MaterialHalo attribute), 555  
hardness\_factor (bpy.types.MaterialTextureSlot attribute), 565  
harmonic (bpy.types.EffectorWeights attribute), 401  
harmonic\_damping (bpy.types.FieldSettings attribute), 430  
has\_ghost\_curves (bpy.types.SpaceGraphEditor attribute), 854  
has\_ik (bge.types.BL\_ArmatureChannel attribute), 1230  
hat (bge.types.SCA\_JoystickSensor attribute), 1215  
hat\_direction (bpy.types.JoystickSensor attribute), 493  
hat\_number (bpy.types.JoystickSensor attribute), 493  
hatSingle (bge.types.SCA\_JoystickSensor attribute), 1215  
hatValues (bge.types.SCA\_JoystickSensor attribute), 1214  
head (bge.types.BL\_ArmatureBone attribute), 1234  
head (bpy.types.Bone attribute), 252  
head (bpy.types.EditBone attribute), 392  
head\_local (bpy.types.Bone attribute), 252  
head\_radius (bpy.types.Bone attribute), 252  
head\_radius (bpy.types.EditBone attribute), 392  
head\_tail (bpy.types.CopyLocationConstraint attribute), 362  
head\_tail (bpy.types.CopyTransformsConstraint attribute), 366  
head\_tail (bpy.types.PivotConstraint attribute), 708  
head\_tail (bpy.types.StretchToConstraint attribute), 888  
head\_tail (bpy.types.TrackToConstraint attribute), 980  
header (bpy.types.ThemeAudioWindow attribute), 934  
header (bpy.types.ThemeConsole attribute), 937  
header (bpy.types.ThemeDopeSheet attribute), 938  
header (bpy.types.ThemeFileBrowser attribute), 940  
header (bpy.types.ThemeGraphEditor attribute), 944  
header (bpy.types.ThemeImageEditor attribute), 946  
header (bpy.types.ThemeInfo attribute), 948  
header (bpy.types.ThemeLogicEditor attribute), 949  
header (bpy.types.ThemeNLAEditor attribute), 951  
header (bpy.types.ThemeNodeEditor attribute), 953  
header (bpy.types.ThemeOutliner attribute), 954  
header (bpy.types.ThemeProperties attribute), 956  
header (bpy.types.ThemeSequenceEditor attribute), 957  
header (bpy.types.ThemeTextEditor attribute), 960  
header (bpy.types.ThemeTimeline attribute), 962  
header (bpy.types.ThemeUserPreferences attribute), 965  
header (bpy.types.ThemeView3D attribute), 968  
Header (class in bpy.types), 468  
Header.layout (in module bpy.types), 468  
header\_flip() (in module bpy.ops.screen), 121  
header\_text (bpy.types.ThemeAudioWindow attribute), 934  
header\_text (bpy.types.ThemeConsole attribute), 937  
header\_text (bpy.types.ThemeDopeSheet attribute), 939  
header\_text (bpy.types.ThemeFileBrowser attribute), 940  
header\_text (bpy.types.ThemeGraphEditor attribute), 944  
header\_text (bpy.types.ThemeImageEditor attribute), 946  
header\_text (bpy.types.ThemeInfo attribute), 948  
header\_text (bpy.types.ThemeLogicEditor attribute), 949  
header\_text (bpy.types.ThemeNLAEditor attribute), 951  
header\_text (bpy.types.ThemeNodeEditor attribute), 953  
header\_text (bpy.types.ThemeOutliner attribute), 955  
header\_text (bpy.types.ThemeProperties attribute), 956  
header\_text (bpy.types.ThemeSequenceEditor attribute), 958  
header\_text (bpy.types.ThemeTextEditor attribute), 960  
header\_text (bpy.types.ThemeTimeline attribute), 962  
header\_text (bpy.types.ThemeUserPreferences attribute), 965  
header\_text (bpy.types.ThemeView3D attribute), 968  
header\_text\_hi (bpy.types.ThemeAudioWindow attribute), 934  
header\_text\_hi (bpy.types.ThemeConsole attribute), 937  
header\_text\_hi (bpy.types.ThemeDopeSheet attribute), 939  
header\_text\_hi (bpy.types.ThemeFileBrowser attribute), 940  
header\_text\_hi (bpy.types.ThemeGraphEditor attribute), 944  
header\_text\_hi (bpy.types.ThemeImageEditor attribute), 947  
header\_text\_hi (bpy.types.ThemeInfo attribute), 948  
header\_text\_hi (bpy.types.ThemeLogicEditor attribute), 949  
header\_text\_hi (bpy.types.ThemeNLAEditor attribute), 951  
header\_text\_hi (bpy.types.ThemeNodeEditor attribute), 953  
header\_text\_hi (bpy.types.ThemeOutliner attribute), 955

header\_text\_hi (bpy.types.ThemeProperties attribute), 956  
 header\_text\_hi (bpy.types.ThemeSequenceEditor attribute), 958  
 header\_text\_hi (bpy.types.ThemeTextEditor attribute), 960  
 header\_text\_hi (bpy.types.ThemeTimeline attribute), 962  
 header\_text\_hi (bpy.types.ThemeUserPreferences attribute), 965  
 header\_text\_hi (bpy.types.ThemeView3D attribute), 968  
 header\_text\_set() (bpy.types.Area method), 194  
 header\_toolbox() (in module bpy.ops.screen), 121  
 headtail (bge.types.BL\_ArmatureConstraint attribute), 1228  
 health (bpy.types.BoidSettings attribute), 249  
 height (bge.types.KX\_CameraActuator attribute), 1172  
 height (bpy.types.BoidSettings attribute), 249  
 height (bpy.types.Brush attribute), 260  
 height (bpy.types.CameraActuator attribute), 270  
 height (bpy.types.TextBox attribute), 902  
 height (bpy.types.WaveModifier attribute), 1046  
 height (bpy.types.WorldMistSettings attribute), 1060  
 HemiLamp (class in bpy.types), 469  
 hexagonal\_grid (bpy.types.ParticleSettings attribute), 689  
 hide (bpy.types.BezierSplinePoint attribute), 211  
 hide (bpy.types.Bone attribute), 253  
 hide (bpy.types.EditBone attribute), 392  
 hide (bpy.types.FCurve attribute), 412  
 hide (bpy.types.GPencilLayer attribute), 446  
 hide (bpy.types.MeshEdge attribute), 583  
 hide (bpy.types.MeshFace attribute), 585  
 hide (bpy.types.MeshTextureFace attribute), 593  
 hide (bpy.types.MeshVertex attribute), 596  
 hide (bpy.types.MetaElement attribute), 603  
 hide (bpy.types.Object attribute), 640  
 hide (bpy.types.Spline attribute), 877  
 hide (bpy.types.SplinePoint attribute), 882  
 hide() (in module bpy.ops.armature), 40  
 hide() (in module bpy.ops.curve), 46  
 hide() (in module bpy.ops.mesh), 78  
 hide() (in module bpy.ops.particle), 113  
 hide() (in module bpy.ops.pose), 116  
 hide() (in module bpy.ops.uv), 150  
 hide\_metaelems() (in module bpy.ops.mball), 74  
 hide\_recent\_locations (bpy.types.UserPreferencesFilePaths attribute), 1019  
 hide\_render (bpy.types.Object attribute), 640  
 hide\_render\_clear() (in module bpy.ops.object), 97  
 hide\_render\_clear\_all() (in module bpy.ops.object), 97  
 hide\_render\_set() (in module bpy.ops.object), 97  
 hide\_select (bpy.types.Bone attribute), 253  
 hide\_select (bpy.types.EditBone attribute), 393  
 hide\_select (bpy.types.Object attribute), 640  
 hide\_socket\_toggle() (in module bpy.ops.node), 91  
 hide\_toggle() (in module bpy.ops.node), 91  
 hide\_view\_clear() (in module bpy.ops.object), 98  
 hide\_view\_set() (in module bpy.ops.object), 98  
 hidedot() (in module bpy.ops.file), 55  
 highlight() (in module bpy.ops.file), 55  
 hinge (bge.types.BL\_ArmatureBone attribute), 1234  
 Histogram (class in bpy.types), 470  
 history\_append() (in module bpy.ops.console), 44  
 history\_cycle() (in module bpy.ops.console), 44  
 hitNormal (bge.types.KX\_MouseFocusSensor attribute), 1189  
 hitNormal (bge.types.KX\_RaySensor attribute), 1201  
 hitObject (bge.types.KX\_MouseFocusSensor attribute), 1189  
 hitObject (bge.types.KX\_RaySensor attribute), 1201  
 hitObject (bge.types.KX\_TouchSensor attribute), 1189  
 hitObjectList (bge.types.KX\_TouchSensor attribute), 1190  
 hitPosition (bge.types.KX\_MouseFocusSensor attribute), 1189  
 hitPosition (bge.types.KX\_RaySensor attribute), 1201  
 hitUV (bge.types.KX\_MouseFocusSensor attribute), 1189  
 HKEY (in module bge.events), 1261  
 hold1 (bge.types.SCA\_KeyboardSensor attribute), 1216  
 hold2 (bge.types.SCA\_KeyboardSensor attribute), 1216  
 HOMEKEY (in module bge.events), 1264  
 hook\_add\_newob() (in module bpy.ops.object), 98  
 hook\_add\_selob() (in module bpy.ops.object), 98  
 hook\_assign() (in module bpy.ops.object), 98  
 hook\_recenter() (in module bpy.ops.object), 98  
 hook\_remove() (in module bpy.ops.object), 98  
 hook\_reset() (in module bpy.ops.object), 98  
 hook\_select() (in module bpy.ops.object), 98  
 HookModifier (class in bpy.types), 471  
 horizon\_brightness (bpy.types.LampSkySettings attribute), 525  
 horizon\_color (bpy.types.World attribute), 1056  
 horizon\_factor (bpy.types.WorldTextureSlot attribute), 1062  
 hsv (mathutils.Color attribute), 1084

|

icon\_file (bpy.types.ThemeUserInterface attribute), 963  
 icon\_filepath (bpy.types.Brush attribute), 260  
 id (bpy.types.DriverTarget attribute), 388  
 id (bpy.types.KeyingSetPath attribute), 516  
 ID (class in bpy.types), 472  
 ID.library (in module bpy.types), 472  
 ID.users (in module bpy.types), 472  
 id\_data (bpy.types.bpy\_struct attribute), 1072  
 id\_operation() (in module bpy.ops.outliner), 110  
 id\_root (bpy.types.Action attribute), 170  
 id\_type (bpy.types.DriverTarget attribute), 388

id\_type (bpy.types.KeyingSetPath attribute), 516  
identity() (mathutils.Matrix method), 1087  
IDMaterials (class in bpy.types), 474  
idname (bpy.types.KeyMapItem attribute), 500  
ik\_add() (in module bpy.ops.pose), 116  
ik\_clear() (in module bpy.ops.pose), 116  
ik\_dist (bge.types.BL\_ArmatureConstraint attribute), 1229  
ik\_dof\_x (bge.types.BL\_ArmatureChannel attribute), 1230  
ik\_dof\_y (bge.types.BL\_ArmatureChannel attribute), 1230  
ik\_dof\_z (bge.types.BL\_ArmatureChannel attribute), 1230  
ik\_flag (bge.types.BL\_ArmatureConstraint attribute), 1229  
ik\_limit\_x (bge.types.BL\_ArmatureChannel attribute), 1230  
ik\_limit\_y (bge.types.BL\_ArmatureChannel attribute), 1230  
ik\_limit\_z (bge.types.BL\_ArmatureChannel attribute), 1230  
ik\_lin\_control (bge.types.BL\_ArmatureChannel attribute), 1230  
ik\_lin\_weight (bge.types.BL\_ArmatureChannel attribute), 1233  
ik\_linear\_weight (bpy.types.PoseBone attribute), 723  
ik\_max\_x (bge.types.BL\_ArmatureChannel attribute), 1232  
ik\_max\_x (bpy.types.PoseBone attribute), 723  
ik\_max\_y (bge.types.BL\_ArmatureChannel attribute), 1232  
ik\_max\_z (bge.types.BL\_ArmatureChannel attribute), 1232  
ik\_max\_z (bpy.types.PoseBone attribute), 723  
ik\_min\_x (bge.types.BL\_ArmatureChannel attribute), 1232  
ik\_min\_x (bpy.types.PoseBone attribute), 723  
ik\_min\_y (bge.types.BL\_ArmatureChannel attribute), 1232  
ik\_min\_y (bpy.types.PoseBone attribute), 723  
ik\_min\_z (bge.types.BL\_ArmatureChannel attribute), 1232  
ik\_min\_z (bpy.types.PoseBone attribute), 723  
ik\_mode (bge.types.BL\_ArmatureConstraint attribute), 1229  
ik\_rot\_control (bge.types.BL\_ArmatureChannel attribute), 1230  
ik\_rot\_weight (bge.types.BL\_ArmatureChannel attribute), 1233  
ik\_rotation\_weight (bpy.types.PoseBone attribute), 723  
ik\_solver (bpy.types.Pose attribute), 721  
ik\_stiffness\_x (bge.types.BL\_ArmatureChannel attribute), 1232  
ik\_stiffness\_x (bpy.types.PoseBone attribute), 723  
ik\_stiffness\_y (bge.types.BL\_ArmatureChannel attribute), 1232  
ik\_stiffness\_y (bpy.types.PoseBone attribute), 723  
ik\_stiffness\_z (bge.types.BL\_ArmatureChannel attribute), 1232  
ik\_stiffness\_z (bpy.types.PoseBone attribute), 723  
ik\_stretch (bge.types.BL\_ArmatureChannel attribute), 1232  
ik\_stretch (bpy.types.PoseBone attribute), 723  
ik\_type (bge.types.BL\_ArmatureConstraint attribute), 1229  
ik\_type (bpy.types.KinematicConstraint attribute), 520  
ik\_weight (bge.types.BL\_ArmatureConstraint attribute), 1229  
IKEY (in module bge.events), 1261  
IKParam (class in bpy.types), 475  
IKParam.ik\_solver (in module bpy.types), 475  
image (bge.texture.ImageBuff attribute), 1255  
image (bge.texture.ImageFFmpeg attribute), 1255  
image (bge.texture.ImageMirror attribute), 1256  
image (bge.texture.ImageMix attribute), 1256  
image (bge.texture.ImageRender attribute), 1257  
image (bge.texture.ImageViewport attribute), 1257  
image (bge.texture.VideoFFmpeg attribute), 1254  
image (bpy.types.BackgroundImage attribute), 208  
image (bpy.types.CompositorNodeImage attribute), 322  
image (bpy.types.EnvironmentMapTexture attribute), 406  
image (bpy.types.ImageTexture attribute), 485  
image (bpy.types.MeshTextureFace attribute), 593  
image (bpy.types.SpaceImageEditor attribute), 856  
image (bpy.types.TextureNodeImage attribute), 919  
image (bpy.types.UVProjectModifier attribute), 1010  
image (bpy.types.VoxelDataTexture attribute), 1043  
Image (class in bpy.types), 476  
Image.bindcode (in module bpy.types), 476  
Image.depth (in module bpy.types), 476  
Image.has\_data (in module bpy.types), 477  
Image.is\_dirty (in module bpy.types), 477  
Image.packed\_file (in module bpy.types), 477  
Image.size (in module bpy.types), 477  
Image.type (in module bpy.types), 478  
image\_editor (bpy.types.UserPreferencesFilePaths attribute), 1019  
image\_from\_view() (in module bpy.ops.paint), 111  
image\_paint() (in module bpy.ops.paint), 111  
image\_paint\_object (in module bpy.context), 28  
image\_strip (bpy.types.ThemeSequenceEditor attribute), 958  
image\_strip\_add() (in module bpy.ops.sequencer), 126  
image\_tool (bpy.types.Brush attribute), 260  
image\_tool\_set() (in module bpy.ops.brush), 42

image\_type (bpy.types.CompositorNodeOutputFile attribute), 331  
**ImageBuff** (class in bge.texture), 1255  
**ImageFFmpeg** (class in bge.texture), 1255  
**ImageMirror** (class in bge.texture), 1255  
**ImageMix** (class in bge.texture), 1256  
**ImagePaint** (class in bpy.types), 480  
**ImageRender** (class in bge.texture), 1257  
**images\_separate()** (in module bpy.ops.sequencer), 127  
**ImageSequence** (class in bpy.types), 481  
**ImageSequence.color\_balance** (in module bpy.types), 481  
**ImageSequence.crop** (in module bpy.types), 482  
**ImageSequence.elements** (in module bpy.types), 482  
**ImageSequence.proxy** (in module bpy.types), 482  
**ImageSequence.transform** (in module bpy.types), 482  
**ImageTexture** (class in bpy.types), 484  
**ImageTexture.image\_user** (in module bpy.types), 485  
**ImageTexture.users\_material** (in module bpy.types), 486  
**ImageTexture.users\_object\_modifier** (in module bpy.types), 486  
**imageToArray()** (in module bge.texture), 1259  
**ImageUser** (class in bpy.types), 487  
**ImageUser.multilayer\_layer** (in module bpy.types), 487  
**ImageUser.multilayer\_pass** (in module bpy.types), 488  
**ImageViewport** (class in bge.texture), 1257  
**impact\_factor** (bpy.types.ObstacleFluidSettings attribute), 654  
**ImportHelper** (class in bpy\_extras.io\_utils), 1159  
**in\_out\_node** (bpy.types.ThemeNodeEditor attribute), 953  
**indent()** (in module bpy.ops.text), 135  
**index** (bge.types.SCA\_JoystickSensor attribute), 1215  
**index** (bpy.types.CompositorNodeIDMask attribute), 321  
**index** (bpy.types.PointCache attribute), 712  
**index()** (bge.types.CListValue method), 1171  
**indirect\_bounces** (bpy.types.WorldLighting attribute), 1058  
**indirect\_factor** (bpy.types.WorldLighting attribute), 1059  
**inflow** (bpy.types.FieldSettings attribute), 430  
**inflow\_velocity** (bpy.types.InflowFluidSettings attribute), 489  
**InflowFluidSettings** (class in bpy.types), 488  
**influence** (bpy.types.Constraint attribute), 352  
**influence** (bpy.types.NlaStrip attribute), 624  
**info** (bpy.types.GPencilLayer attribute), 446  
**inherit\_scale** (bge.types.BL\_ArmatureBone attribute), 1234  
**initial\_velocity** (bpy.types.FluidFluidSettings attribute), 439  
**initial\_velocity** (bpy.types.SmokeFlowSettings attribute), 836  
**inner** (bpy.types.ThemeWidgetColors attribute), 970  
**inner\_anim** (bpy.types.ThemeWidgetStateColors attribute), 971  
**inner\_anim\_sel** (bpy.types.ThemeWidgetStateColors attribute), 971  
**inner\_driven** (bpy.types.ThemeWidgetStateColors attribute), 972  
**inner\_driven\_sel** (bpy.types.ThemeWidgetStateColors attribute), 972  
**inner\_key** (bpy.types.ThemeWidgetStateColors attribute), 972  
**inner\_key\_sel** (bpy.types.ThemeWidgetStateColors attribute), 972  
**inner\_sel** (bpy.types.ThemeWidgetColors attribute), 970  
**insert()** (bpy.types.FCurveKeyframePoints method), 415  
**insert()** (in module bpy.ops.console), 44  
**insert()** (in module bpy.ops.text), 135  
**insert\_lorem()** (in module bpy.ops.font), 57  
**INSERTKEY** (in module bge.events), 1264  
**instantAddObject()** (bge.types.KX\_SCA\_AddObjectActuator method), 1202  
**instantReplaceMesh()** (bge.types.KX\_SCA\_ReplaceMeshActuator method), 1203  
**int** (bpy.types.PropertyGroupItem attribute), 733  
**int\_array** (bpy.types.PropertyGroupItem attribute), 733  
**int\_max** (bpy.types.RandomActuator attribute), 740  
**int\_mean** (bpy.types.RandomActuator attribute), 740  
**int\_min** (bpy.types.RandomActuator attribute), 740  
**int\_value** (bpy.types.RandomActuator attribute), 740  
**integral\_coefficient** (bpy.types.ObjectActuator attribute), 649  
**integrator** (bpy.types.ParticleSettings attribute), 689  
**intensity** (bpy.types.CompositorNodeTonemap attribute), 343  
**intensity** (bpy.types.Texture attribute), 909  
**intensity** (bpy.types.VoxelData attribute), 1042  
**intensity** (bpy.types.WorldMistSettings attribute), 1060  
**interaction\_preset\_add()** (in module bpy.ops.wm), 163  
**internal\_friction** (bpy.types.ClothSettings attribute), 280  
**interpolate\_bezier()** (in module mathutils.geometry), 1113  
**interpolation** (bpy.types.ColorRamp attribute), 288  
**interpolation** (bpy.types.Keyframe attribute), 512  
**interpolation** (bpy.types.ShapeKey attribute), 825  
**interpolation** (bpy.types.TransformSequence attribute), 985  
**interpolation** (bpy.types.VoxelData attribute), 1042  
**interpolation\_type()** (in module bpy.ops.action), 33  
**interpolation\_type()** (in module bpy.ops.graph), 61  
**interpolation\_type\_u** (bpy.types.Lattice attribute), 529  
**interpolation\_type\_v** (bpy.types.Lattice attribute), 529  
**interpolation\_type\_w** (bpy.types.Lattice attribute), 529  
**intersect\_line\_line()** (in module mathutils.geometry), 1113  
**intersect\_line\_line\_2d()** (in module mathutils.geometry), 1113

intersect\_line\_plane() (in module mathutils.geometry), 1114  
intersect\_line\_sphere() (in module mathutils.geometry), 1114  
intersect\_line\_sphere\_2d() (in module mathutils.geometry), 1114  
intersect\_point\_line() (in module mathutils.geometry), 1114  
intersect\_point\_quad\_2d() (in module mathutils.geometry), 1115  
intersect\_point\_tri\_2d() (in module mathutils.geometry), 1115  
intersect\_ray\_tri() (in module mathutils.geometry), 1115  
IntProperty (class in bpy.types), 489  
IntProperty() (in module bpy.props), 1080  
IntProperty.array\_length (in module bpy.types), 490  
IntProperty.default (in module bpy.types), 490  
IntProperty.default\_array (in module bpy.types), 490  
IntProperty.hard\_max (in module bpy.types), 490  
IntProperty.hard\_min (in module bpy.types), 490  
IntProperty.soft\_max (in module bpy.types), 490  
IntProperty.soft\_min (in module bpy.types), 490  
IntProperty.step (in module bpy.types), 490  
introspect() (bpy.typesUILayout method), 1008  
IntVectorProperty() (in module bpy.props), 1080  
invalid (bge.types.PyObjectPlus attribute), 1163  
inverse\_matrix (bpy.types.ChildOfConstraint attribute), 273  
invert (bge.types.SCA\_ISensor attribute), 1164  
invert (bpy.types.Sensor attribute), 793  
invert (bpy.types.TextureSlot attribute), 931  
invert() (in module bpy.ops.image), 64  
invert() (mathutils.Matrix method), 1087  
invert\_alpha (bpy.types.CompositorNodeInvert attribute), 323  
invert\_alpha (bpy.types.ImageTexture attribute), 485  
invert\_gain (bpy.types.SequenceColorBalance attribute), 797  
invert\_gamma (bpy.types.SequenceColorBalance attribute), 797  
invert\_grid (bpy.types.ParticleSettings attribute), 689  
invert\_lift (bpy.types.SequenceColorBalance attribute), 797  
invert\_mouse\_zoom (bpy.types.UserPreferencesInput attribute), 1021  
invert\_normal (bpy.types.ShaderNodeExtendedMaterial attribute), 806  
invert\_normal (bpy.types.ShaderNodeMaterial attribute), 810  
invert\_rgb (bpy.types.CompositorNodeInvert attribute), 323  
invert\_stencil (bpy.types.ImagePaint attribute), 480  
invert\_vertex\_group (bpy.types.ArmatureModifier attribute), 203  
invert\_vertex\_group (bpy.types.MaskModifier attribute), 546  
invert\_vertex\_group (bpy.types.MeshDeformModifier attribute), 582  
invert\_vertex\_group (bpy.types.SolidifyModifier attribute), 844  
invert\_vertex\_group\_clump (bpy.types.ParticleSystem attribute), 701  
invert\_vertex\_group\_density (bpy.types.ParticleSystem attribute), 701  
invert\_vertex\_group\_field (bpy.types.ParticleSystem attribute), 701  
invert\_vertex\_group\_kink (bpy.types.ParticleSystem attribute), 702  
invert\_vertex\_group\_length (bpy.types.ParticleSystem attribute), 702  
invert\_vertex\_group\_rotation (bpy.types.ParticleSystem attribute), 702  
invert\_vertex\_group\_roughness\_1 (bpy.types.ParticleSystem attribute), 702  
invert\_vertex\_group\_roughness\_2 (bpy.types.ParticleSystem attribute), 702  
invert\_vertex\_group\_roughness\_end (bpy.types.ParticleSystem attribute), 702  
invert\_vertex\_group\_size (bpy.types.ParticleSystem attribute), 702  
invert\_vertex\_group\_tangent (bpy.types.ParticleSystem attribute), 702  
invert\_vertex\_group\_velocity (bpy.types.ParticleSystem attribute), 702  
invert\_x (bpy.types.CopyLocationConstraint attribute), 362  
invert\_x (bpy.types.CopyRotationConstraint attribute), 363  
invert\_y (bpy.types.CopyLocationConstraint attribute), 362  
invert\_y (bpy.types.CopyRotationConstraint attribute), 363  
invert\_z (bpy.types.CopyLocationConstraint attribute), 362  
invert\_z (bpy.types.CopyRotationConstraint attribute), 363  
invert\_z (bpy.types.Material attribute), 548  
invert\_zmask (bpy.types.SceneRenderLayer attribute), 781  
invert\_zoom\_wheel (bpy.types.UserPreferencesInput attribute), 1021  
inverted() (mathutils.Matrix method), 1087  
invoke() (bpy.types.Operator method), 661  
invoke\_confirm() (bpy.types.WindowManager class method), 1051  
invoke\_popup() (bpy.types.WindowManager class method), 1051

**invoke\_props\_dialog()** (bpy.types.WindowManager class method), [1051](#)  
**invoke\_props\_popup()** (bpy.types.WindowManager class method), [1050](#)  
**invoke\_search\_popup()** (bpy.types.WindowManager class method), [1051](#)  
**ior** (bpy.types.MaterialRaytraceTransparency attribute), [560](#)  
**ior** (bpy.types.MaterialSubsurfaceScattering attribute), [563](#)  
**is\_edited** (bpy.types.GPencilFrame attribute), [445](#)  
**is\_fgon** (bpy.types.MeshEdge attribute), [583](#)  
**is\_loose** (bpy.types.MeshEdge attribute), [583](#)  
**is\_modified** (bpy.types.MotionPath attribute), [610](#)  
**is\_modified()** (bpy.types.Object method), [645](#)  
**is\_negative** (mathutils.Matrix attribute), [1089](#)  
**is\_orthogonal** (mathutils.Matrix attribute), [1089](#)  
**is\_perspective** (bpy.types.RegionView3D attribute), [744](#)  
**is\_property\_hidden()** (bpy.types.bpy\_struct method), [1069](#)  
**is\_property\_set()** (bpy.types.bpy\_struct method), [1069](#)  
**is\_proxy\_local** (bpy.types.Constraint attribute), [352](#)  
**is\_start** (bpy.types.OperatorStrokeElement attribute), [664](#)  
**is\_subdir()** (in module bpy.path), [1074](#)  
**is\_user\_modified** (bpy.types.KeyMap attribute), [498](#)  
**is\_valid** (bpy.types.Driver attribute), [387](#)  
**is\_valid** (bpy.types.FCurve attribute), [412](#)  
**is\_valid** (bpy.types.ParticleTarget attribute), [707](#)  
**is\_visible()** (bpy.types.Object method), [645](#)  
**is\_wrapped** (mathutils.Color attribute), [1084](#)  
**is\_wrapped** (mathutils.Euler attribute), [1085](#)  
**is\_wrapped** (mathutils.Matrix attribute), [1089](#)  
**is\_wrapped** (mathutils.Quaternion attribute), [1091](#)  
**is\_wrapped** (mathutils.Vector attribute), [1096](#)  
**isCollider()** (bge.types.KX\_PolyProxy method), [1194](#)  
**isolate\_type\_render()** (in module bpy.ops.object), [98](#)  
**isValid()** (bge.types.BL\_Shader method), [1167](#)  
**isVisible()** (bge.types.KX\_PolyProxy method), [1194](#)  
**Itasc** (class in bpy.types), [491](#)  
**item** (bpy.types.ThemeWidgetColors attribute), [970](#)  
**item\_activate()** (in module bpy.ops.outliner), [110](#)  
**item\_openclose()** (in module bpy.ops.outliner), [110](#)  
**item\_rename()** (in module bpy.ops.outliner), [110](#)  
**items()** (bpy.types.bpy\_prop\_collection method), [1067](#)  
**items()** (bpy.types.bpy\_struct method), [1069](#)  
**iterations** (bpy.types.CompositorNodeBilateralblur attribute), [294](#)  
**iterations** (bpy.types.CompositorNodeDBlur attribute), [310](#)  
**iterations** (bpy.types.CompositorNodeGlare attribute), [318](#)  
**iterations** (bpy.types.Itasc attribute), [491](#)  
**iterations** (bpy.types.KinematicConstraint attribute), [520](#)  
**iterations** (bpy.types.ScrewModifier attribute), [790](#)  
**iterations** (bpy.types.SmoothModifier attribute), [838](#)  
**iterator()** (bpy.types.KeyingSetInfo method), [515](#)

## J

**jitter** (bpy.types.Brush attribute), [260](#)  
**jitter\_factor** (bpy.types.ParticleSettings attribute), [689](#)  
**JKEY** (in module bge.events), [1261](#)  
**join()** (in module bpy.ops.object), [98](#)  
**join\_shapes()** (in module bpy.ops.object), [98](#)  
**join\_uvs()** (in module bpy.ops.object), [98](#)  
**joint\_bindings** (bpy.types.SplineIKConstraint attribute), [881](#)  
**joint\_rotation** (bge.types.BL\_ArmatureChannel attribute), [1233](#)

**joystick\_index** (bpy.types.JoystickSensor attribute), [493](#)  
**JoystickSensor** (class in bpy.types), [493](#)  
**jump()** (in module bpy.ops.text), [135](#)

## K

**keep** (aud.Handle attribute), [1156](#)  
**keep\_axis** (bpy.types.StretchToConstraint attribute), [888](#)  
**KERNING\_DEFAULT** (in module blf), [1146](#)  
**key** (bge.types.SCA\_KeyboardSensor attribute), [1216](#)  
**key** (bpy.types.CompositorNodeTonemap attribute), [343](#)  
**key** (bpy.types.KeyboardSensor attribute), [509](#)  
**Key** (class in bpy.types), [494](#)  
**Key.animation\_data** (in module bpy.types), [494](#)  
**Key.key\_blocks** (in module bpy.types), [494](#)  
**Key.reference\_key** (in module bpy.types), [494](#)  
**Key.user** (in module bpy.types), [495](#)  
**key\_modifier** (bpy.types.KeyMapItem attribute), [500](#)  
**keyboard** (in module bge.logic), [1236](#)  
**KeyboardSensor** (class in bpy.types), [509](#)  
**KeyConfig** (class in bpy.types), [496](#)  
**KeyConfig.is\_user\_defined** (in module bpy.types), [496](#)  
**KeyConfig.keymaps** (in module bpy.types), [496](#)  
**keyconfig\_activate()** (in module bpy.ops.wm), [163](#)  
**keyconfig\_export()** (in module bpy.ops.wm), [163](#)  
**keyconfig\_import()** (in module bpy.ops.wm), [164](#)  
**keyconfig\_preset\_add()** (in module bpy.ops.wm), [164](#)  
**keyconfig\_remove()** (in module bpy.ops.wm), [164](#)  
**keyconfig\_set()** (in module bpy.utils), [1072](#)  
**keyconfig\_test()** (in module bpy.ops.wm), [164](#)  
**KeyConfigurations** (class in bpy.types), [497](#)  
**KeyConfigurations.addon** (in module bpy.types), [497](#)  
**KeyConfigurations.default** (in module bpy.types), [497](#)  
**KeyConfigurations.user** (in module bpy.types), [497](#)  
**keyed\_loops** (bpy.types.ParticleSettings attribute), [689](#)  
**keyframe** (bpy.types.ThemeSequenceEditor attribute), [958](#)  
**Keyframe** (class in bpy.types), [512](#)  
**keyframe\_delete()** (bpy.types.bpy\_struct method), [1070](#)  
**keyframe\_delete()** (in module bpy.ops.anim), [36](#)  
**keyframe\_delete\_button()** (in module bpy.ops.anim), [37](#)

keyframe\_delete\_v3d() (in module bpy.ops.anim), 37  
keyframe\_insert() (bpy.types.bpy\_struct method), 1070  
keyframe\_insert() (in module bpy.ops.action), 33  
keyframe\_insert() (in module bpy.ops.anim), 37  
keyframe\_insert() (in module bpy.ops.graph), 61  
keyframe\_insert\_button() (in module bpy.ops.anim), 37  
keyframe\_insert\_menu() (in module bpy.ops.anim), 37  
keyframe\_jump() (in module bpy.ops.screen), 122  
keyframe\_new\_handle\_type  
    (bpy.types.UserPreferencesEdit attribute), 1016  
keyframe\_new\_interpolation\_type  
    (bpy.types.UserPreferencesEdit attribute), 1016  
keyframe\_type() (in module bpy.ops.action), 33  
keying\_set\_active\_set() (in module bpy.ops.anim), 37  
keying\_set\_add() (in module bpy.ops.anim), 37  
keying\_set\_export() (in module bpy.ops.anim), 37  
keying\_set\_path\_add() (in module bpy.ops.anim), 38  
keying\_set\_path\_remove() (in module bpy.ops.anim), 38  
keying\_set\_remove() (in module bpy.ops.anim), 38  
KeyingSet (class in bpy.types), 513  
KeyingSet.is\_path\_absolute (in module bpy.types), 513  
KeyingSet.paths (in module bpy.types), 513  
KeyingSet.type\_info (in module bpy.types), 513  
keyingset\_add\_selected() (in module bpy.ops.outliner), 110  
keyingset\_button\_add() (in module bpy.ops.anim), 38  
keyingset\_button\_remove() (in module bpy.ops.anim), 38  
keyingset\_remove\_selected() (in module bpy.ops.outliner), 110  
KeyingSetInfo (class in bpy.types), 514  
KeyingSetPath (class in bpy.types), 515  
KeyingSetPaths (class in bpy.types), 517  
KeyingSets (class in bpy.types), 518  
KeyingSetsAll (class in bpy.types), 519  
keyitem\_add() (in module bpy.ops.wm), 164  
keyitem\_remove() (in module bpy.ops.wm), 164  
keyitem\_restore() (in module bpy.ops.wm), 164  
KeyMap (class in bpy.types), 498  
KeyMap.is\_modal (in module bpy.types), 498  
KeyMap.keymap\_items (in module bpy.types), 498  
KeyMap.name (in module bpy.types), 498  
KeyMap.region\_type (in module bpy.types), 498  
KeyMap.space\_type (in module bpy.types), 498  
keymap\_restore() (in module bpy.ops.wm), 164  
KeyMapItem (class in bpy.types), 499  
KeyMapItem.id (in module bpy.types), 500  
KeyMapItem.is\_user\_defined (in module bpy.types), 500  
KeyMapItem.is\_user\_modified (in module bpy.types), 500  
KeyMapItem.name (in module bpy.types), 501  
KeyMapItem.properties (in module bpy.types), 501  
KeyMapItems (class in bpy.types), 503  
KeyMaps (class in bpy.types), 507  
keys() (bpy.types.bpy\_prop\_collection method), 1067  
keys() (bpy.types.bpy\_struct method), 1071  
keys\_step (bpy.types.ParticleSettings attribute), 689  
KinematicConstraint (class in bpy.types), 520  
kink (bpy.types.ParticleSettings attribute), 689  
kink\_amplitude (bpy.types.ParticleSettings attribute), 689  
kink\_amplitude\_clump (bpy.types.ParticleSettings attribute), 689  
kink\_axis (bpy.types.ParticleSettings attribute), 690  
kink\_factor (bpy.types.ParticleSettingsTextureSlot attribute), 697  
kink\_flat (bpy.types.ParticleSettings attribute), 690  
kink\_frequency (bpy.types.ParticleSettings attribute), 690  
kink\_shape (bpy.types.ParticleSettings attribute), 690  
KKEY (in module bge.events), 1261  
knife\_cut() (in module bpy.ops.mesh), 78  
KX\_ACT\_CONSTRAINT\_DISTANCE (in module bge.logic), 1242  
KX\_ACT\_CONSTRAINT\_DOROTFH (in module bge.logic), 1242  
KX\_ACT\_CONSTRAINT\_FHNX (in module bge.logic), 1243  
KX\_ACT\_CONSTRAINT\_FHNY (in module bge.logic), 1243  
KX\_ACT\_CONSTRAINT\_FHNZ (in module bge.logic), 1243  
KX\_ACT\_CONSTRAINT\_FHPX (in module bge.logic), 1243  
KX\_ACT\_CONSTRAINT\_FHPY (in module bge.logic), 1243  
KX\_ACT\_CONSTRAINT\_FHPZ (in module bge.logic), 1243  
KX\_ACT\_CONSTRAINT\_LOCAL (in module bge.logic), 1242  
KX\_ACT\_CONSTRAINT\_MATERIAL (in module bge.logic), 1242  
KX\_ACT\_CONSTRAINT\_NORMAL (in module bge.logic), 1242  
KX\_ACT\_CONSTRAINT\_PERMANENT (in module bge.logic), 1242  
KX\_ACTIONACT\_FLIPPER (in module bge.logic), 1241, 1245  
KX\_ACTIONACT\_LOOPEND (in module bge.logic), 1241, 1245  
KX\_ACTIONACT\_LOOPSTOP (in module bge.logic), 1241, 1245  
KX\_ACTIONACT\_PLAY (in module bge.logic), 1241, 1245  
KX\_ACTIONACT\_PROPERTY (in module bge.logic), 1241, 1245  
KX\_ArmatureSensor (class in bge.types), 1225  
KX\_ArmatureSensor.KX\_ARMSENSOR\_LIN\_ERROR ABOVE  
    (in module bge.types), 1226

KX\_ArmatureSensor.KX\_ARMSENSOR\_LIN\_ERROR\_BKOWN\_ENABLE\_RIGID\_BODY (in module bge.logic), 1243  
 (in module bge.types), 1226  
 KX\_ArmatureSensor.KX\_ARMSENSOR\_ROT\_ERROR\_ABOWN\_RESTORE\_DYNAMICS (in module bge.logic), 1243  
 (in module bge.types), 1226  
 KX\_ArmatureSensor.KX\_ARMSENSOR\_ROT\_ERROR\_BKOWN\_SET\_MASS (in module bge.logic), 1243  
 (in module bge.types), 1226  
 KX\_ArmatureSensor.KX\_ARMSENSOR\_STATE\_CHANGE\_GAME\_LOAD (in module bge.logic), 1243  
 (in module bge.types), 1226  
 KX\_BLENDER\_GLSL\_MATERIAL (in module bge.render), 1250  
 KX\_BLENDER\_MULTITEX\_MATERIAL (in module bge.render), 1250  
 KX\_BlenderMaterial (class in bge.types), 1172  
 KX\_Camera (class in bge.types), 1220  
 KX\_Camera.INSIDE (in module bge.types), 1220  
 KX\_Camera.INTERSECT (in module bge.types), 1220  
 KX\_Camera.OUTSIDE (in module bge.types), 1220  
 KX\_CameraActuator (class in bge.types), 1172  
 KX\_CONSTRAINTACT\_DIRNX (in module bge.logic), 1242  
 KX\_CONSTRAINTACT\_DIRNY (in module bge.logic), 1242  
 KX\_CONSTRAINTACT\_DIRNZ (in module bge.logic), 1242  
 KX\_CONSTRAINTACT\_DIRPX (in module bge.logic), 1242  
 KX\_CONSTRAINTACT\_DIRPY (in module bge.logic), 1242  
 KX\_CONSTRAINTACT\_DIRPZ (in module bge.logic), 1242  
 KX\_CONSTRAINTACT\_LOCX (in module bge.logic), 1242  
 KX\_CONSTRAINTACT\_LOCY (in module bge.logic), 1242  
 KX\_CONSTRAINTACT\_LOCZ (in module bge.logic), 1242  
 KX\_CONSTRAINTACT\_ORIX (in module bge.logic), 1243  
 KX\_CONSTRAINTACT\_ORIY (in module bge.logic), 1243  
 KX\_CONSTRAINTACT\_ORIZ (in module bge.logic), 1243  
 KX\_CONSTRAINTACT\_ROTX (in module bge.logic), 1242  
 KX\_CONSTRAINTACT\_ROTY (in module bge.logic), 1242  
 KX\_CONSTRAINTACT\_ROTZ (in module bge.logic), 1242  
 KX\_ConstraintActuator (class in bge.types), 1172  
 KX\_ConstraintWrapper (class in bge.types), 1173  
 KX\_DYN\_DISABLE\_DYNAMICS (in module bge.logic), 1243  
 KX\_DYN\_DISABLE\_RIGID\_BODY (in module bge.logic), 1243  
 KX\_FALSE (in module bge.logic), 1240  
 KX\_GAME\_LOAD (in module bge.logic), 1243  
 KX\_GAME\_LOADCFG (in module bge.logic), 1243  
 KX\_GAME\_QUIT (in module bge.logic), 1243  
 KX\_GAME\_RESTART (in module bge.logic), 1243  
 KX\_GAME\_SAVECFG (in module bge.logic), 1243  
 KX\_GAME\_START (in module bge.logic), 1243  
 KX\_GameActuator (class in bge.types), 1174  
 KX\_GameObject (class in bge.types), 1174  
 KX\_INPUT\_ACTIVE (in module bge.logic), 1245  
 KX\_INPUT JUST ACTIVATED (in module bge.logic), 1245  
 KX\_INPUT JUST RELEASED (in module bge.logic), 1245  
 KX\_INPUT\_NONE (in module bge.logic), 1245  
 KX\_IPOACT\_FLIPPER (in module bge.logic), 1244  
 KX\_IPOACT\_FROM\_PROP (in module bge.logic), 1244  
 KX\_IPOACT\_LOOPEND (in module bge.logic), 1244  
 KX\_IPOACT\_LOOPSTOP (in module bge.logic), 1244  
 KX\_IPOACT\_PINGPONG (in module bge.logic), 1244  
 KX\_IPOACT\_PLAY (in module bge.logic), 1244  
 KX\_IpoActuator (class in bge.types), 1184  
 KX\_LightObject (class in bge.types), 1185  
 KX\_LightObject.NORMAL (in module bge.types), 1185  
 KX\_LightObject.SPOT (in module bge.types), 1185  
 KX\_LightObject.SUN (in module bge.types), 1185  
 KX\_MeshProxy (class in bge.types), 1186  
 KX\_MOUSE BUT LEFT (in module bge.logic), 1246  
 KX\_MOUSE BUT MIDDLE (in module bge.logic), 1246  
 KX\_MOUSE BUT RIGHT (in module bge.logic), 1246  
 KX\_MouseFocusSensor (class in bge.types), 1188  
 KX\_NearSensor (class in bge.types), 1190  
 KX\_NetworkMessageActuator (class in bge.types), 1190  
 KX\_NetworkMessageSensor (class in bge.types), 1190  
 KX\_ObjectActuator (class in bge.types), 1190  
 KX\_PARENT REMOVE (in module bge.logic), 1244  
 KX\_PARENT\_SET (in module bge.logic), 1244  
 KX\_ParentActuator (class in bge.types), 1192  
 KX\_PhysicsObjectWrapper (class in bge.types), 1192  
 KX\_PolygonMaterial (class in bge.types), 1195  
 KX\_PolyProxy (class in bge.types), 1193  
 KX\_PROPSENSOR\_CHANGED (in module bge.logic), 1241  
 KX\_PROPSENSOR\_EQUAL (in module bge.logic), 1240  
 KX\_PROPSENSOR\_EXPRESSION (in module bge.logic), 1241

KX\_PROPSENSOR\_INTERVAL (in module bge.logic), 1240  
KX\_PROPSENSOR\_NOTEQUAL (in module bge.logic), 1240  
KX\_RADAR\_AXIS\_NEG\_X (in module bge.logic), 1241  
KX\_RADAR\_AXIS\_NEG\_Y (in module bge.logic), 1241  
KX\_RADAR\_AXIS\_NEG\_Z (in module bge.logic), 1241  
KX\_RADAR\_AXIS\_POS\_X (in module bge.logic), 1241  
KX\_RADAR\_AXIS\_POS\_Y (in module bge.logic), 1241  
KX\_RADAR\_AXIS\_POS\_Z (in module bge.logic), 1241  
KX\_RadarSensor (class in bge.types), 1200  
KX\_RANDOMACT\_BOOL\_BERNOULLI (in module bge.logic), 1244  
KX\_RANDOMACT\_BOOL\_CONST (in module bge.logic), 1244  
KX\_RANDOMACT\_BOOL\_UNIFORM (in module bge.logic), 1244  
KX\_RANDOMACT\_FLOAT\_CONST (in module bge.logic), 1244  
KX\_RANDOMACT\_FLOAT\_NEGATIVE\_EXPONENTIAL (in module bge.logic), 1244  
KX\_RANDOMACT\_FLOAT\_NORMAL (in module bge.logic), 1244  
KX\_RANDOMACT\_FLOAT\_UNIFORM (in module bge.logic), 1244  
KX\_RANDOMACT\_INT\_CONST (in module bge.logic), 1244  
KX\_RANDOMACT\_INT\_POISSON (in module bge.logic), 1244  
KX\_RANDOMACT\_INT\_UNIFORM (in module bge.logic), 1244  
KX\_RAY\_AXIS\_NEG\_X (in module bge.logic), 1241  
KX\_RAY\_AXIS\_NEG\_Y (in module bge.logic), 1241  
KX\_RAY\_AXIS\_NEG\_Z (in module bge.logic), 1241  
KX\_RAY\_AXIS\_POS\_X (in module bge.logic), 1241  
KX\_RAY\_AXIS\_POS\_Y (in module bge.logic), 1241  
KX\_RAY\_AXIS\_POS\_Z (in module bge.logic), 1241  
KX\_RaySensor (class in bge.types), 1200  
KX\_SCA\_AddObjectActuator (class in bge.types), 1201  
KX\_SCA\_DynamicActuator (class in bge.types), 1202  
KX\_SCA\_EndObjectActuator (class in bge.types), 1202  
KX\_SCA\_ReplaceMeshActuator (class in bge.types), 1202  
KX\_Scene (class in bge.types), 1203  
KX\_SCENE\_ADD\_BACK\_SCENE (in module bge.logic), 1244  
KX\_SCENE\_ADD\_FRONT\_SCENE (in module bge.logic), 1244  
KX\_SCENE\_REMOVE\_SCENE (in module bge.logic), 1244  
KX\_SCENE\_RESTART (in module bge.logic), 1244  
KX\_SCENE\_RESUME (in module bge.logic), 1244  
KX\_SCENE\_SET\_CAMERA (in module bge.logic), 1244  
KX\_SCENE\_SET\_SCENE (in module bge.logic), 1244  
KX\_SCENE\_SUSPEND (in module bge.logic), 1244  
KX\_SceneActuator (class in bge.types), 1205  
KX\_SENSOR\_ACTIVE (in module bge.logic), 1240  
KX\_SENSOR\_INACTIVE (in module bge.logic), 1240  
KX\_SENSOR JUST\_ACTIVATED (in module bge.logic), 1240  
KX\_SENSOR JUST\_DEACTIVATED (in module bge.logic), 1240  
KX\_SOUNDACT\_LOOPBIDIRECTIONAL (in module bge.logic), 1245  
KX\_SOUNDACT\_LOOPBIDIRECTIONAL\_STOP (in module bge.logic), 1245  
KX\_SOUNDACT\_LOOPEND (in module bge.logic), 1245  
KX\_SOUNDACT\_LOOPSTOP (in module bge.logic), 1245  
KX\_SOUNDACT\_PLAYEND (in module bge.logic), 1245  
KX\_SOUNDACT\_PLAYSTOP (in module bge.logic), 1245  
KX\_SoundActuator (class in bge.types), 1206  
KX\_STATE1 (in module bge.logic), 1246  
KX\_STATE10 (in module bge.logic), 1246  
KX\_STATE11 (in module bge.logic), 1246  
KX\_STATE12 (in module bge.logic), 1246  
KX\_STATE13 (in module bge.logic), 1246  
KX\_STATE14 (in module bge.logic), 1246  
KX\_STATE15 (in module bge.logic), 1246  
KX\_STATE16 (in module bge.logic), 1246  
KX\_STATE17 (in module bge.logic), 1246  
KX\_STATE18 (in module bge.logic), 1246  
KX\_STATE19 (in module bge.logic), 1246  
KX\_STATE2 (in module bge.logic), 1246  
KX\_STATE20 (in module bge.logic), 1246  
KX\_STATE21 (in module bge.logic), 1246  
KX\_STATE22 (in module bge.logic), 1246  
KX\_STATE23 (in module bge.logic), 1246  
KX\_STATE24 (in module bge.logic), 1246  
KX\_STATE25 (in module bge.logic), 1246  
KX\_STATE26 (in module bge.logic), 1246  
KX\_STATE27 (in module bge.logic), 1246  
KX\_STATE28 (in module bge.logic), 1246  
KX\_STATE29 (in module bge.logic), 1247  
KX\_STATE3 (in module bge.logic), 1246  
KX\_STATE30 (in module bge.logic), 1247  
KX\_STATE4 (in module bge.logic), 1246  
KX\_STATE5 (in module bge.logic), 1246  
KX\_STATE6 (in module bge.logic), 1246  
KX\_STATE7 (in module bge.logic), 1246  
KX\_STATE8 (in module bge.logic), 1246

KX\_STATE9 (in module bge.logic), 1246  
 KX\_STATE\_OP\_CLR (in module bge.logic), 1247  
 KX\_STATE\_OP\_CPY (in module bge.logic), 1247  
 KX\_STATE\_OP\_NEG (in module bge.logic), 1247  
 KX\_STATE\_OP\_SET (in module bge.logic), 1247  
 KX\_StateActuator (class in bge.types), 1207  
 KX\_TEXFACE\_MATERIAL (in module bge.render), 1250  
 KX\_TouchSensor (class in bge.types), 1189  
 KX\_TrackToActuator (class in bge.types), 1207  
 KX\_TRUE (in module bge.logic), 1240  
 KX\_VehicleWrapper (class in bge.types), 1207  
 KX\_VertexProxy (class in bge.types), 1210  
 KX\_VisibilityActuator (class in bge.types), 1212

**L**

label (bpy.types.Node attribute), 629  
 label() (bpy.typesUILayout method), 1001  
 lacunarity (bpy.types.MusgraveTexture attribute), 620  
 lamp (bpy.types.ThemeView3D attribute), 968  
 Lamp (class in bpy.types), 523  
 lamp (in module bpy.context), 30  
 Lamp.animation\_data (in module bpy.types), 523  
 Lamp.texture\_slots (in module bpy.types), 523  
 lamp\_add() (in module bpy.ops.object), 98  
 LampSkySettings (class in bpy.types), 524  
 LampTextureSlot (class in bpy.types), 526  
 LampTextureSlots (class in bpy.types), 528  
 land\_acc\_max (bpy.types.BoidSettings attribute), 249  
 land\_ave\_max (bpy.types.BoidSettings attribute), 249  
 land\_jump\_speed (bpy.types.BoidSettings attribute), 249  
 land\_personal\_space (bpy.types.BoidSettings attribute), 249  
 land\_smooth (bpy.types.BoidSettings attribute), 249  
 land\_speed\_max (bpy.types.BoidSettings attribute), 249  
 land\_stick\_force (bpy.types.BoidSettings attribute), 249  
 language (bpy.types.SpaceConsole attribute), 851  
 language (bpy.types.UserPreferencesSystem attribute), 1024  
 language() (in module bpy.ops.console), 44  
 lastDraw (bge.types.SCA\_RandomSensor attribute), 1220  
 lastsel\_point (bpy.types.ThemeGraphEditor attribute), 944  
 lastsel\_point (bpy.types.ThemeView3D attribute), 968  
 Lattice (class in bpy.types), 529  
 lattice (in module bpy.context), 29  
 Lattice.animation\_data (in module bpy.types), 529  
 Lattice.points (in module bpy.types), 529  
 Lattice.shape\_keys (in module bpy.types), 529  
 LatticeModifier (class in bpy.types), 530  
 LatticePoint (class in bpy.types), 531  
 LatticePoint.co (in module bpy.types), 531  
 LatticePoint.groups (in module bpy.types), 531

layer (bge.types.KX\_LightObject attribute), 1185  
 layer (bpy.types.CompositorNodeImage attribute), 322  
 layer (bpy.types.CompositorNodeRLayers attribute), 334  
 layer\_add() (in module bpy.ops.gpencil), 59  
 layers (bpy.types.Armature attribute), 199  
 layers (bpy.types.Bone attribute), 253  
 layers (bpy.types.EditBone attribute), 393  
 layers (bpy.types.Group attribute), 464  
 layers (bpy.types.Object attribute), 640  
 layers (bpy.types.ObjectBase attribute), 651  
 layers (bpy.types.Scene attribute), 771  
 layers (bpy.types.SceneRenderLayer attribute), 781  
 layers (bpy.types.SpaceView3D attribute), 873  
 layers() (in module bpy.ops.view3d), 156  
 layers\_from\_view() (bpy.types.ObjectBase method), 651  
 layers\_ignore (bpy.types.EnvironmentMap attribute), 404  
 layers\_protected (bpy.types.Armature attribute), 199  
 layers\_show\_all() (in module bpy.ops.armature), 40  
 layers\_zmask (bpy.types.SceneRenderLayer attribute), 781  
 LEFTALTKEY (in module bge.events), 1262  
 LEFTARROWKEY (in module bge.events), 1263  
 LEFTBRACKETKEY (in module bge.events), 1264  
 LEFTCTRLKEY (in module bge.events), 1262  
 LEFTMOUSE (in module bge.events), 1261  
 LEFTSHIFTKEY (in module bge.events), 1262  
 length (bge.types.BL\_ArmatureBone attribute), 1234  
 length (bpy.types.Bone attribute), 254  
 length (bpy.types.EditBone attribute), 394  
 length (bpy.types.PoseBone attribute), 726  
 length (mathutils.Vector attribute), 1096  
 length\_factor (bpy.types.ParticleSettingsTextureSlot attribute), 697  
 length\_mode (bpy.types.ParticleBrush attribute), 675  
 length\_random (bpy.types.ParticleSettings attribute), 690  
 length\_squared (mathutils.Vector attribute), 1096  
 lennardjones (bpy.types.EffectorWeights attribute), 401  
 lens (bge.types.KX\_Camera attribute), 1220  
 lens (bpy.types.Camera attribute), 268  
 lens (bpy.types.SpaceView3D attribute), 873  
 lens\_unit (bpy.types.Camera attribute), 268  
 level (bge.types.SCA\_ISensor attribute), 1164  
 level (bpy.types.BoidRuleAverageSpeed attribute), 243  
 levels (bge.texture.FilterLevel attribute), 1259  
 levels (bpy.types.MultiresModifier attribute), 618  
 levels (bpy.types.SubsurfModifier attribute), 894  
 LibFree() (in module bge.logic), 1238  
 LibList() (in module bge.logic), 1238  
 LibLoad() (in module bge.logic), 1237  
 LibNew() (in module bge.logic), 1237  
 Library (class in bpy.types), 532  
 Library.parent (in module bpy.types), 532  
 Library.users\_id (in module bpy.types), 532

life\_factor (bpy.types.ParticleSettingsTextureSlot attribute), 697  
lifetime (bpy.types.Particle attribute), 674  
lifetime (bpy.types.ParticleSettings attribute), 690  
lifetime (bpy.types.WaveModifier attribute), 1046  
lifetime\_random (bpy.types.ParticleSettings attribute), 690  
lift (bpy.types.CompositorNodeChromaMatte attribute), 299  
lift (bpy.types.CompositorNodeColorBalance attribute), 300  
lift (bpy.types.SequenceColorBalance attribute), 798  
light\_group (bpy.types.Material attribute), 548  
light\_method (bpy.types.MaterialVolume attribute), 571  
light\_override (bpy.types.SceneRenderLayer attribute), 781  
lightlayer (bge.types.KX\_PolygonMaterial attribute), 1198  
lightmap\_pack() (in module bpy.ops.uv), 150  
lights (bge.types.KX\_Scene attribute), 1204  
limit (bge.types.KX\_ConstraintActuator attribute), 1173  
limit (bpy.types.ConstraintActuator attribute), 354  
limit\_angle\_max\_x (bpy.types.RigidBodyJointConstraint attribute), 765  
limit\_angle\_max\_y (bpy.types.RigidBodyJointConstraint attribute), 765  
limit\_angle\_max\_z (bpy.types.RigidBodyJointConstraint attribute), 765  
limit\_angle\_min\_x (bpy.types.RigidBodyJointConstraint attribute), 765  
limit\_angle\_min\_y (bpy.types.RigidBodyJointConstraint attribute), 765  
limit\_angle\_min\_z (bpy.types.RigidBodyJointConstraint attribute), 765  
limit\_channel (bpy.types.CompositorNodeChannelMatte attribute), 297  
limit\_channel (bpy.types.CompositorNodeColorSpill attribute), 302  
limit\_max (bpy.types.CompositorNodeChannelMatte attribute), 297  
limit\_max (bpy.types.CompositorNodeLumaMatte attribute), 325  
limit\_max (bpy.types.ConstraintActuator attribute), 355  
limit\_max\_x (bpy.types.RigidBodyJointConstraint attribute), 765  
limit\_max\_y (bpy.types.RigidBodyJointConstraint attribute), 765  
limit\_max\_z (bpy.types.RigidBodyJointConstraint attribute), 765  
limit\_method (bpy.types.BevelModifier attribute), 209  
limit\_method (bpy.types.CompositorNodeChannelMatte attribute), 298  
limit\_method (bpy.types.CompositorNodeColorSpill attribute), 302  
limit\_min (bpy.types.CompositorNodeChannelMatte attribute), 298  
limit\_min (bpy.types.CompositorNodeLumaMatte attribute), 325  
limit\_min (bpy.types.ConstraintActuator attribute), 355  
limit\_min\_x (bpy.types.RigidBodyJointConstraint attribute), 765  
limit\_min\_y (bpy.types.RigidBodyJointConstraint attribute), 766  
limit\_min\_z (bpy.types.RigidBodyJointConstraint attribute), 766  
limit\_mode (bpy.types.KinematicConstraint attribute), 520  
limit\_mode (bpy.types.LimitDistanceConstraint attribute), 533  
limitdistance\_reset() (in module bpy.ops.constraint), 45  
LimitDistanceConstraint (class in bpy.types), 533  
LimitLocationConstraint (class in bpy.types), 534  
LimitRotationConstraint (class in bpy.types), 536  
limits (bge.texture.FilterBlueScreen attribute), 1258  
limits (bpy.types.SimpleDeformModifier attribute), 832  
LimitScaleConstraint (class in bpy.types), 538  
lin\_attenuation (bge.types.KX\_LightObject attribute), 1186  
lin\_error (bge.types.BL\_ArmatureConstraint attribute), 1228  
line\_break() (in module bpy.ops.font), 57  
line\_break() (in module bpy.ops.text), 136  
line\_count (bpy.types.MaterialHalo attribute), 555  
line\_error (bpy.types.ThemeConsole attribute), 937  
line\_info (bpy.types.ThemeConsole attribute), 937  
line\_input (bpy.types.ThemeConsole attribute), 937  
line\_length\_head (bpy.types.ParticleSettings attribute), 690  
line\_length\_tail (bpy.types.ParticleSettings attribute), 690  
line\_number() (in module bpy.ops.text), 136  
line\_numbers\_background (bpy.types.ThemeTextEditor attribute), 960  
line\_output (bpy.types.ThemeConsole attribute), 937  
line\_width (bpy.types.GPencilLayer attribute), 446  
linear\_attenuation (bpy.types.PointLamp attribute), 718  
linear\_attenuation (bpy.types.SpotLamp attribute), 884  
linear\_drag (bpy.types.FieldSettings attribute), 430  
linear\_stiffness (bpy.types.GameSoftBodySettings attribute), 457  
linear\_velocity (bpy.types.EditObjectActuator attribute), 396  
linear\_velocity (bpy.types.ObjectActuator attribute), 649  
linear\_viscosity (bpy.types.SPHFluidSettings attribute), 768  
linearVelocity (bge.types.KX\_SCA\_AddObjectActuator attribute), 1202  
LINEFEEDKEY (in module bge.events), 1264

|                                                             |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------------------------------------------------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| LINEHINGE_CONSTRAINT<br>(in<br>bge.constraints), 1270       | module | loc (bpy.types.OperatorMousePath attribute), 663<br>loc_clear() (in module bpy.ops.pose), 116<br>localAngularVelocity (bge.types.KX_GameObject<br>attribute), 1176<br>localInertia (bge.types.KX_GameObject attribute), 1175<br>localLinearVelocity (bge.types.KX_GameObject at-<br>tribute), 1176<br>localOrientation (bge.types.KX_GameObject attribute),<br>1175<br>localPosition (bge.types.KX_GameObject attribute),<br>1176<br>localScale (bge.types.KX_GameObject attribute), 1175<br>localview() (in module bpy.ops.view3d), 156<br>location (aud.Handle attribute), 1156<br>location (bge.types.BL_ArmatureChannel attribute),<br>1230<br>location (bpy.types.Node attribute), 629<br>location (bpy.types.Object attribute), 640<br>location (bpy.types.OperatorStrokeElement attribute),<br>664<br>location (bpy.types.Particle attribute), 674<br>location (bpy.types.ParticleKey attribute), 683<br>location (bpy.types.PoseBone attribute), 724<br>location (bpy.types.ShaderNodeMapping attribute), 809<br>location (bpy.types.TexMapping attribute), 899<br>location_3d_to_region_2d() (in module<br>bpy_extras.view3d_utils), 1161<br>location_clear() (in module bpy.ops.object), 99<br>location_iterations (bpy.types.GameSoftBodySettings at-<br>tribute), 457<br>location_mass_center (bpy.types.SoftBodySettings<br>attribute), 841<br>lock (bpy.types.ActionGroup attribute), 176<br>lock (bpy.types.EditBone attribute), 393<br>lock (bpy.types.FCurve attribute), 413<br>lock (bpy.types.GPencilLayer attribute), 446<br>lock (bpy.types.NlaTrack attribute), 627<br>lock (bpy.types.Sequence attribute), 795<br>lock() (in module bpy.ops.sequencer), 127<br>lock_axis (bpy.types.LockedTrackConstraint attribute),<br>539<br>lock_billboard (bpy.types.ParticleSettings attribute), 690<br>lock_boids_to_surface (bpy.types.ParticleSettings at-<br>tribute), 690<br>lock_bone (bpy.types.SpaceView3D attribute), 873<br>lock_bounds (bpy.types.SpaceUVEditor attribute), 870<br>lock_camera (bpy.types.SpaceView3D attribute), 873<br>lock_camera_and_layers (bpy.types.SpaceView3D<br>attribute), 873<br>lock_cursor (bpy.types.SpaceView3D attribute), 873<br>lock_frame (bpy.types.GPencilLayer attribute), 446<br>lock_ik_x (bpy.types.PoseBone attribute), 724<br>lock_ik_y (bpy.types.PoseBone attribute), 724<br>lock_ik_z (bpy.types.PoseBone attribute), 724 |
| link (bpy.types.MaterialSlot attribute), 561                |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| link() (bpy.types.Actuator method), 179                     |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| link() (bpy.types.Controller method), 361                   |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| link() (bpy.types.GroupObjects method), 466                 |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| link() (bpy.types.SceneObjects method), 780                 |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| link() (bpy.types.Sensor method), 793                       |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| link() (in module bpy.ops.node), 91                         |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| link_append() (in module bpy.ops.wm), 165                   |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| link_make() (in module bpy.ops.node), 91                    |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| link_viewer() (in module bpy.ops.node), 91                  |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| links_cut() (in module bpy.ops.logic), 72                   |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| links_cut() (in module bpy.ops.node), 91                    |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| linV (bge.types.KX_ObjectActuator attribute), 1191          |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| linVelocityMax (bge.types.KX_GameObject attribute),<br>1174 |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| linVelocityMin (bge.types.KX_GameObject attribute),<br>1174 |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| list (bpy.types.ThemeDopeSheet attribute), 939              |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| list (bpy.types.ThemeFileBrowser attribute), 941            |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| list (bpy.types.ThemeGraphEditor attribute), 944            |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| list (bpy.types.ThemeNLAEditor attribute), 951              |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| list (bpy.types.ThemeNodeEditor attribute), 953             |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| list_text (bpy.types.ThemeDopeSheet attribute), 939         |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| list_text (bpy.types.ThemeFileBrowser attribute), 941       |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| list_text (bpy.types.ThemeGraphEditor attribute), 945       |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| list_text (bpy.types.ThemeNLAEditor attribute), 951         |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| list_text (bpy.types.ThemeNodeEditor attribute), 953        |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| list_text_hi (bpy.types.ThemeDopeSheet attribute), 939      |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| list_text_hi (bpy.types.ThemeFileBrowser attribute), 941    |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| list_text_hi (bpy.types.ThemeGraphEditor attribute), 945    |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| list_text_hi (bpy.types.ThemeNLAEditor attribute), 951      |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| list_text_hi (bpy.types.ThemeNodeEditor attribute), 953     |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| listener_location (aud.Device attribute), 1151              |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| listener_orientation (aud.Device attribute), 1151           |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| listener_velocity (aud.Device attribute), 1151              |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| LKEY (in module bge.events), 1261                           |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| load() (bge.texture.ImageBuff method), 1255                 |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| load() (bpy.typesBlendDataFonts method), 220                |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| load() (bpy.typesBlendDataImages method), 223               |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| load() (bpy.typesBlendDataLibraries method), 226            |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| load() (bpy.typesBlendDataTexts method), 236                |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| load() (in module blf), 1148                                |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| load_from_file() (bpy.types.RenderLayer method), 752        |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| load_from_file() (bpy.types.RenderResult method), 755       |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| load_image() (in module bpy_extras.image_utils), 1159       |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| load_scripts() (in module bpy.utils), 1072                  |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| loadGlobalDict() (in module bge.logic), 1237                |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

|                                                            |                                                                       |      |
|------------------------------------------------------------|-----------------------------------------------------------------------|------|
| lock_location (bpy.types.Object attribute),                | 640                                                                   |      |
| lock_location (bpy.types.PoseBone attribute),              | 724                                                                   |      |
| lock_location_x (bpy.types.GameObjectSettings attribute),  | 453                                                                   |      |
| lock_location_x (bpy.types.KinematicConstraint attribute), | 520                                                                   |      |
| lock_location_y (bpy.types.GameObjectSettings attribute),  | 453                                                                   |      |
| lock_location_y (bpy.types.KinematicConstraint attribute), | 520                                                                   |      |
| lock_location_z (bpy.types.GameObjectSettings attribute),  | 453                                                                   |      |
| lock_location_z (bpy.types.KinematicConstraint attribute), | 521                                                                   |      |
| lock_object (bpy.types.SpaceView3D attribute),             | 873                                                                   |      |
| lock_rotation (bpy.types.Object attribute),                | 640                                                                   |      |
| lock_rotation (bpy.types.PoseBone attribute),              | 724                                                                   |      |
| lock_rotation (bpy.types.RegionView3D attribute),          | 744                                                                   |      |
| lock_rotation_w (bpy.types.Object attribute),              | 640                                                                   |      |
| lock_rotation_w (bpy.types.PoseBone attribute),            | 724                                                                   |      |
| lock_rotation_x (bpy.types.GameObjectSettings attribute),  | 453                                                                   |      |
| lock_rotation_x (bpy.types.KinematicConstraint attribute), | 521                                                                   |      |
| lock_rotation_y (bpy.types.GameObjectSettings attribute),  | 453                                                                   |      |
| lock_rotation_y (bpy.types.KinematicConstraint attribute), | 521                                                                   |      |
| lock_rotation_z (bpy.types.GameObjectSettings attribute),  | 453                                                                   |      |
| lock_rotation_z (bpy.types.KinematicConstraint attribute), | 521                                                                   |      |
| lock_rotations_4d (bpy.types.Object attribute),            | 640                                                                   |      |
| lock_rotations_4d (bpy.types.PoseBone attribute),          | 724                                                                   |      |
| lock_scale (bpy.types.Object attribute),                   | 641                                                                   |      |
| lock_scale (bpy.types.PoseBone attribute),                 | 724                                                                   |      |
| lock_x (bpy.types.Sculpt attribute),                       | 791                                                                   |      |
| lock_x (bpy.types.SimpleDeformModifier attribute),         | 832                                                                   |      |
| lock_y (bpy.types.Sculpt attribute),                       | 791                                                                   |      |
| lock_y (bpy.types.SimpleDeformModifier attribute),         | 832                                                                   |      |
| lock_z (bpy.types.Sculpt attribute),                       | 791                                                                   |      |
| LockedTrackConstraint (class in bpy.types),                | 539                                                                   |      |
| log (bpy.types.KeyboardSensor attribute),                  | 509                                                                   |      |
| logic_bricks_copy() (in module bpy.ops.object),            | 99                                                                    |      |
| logic_step_max (bpy.types.SceneGameData attribute),        | 776                                                                   |      |
| long_key (bpy.types.ThemeDopeSheet attribute),             | 939                                                                   |      |
| long_key_selected (bpy.types.ThemeDopeSheet attribute),    | 939                                                                   |      |
| look_ahead (bpy.types.BoidRuleAvoidCollision attribute),   | 244                                                                   |      |
| loop_count (aud.Handle attribute),                         | 1156                                                                  |      |
| loop_multi_select() (in module bpy.ops.mesh),              | 78                                                                    |      |
| loop_select() (in module bpy.ops.mesh),                    | 78                                                                    |      |
| loop_to_region() (in module bpy.ops.mesh),                 | 78                                                                    |      |
| loopcut() (in module bpy.ops.mesh),                        | 78                                                                    |      |
| loopcut_slide() (in module bpy.ops.mesh),                  | 78                                                                    |      |
| looping (bge.types.KX_SoundActuator attribute),            | 1206                                                                  |      |
| at-                                                        | <b>M</b>                                                              |      |
| at-                                                        | Macro (class in bpy.types),                                           | 540  |
| at-                                                        | Macro.name (in module bpy.types),                                     | 541  |
| at-                                                        | Macro.properties (in module bpy.types),                               | 541  |
| at-                                                        | MagicTexture (class in bpy.types),                                    | 542  |
| at-                                                        | MagicTexture.users_material (in module bpy.types),                    | 542  |
| at-                                                        | MagicTexture.users_object_modifier (in module bpy.types),             | 542  |
| at-                                                        | magnetic (bpy.types.EffectorWeights attribute),                       | 401  |
| at-                                                        | magnitude (mathutils.Quaternion attribute),                           | 1091 |
| at-                                                        | magnitude (mathutils.Vector attribute),                               | 1096 |
| at-                                                        | main_axis (bpy.types.ClampToConstraint attribute),                    | 276  |
| at-                                                        | MaintainVolumeConstraint (class in bpy.types),                        | 543  |
| at-                                                        | make_compatible() (mathutils.Euler method),                           | 1084 |
| at-                                                        | make_dupli_face() (in module bpy.ops.object),                         | 99   |
| at-                                                        | make_internal() (in module bpy.ops.text),                             | 136  |
| at-                                                        | make_links_data() (in module bpy.ops.object),                         | 99   |
| at-                                                        | make_links_scene() (in module bpy.ops.marker),                        | 73   |
| at-                                                        | make_links_scene() (in module bpy.ops.object),                        | 99   |
| at-                                                        | make_local() (in module bpy.ops.object),                              | 99   |
| at-                                                        | make_paths_absolute() (in module bpy.ops.file),                       | 55   |
| at-                                                        | make_paths_relative() (in module bpy.ops.file),                       | 55   |
| at-                                                        | make_regular() (in module bpy.ops.lattice),                           | 71   |
| at-                                                        | make_segment() (in module bpy.ops.curve),                             | 46   |
| at-                                                        | make_single_user() (in module bpy.ops.object),                        | 99   |
| at-                                                        | makeScreenshot() (in module bge.render),                              | 1250 |
| at-                                                        | manipulator() (in module bpy.ops.view3d),                             | 156  |
| at-                                                        | manipulator_handle_size<br>(bpy.types.UserPreferencesView attribute), | 1027 |
| at-                                                        | manipulator_hotspot (bpy.types.UserPreferencesView attribute),        | 1027 |
| at-                                                        | manipulator_size (bpy.types.UserPreferencesView attribute),           | 1027 |
| at-                                                        | map_from (bpy.types.TransformConstraint attribute),                   | 982  |
| at-                                                        | map_mode (bpy.types.BrushTextureSlot attribute),                      | 265  |
| at-                                                        | map_to (bpy.types.TransformConstraint attribute),                     | 982  |
| at-                                                        | map_to_x_from (bpy.types.TransformConstraint attribute),              | 982  |
| at-                                                        | map_to_y_from (bpy.types.TransformConstraint attribute),              | 982  |
| at-                                                        | map_to_z_from (bpy.types.TransformConstraint attribute),              | 982  |
| at-                                                        | map_type (bpy.types.KeyMapItem attribute),                            | 501  |
| at-                                                        | mapping (bpy.types.CompositorNodePremulKey attribute),                | 332  |
| at-                                                        | mapping (bpy.types.EnvironmentMap attribute),                         | 404  |
| at-                                                        | mapping (bpy.types.Image attribute),                                  | 477  |
| at-                                                        | mapping (bpy.types.MaterialTextureSlot attribute),                    | 565  |

mapping (bpy.types.ParticleSettingsTextureSlot attribute), 697  
 mapping\_x (bpy.types.MaterialTextureSlot attribute), 565  
 mapping\_x (bpy.types.ParticleSettingsTextureSlot attribute), 697  
 mapping\_y (bpy.types.MaterialTextureSlot attribute), 565  
 mapping\_y (bpy.types.ParticleSettingsTextureSlot attribute), 697  
 mapping\_z (bpy.types.MaterialTextureSlot attribute), 565  
 mapping\_z (bpy.types.ParticleSettingsTextureSlot attribute), 697  
 marble\_type (bpy.types.MarbleTexture attribute), 544  
 MarbleTexture (class in bpy.types), 544  
 MarbleTexture.users\_material (in module bpy.types), 545  
 MarbleTexture.users\_object\_modifier (in module bpy.types), 545  
 margin\_column (bpy.types.SpaceTextEditor attribute), 867  
 mark\_all() (in module bpy.ops.text), 136  
 mark\_seam() (in module bpy.ops.mesh), 78  
 mark\_sharp() (in module bpy.ops.mesh), 78  
 markers\_clear() (in module bpy.ops.text), 136  
 markers\_make\_local() (in module bpy.ops.action), 33  
 mask (bge.types.KX\_StateActuator attribute), 1207  
 MaskModifier (class in bpy.types), 546  
 mass (bge.types.KX\_GameObject attribute), 1174  
 mass (bge.types.KX\_SCA\_DynamicActuator attribute), 1202  
 mass (bpy.types.ClothSettings attribute), 280  
 mass (bpy.types.EditObjectActuator attribute), 396  
 mass (bpy.types.GameObjectSettings attribute), 453  
 mass (bpy.types.ParticleSettings attribute), 690  
 mass (bpy.types.SoftBodySettings attribute), 841  
 material (bge.types.KX\_PolygonMaterial attribute), 1197  
 material (bge.types.KX\_PolyProxy attribute), 1193  
 material (bpy.types.CollisionSensor attribute), 285  
 material (bpy.types.ConstraintActuator attribute), 355  
 material (bpy.types.MaterialSlot attribute), 561  
 material (bpy.types.ParticleSettings attribute), 690  
 material (bpy.types.RaySensor attribute), 742  
 material (bpy.types.ShaderNodeExtendedMaterial attribute), 806  
 material (bpy.types.ShaderNodeMaterial attribute), 810  
 material (bpy.types.TouchSensor attribute), 979  
 Material (class in bpy.types), 547  
 material (in module bpy.context), 30  
 Material.animation\_data (in module bpy.types), 547  
 Material.diffuse\_ramp (in module bpy.types), 548  
 Material.halo (in module bpy.types), 548  
 Material.node\_tree (in module bpy.types), 549  
 Material.physics (in module bpy.types), 549  
 Material.raytrace\_mirror (in module bpy.types), 549  
 Material.raytrace\_transparency (in module bpy.types), 549  
 Material.specular\_ramp (in module bpy.types), 550  
 Material.strand (in module bpy.types), 551  
 Material.subsurface\_scattering (in module bpy.types), 551  
 Material.texture\_slots (in module bpy.types), 551  
 Material.volume (in module bpy.types), 553  
 material\_index (bpy.types.MeshFace attribute), 585  
 material\_index (bpy.types.Spline attribute), 878  
 material\_link (bpy.types.UserPreferencesEdit attribute), 1016  
 material\_mode (bpy.types.SceneGameData attribute), 777  
 material\_offset (bpy.types.SolidifyModifier attribute), 844  
 material\_offset\_rim (bpy.types.SolidifyModifier attribute), 844  
 material\_override (bpy.types.SceneRenderLayer attribute), 781  
 material\_slot (in module bpy.context), 30  
 material\_slot\_add() (in module bpy.ops.object), 99  
 material\_slot\_assign() (in module bpy.ops.object), 99  
 material\_slot\_copy() (in module bpy.ops.object), 99  
 material\_slot\_deselect() (in module bpy.ops.object), 100  
 material\_slot\_remove() (in module bpy.ops.object), 100  
 material\_slot\_select() (in module bpy.ops.object), 100  
 MaterialHalo (class in bpy.types), 554  
 MaterialPhysics (class in bpy.types), 556  
 MaterialRaytraceMirror (class in bpy.types), 557  
 MaterialRaytraceTransparency (class in bpy.types), 559  
 materials (bge.types.KX\_MeshProxy attribute), 1187  
 MaterialSlot (class in bpy.types), 560  
 MaterialSlot.name (in module bpy.types), 561  
 MaterialStrand (class in bpy.types), 561  
 MaterialStrand.use\_surface\_diffuse (in module bpy.types), 562  
 MaterialSubsurfaceScattering (class in bpy.types), 563  
 MaterialTextureSlot (class in bpy.types), 564  
 MaterialTextureSlots (class in bpy.types), 569  
 MaterialVolume (class in bpy.types), 570  
 mathutils (module), 1083  
 mathutils.geometry (module), 1112  
 matid (bge.types.KX\_PolyProxy attribute), 1193  
 matname (bge.types.KX\_PolyProxy attribute), 1193  
 matrix (bge.texture.FilterColor attribute), 1258  
 matrix (bpy.types.Bone attribute), 253  
 matrix (bpy.types.DupliObject attribute), 390  
 matrix (bpy.types.PoseBone attribute), 724  
 matrix (bpy.types.TransformOrientation attribute), 984  
 Matrix (class in mathutils), 1085  
 Matrix.lerp() (in module mathutils), 1087  
 matrix\_basis (bpy.types.Object attribute), 641  
 matrix\_basis (bpy.types.PoseBone attribute), 724  
 matrix\_local (bpy.types.Bone attribute), 253  
 matrix\_local (bpy.types.Object attribute), 641

matrix\_original (bpy.types.DupliObject attribute), 390  
matrix\_parent\_inverse (bpy.types.Object attribute), 641  
matrix\_world (bpy.types.Object attribute), 641  
matte\_channel (bpy.types.CompositorNodeChannelMatte attribute), 298  
max (bge.types.KX\_CameraActuator attribute), 1172  
max (bge.types.KX\_ConstraintActuator attribute), 1173  
max (bge.types.SCA\_PropertySensor attribute), 1217  
max (bpy.types.ActionConstraint attribute), 173  
max (bpy.types.CameraActuator attribute), 270  
max (bpy.types.CompositorNodeMapView attribute), 327  
max (bpy.types.FModifierEnvelopeControlPoint attribute), 422  
max (bpy.types.ShaderNodeMapping attribute), 809  
max (bpy.types.TexMapping attribute), 899  
max\_x (bpy.types.CompositorNodeCrop attribute), 307  
max\_x (bpy.types.FModifierLimits attribute), 425  
max\_x (bpy.types.LimitLocationConstraint attribute), 534  
max\_x (bpy.types.LimitRotationConstraint attribute), 536  
max\_x (bpy.types.LimitScaleConstraint attribute), 538  
max\_x (bpy.types.SequenceCrop attribute), 798  
max\_y (bpy.types.CompositorNodeCrop attribute), 307  
max\_y (bpy.types.FModifierLimits attribute), 425  
max\_y (bpy.types.LimitLocationConstraint attribute), 534  
max\_y (bpy.types.LimitRotationConstraint attribute), 536  
max\_y (bpy.types.LimitScaleConstraint attribute), 538  
max\_y (bpy.types.SequenceCrop attribute), 798  
max\_z (bpy.types.LimitLocationConstraint attribute), 534  
max\_z (bpy.types.LimitRotationConstraint attribute), 536  
max\_z (bpy.types.LimitScaleConstraint attribute), 538  
median\_scale (mathutils.Matrix attribute), 1089  
memory\_cache\_limit (bpy.types.UserPreferencesSystem attribute), 1025  
memory\_statistics() (in module bpy.ops.wm), 165  
Menu (class in bpy.types), 574  
menu() (bpy.typesUILayout method), 1003  
Menu.layout (in module bpy.types), 574  
merge() (in module bpy.ops.armature), 40  
merge() (in module bpy.ops.mesh), 78  
merge\_threshold (bpy.types.ArrayModifier attribute), 206  
merge\_threshold (bpy.types.MirrorModifier attribute), 607  
mesh (bge.types.KX\_SCA\_ReplaceMeshActuator attribute), 1203  
mesh (bpy.types.EditObjectActuator attribute), 396  
Mesh (class in bpy.types), 575  
mesh (in module bpy.context), 29  
Mesh.animation\_data (in module bpy.types), 575  
Mesh.edge\_keys (in module bpy.types), 578  
Mesh.edges (in module bpy.types), 575  
Mesh.faces (in module bpy.types), 576  
Mesh.layers\_float (in module bpy.types), 576  
Mesh.layers\_int (in module bpy.types), 576  
Mesh.layers\_string (in module bpy.types), 576  
Mesh.materials (in module bpy.types), 576  
Mesh.shape\_keys (in module bpy.types), 576  
Mesh.sticky (in module bpy.types), 577  
Mesh.total\_edge\_sel (in module bpy.types), 577  
Mesh.total\_face\_sel (in module bpy.types), 577  
Mesh.total\_vert\_sel (in module bpy.types), 577  
Mesh.uv\_textures (in module bpy.types), 578  
Mesh.vertex\_colors (in module bpy.types), 578  
Mesh.vertices (in module bpy.types), 578  
mesh\_linked\_faces() (in module bpy\_extras.mesh\_utils), 1160  
mesh\_select\_mode (bpy.types.ToolSettings attribute), 976  
MeshColor (class in bpy.types), 580  
MeshColorLayer (class in bpy.types), 581  
MeshColorLayer.data (in module bpy.types), 581  
meshdeform\_bind() (in module bpy.ops.object), 100  
MeshDeformModifier (class in bpy.types), 582  
MeshDeformModifier.is\_bound (in module bpy.types), 582  
MeshEdge (class in bpy.types), 583  
MeshEdge.index (in module bpy.types), 583  
MeshEdge.key (in module bpy.types), 584  
MeshEdges (class in bpy.types), 584  
meshes (bge.types.KX\_GameObject attribute), 1176  
MeshFace (class in bpy.types), 585  
MeshFace.area (in module bpy.types), 585  
MeshFace.center (in module bpy.types), 586  
MeshFace.edge\_keys (in module bpy.types), 586  
MeshFace.index (in module bpy.types), 585  
MeshFace.normal (in module bpy.types), 585  
MeshFaces (class in bpy.types), 586  
MeshFaces.active\_tface (in module bpy.types), 587  
MeshFloatProperty (class in bpy.types), 587  
MeshFloatPropertyLayer (class in bpy.types), 588  
MeshFloatPropertyLayer.data (in module bpy.types), 588  
MeshIntProperty (class in bpy.types), 589  
MeshIntPropertyLayer (class in bpy.types), 590  
MeshIntPropertyLayer.data (in module bpy.types), 590  
MeshSticky (class in bpy.types), 590  
MeshStringProperty (class in bpy.types), 591  
MeshStringPropertyLayer (class in bpy.types), 592  
MeshStringPropertyLayer.data (in module bpy.types), 592  
MeshTextureFace (class in bpy.types), 593  
MeshTextureFaceLayer (class in bpy.types), 595  
MeshTextureFaceLayer.data (in module bpy.types), 595  
MeshVertex (class in bpy.types), 596  
MeshVertex.groups (in module bpy.types), 596  
MeshVertex.index (in module bpy.types), 596  
MeshVertices (class in bpy.types), 597

MessageActuator (class in bpy.types), 598  
 MessageSensor (class in bpy.types), 599  
 meta\_add() (in module bpy.ops.nla), 88  
 meta\_ball (in module bpy.context), 30  
 meta\_make() (in module bpy.ops.sequencer), 127  
 meta\_remove() (in module bpy.ops.nla), 88  
 meta\_separate() (in module bpy.ops.sequencer), 127  
 meta\_strip (bpy.types.ThemeSequenceEditor attribute), 958  
 meta\_toggle() (in module bpy.ops.sequencer), 127  
 MetaBall (class in bpy.types), 600  
 MetaBall.animation\_data (in module bpy.types), 600  
 MetaBall.elements (in module bpy.types), 600  
 MetaBall.materials (in module bpy.types), 600  
 metaball\_add() (in module bpy.ops.object), 100  
 MetaBallElements (class in bpy.types), 602  
 MetaBallElements.active (in module bpy.types), 602  
 MetaElement (class in bpy.types), 603  
 MetaSequence (class in bpy.types), 604  
 MetaSequence.color\_balance (in module bpy.types), 604  
 MetaSequence.crop (in module bpy.types), 604  
 MetaSequence.proxy (in module bpy.types), 604  
 MetaSequence.sequences (in module bpy.types), 605  
 MetaSequence.transform (in module bpy.types), 605  
 mid\_level (bpy.types.DisplaceModifier attribute), 379  
 MIDDLEMOUSE (in module bge.events), 1261  
 min (bge.types.KX\_CameraActuator attribute), 1172  
 min (bge.types.KX\_ConstraintActuator attribute), 1173  
 min (bge.types.SCA\_PropertySensor attribute), 1217  
 min (bpy.types.ActionConstraint attribute), 173  
 min (bpy.types.CameraActuator attribute), 270  
 min (bpy.types.CompositorNodeMapView attribute), 327  
 min (bpy.types.FModifierEnvelopeControlPoint attribute), 422  
 min (bpy.types.ShaderNodeMapping attribute), 809  
 min (bpy.types.TexMapping attribute), 899  
 min\_x (bpy.types.CompositorNodeCrop attribute), 307  
 min\_x (bpy.types.FModifierLimits attribute), 425  
 min\_x (bpy.types.LimitLocationConstraint attribute), 535  
 min\_x (bpy.types.LimitRotationConstraint attribute), 536  
 min\_x (bpy.types.LimitScaleConstraint attribute), 538  
 min\_x (bpy.types.SequenceCrop attribute), 798  
 min\_y (bpy.types.CompositorNodeCrop attribute), 307  
 min\_y (bpy.types.FModifierLimits attribute), 425  
 min\_y (bpy.types.LimitLocationConstraint attribute), 535  
 min\_y (bpy.types.LimitRotationConstraint attribute), 536  
 min\_y (bpy.types.LimitScaleConstraint attribute), 538  
 min\_y (bpy.types.SequenceCrop attribute), 799  
 min\_z (bpy.types.LimitLocationConstraint attribute), 535  
 min\_z (bpy.types.LimitRotationConstraint attribute), 536  
 min\_z (bpy.types.LimitScaleConstraint attribute), 538  
 mini\_axis\_brightness (bpy.types.UserPreferencesView attribute), 1027  
 mini\_axis\_size (bpy.types.UserPreferencesView attribute), 1027  
 minimize\_stretch() (in module bpy.ops.uv), 150  
 minkovsky\_exponent (bpy.types.VoronoiTexture attribute), 1040  
 MINUSKEY (in module bge.events), 1264  
 mipmap (bge.texture.Texture attribute), 1258  
 mirror() (in module bpy.ops.action), 34  
 mirror() (in module bpy.ops.graph), 61  
 mirror() (in module bpy.ops.particle), 113  
 mirror() (in module bpy.ops.transform), 140  
 mirror\_color (bpy.types.Material attribute), 549  
 mirror\_factor (bpy.types.MaterialTextureSlot attribute), 565  
 mirror\_object (bpy.types.MirrorModifier attribute), 607  
 MirrorModifier (class in bpy.types), 607  
 mix (bpy.types.CompositorNodeGlare attribute), 318  
 MKEY (in module bge.events), 1261  
 modal() (bpy.types.Operator method), 661  
 modal\_handler\_add() (bpy.types.WindowManager class method), 1050  
 mode (bge.types.BL\_ActionActuator attribute), 1166  
 mode (bge.types.BL\_ShapeActionActuator attribute), 1171  
 mode (bge.types.KX\_GameActuator attribute), 1174  
 mode (bge.types.KX\_IpoActuator attribute), 1185  
 mode (bge.types.KX\_ParentActuator attribute), 1192  
 mode (bge.types.KX\_SCA\_DynamicActuator attribute), 1202  
 mode (bge.types.KX\_SceneActuator attribute), 1206  
 mode (bge.types.KX\_SoundActuator attribute), 1207  
 mode (bge.types.SCA\_2DFilterActuator attribute), 1213  
 mode (bge.types.SCA\_MouseSensor attribute), 1188  
 mode (bge.types.SCA\_PropertyActuator attribute), 1217  
 mode (bge.types.SCA\_PropertySensor attribute), 1217  
 mode (bge.types.SCA\_PythonController attribute), 1218  
 mode (bpy.types.ArmatureActuator attribute), 201  
 mode (bpy.types.CompositorNodeCombYCCA attribute), 304  
 mode (bpy.types.CompositorNodeSepYCCA attribute), 338  
 mode (bpy.types.ConstraintActuator attribute), 355  
 mode (bpy.types.EditObjectActuator attribute), 396  
 mode (bpy.types.Filter2DActuator attribute), 435  
 mode (bpy.types.FModifierGenerator attribute), 424  
 mode (bpy.types.GameActuator attribute), 449  
 mode (bpy.types.Histogram attribute), 470  
 mode (bpy.types.Itasc attribute), 491  
 mode (bpy.types.MaskModifier attribute), 546  
 mode (bpy.types.ObjectActuator attribute), 649  
 mode (bpy.types.ParentActuator attribute), 673  
 mode (bpy.types.PropertyActuator attribute), 730  
 mode (bpy.types.PythonController attribute), 736  
 mode (bpy.types.SceneActuator attribute), 774

mode (bpy.types.ShapeActionActuator attribute), 824  
mode (bpy.types.SoundActuator attribute), 847  
mode (bpy.types.SpaceDopeSheetEditor attribute), 852  
mode (bpy.types.SpaceGraphEditor attribute), 854  
mode\_after (bpy.types.FModifierCycles attribute), 420  
mode\_before (bpy.types.FModifierCycles attribute), 420  
mode\_set() (in module bpy.ops.object), 100  
MODELMATRIX (in module bge.logic), 1248  
MODELMATRIX\_INVERSE (in module bge.logic), 1248  
MODELMATRIX\_INVERSETRANSPOSE (in module bge.logic), 1248  
MODELMATRIX\_TRANSPOSE (in module bge.logic), 1248  
modelview\_matrix (bge.types.KX\_Camera attribute), 1221  
MODELVIEWMATRIX (in module bge.logic), 1248  
MODELVIEWMATRIX\_INVERSE (in module bge.logic), 1248  
MODELVIEWMATRIX\_INVERSETRANSPOSE (in module bge.logic), 1248  
MODELVIEWMATRIX\_TRANSPOSE (in module bge.logic), 1248  
Modifier (class in bpy.types), 608  
Modifier.type (in module bpy.types), 609  
modifier\_add() (in module bpy.ops.object), 100  
modifier\_apply() (in module bpy.ops.object), 100  
modifier\_convert() (in module bpy.ops.object), 101  
modifier\_copy() (in module bpy.ops.object), 101  
modifier\_key\_1 (bpy.types.KeyboardSensor attribute), 509  
modifier\_key\_2 (bpy.types.KeyboardSensor attribute), 510  
modifier\_move\_down() (in module bpy.ops.object), 101  
modifier\_move\_up() (in module bpy.ops.object), 101  
modifier\_remove() (in module bpy.ops.object), 101  
module (bpy.types.Addon attribute), 181  
module (bpy.types.PythonController attribute), 736  
module\_names() (in module bpy.path), 1074  
modules\_from\_path() (in module bpy.utils), 1072  
motion\_blur\_factor (bpy.types.Filter2DActuator attribute), 435  
motion\_blur\_samples (bpy.types.RenderSettings attribute), 758  
motion\_blur\_shutter (bpy.types.RenderSettings attribute), 758  
MotionPath (class in bpy.types), 610  
MotionPath.frame\_end (in module bpy.types), 610  
MotionPath.frame\_start (in module bpy.types), 610  
MotionPath.length (in module bpy.types), 610  
MotionPath.points (in module bpy.types), 610  
MotionPath.use\_bone\_head (in module bpy.types), 610  
MotionPathVert (class in bpy.types), 611  
mouse (bpy.types.OperatorStrokeElement attribute), 664  
mouse (in module bge.logic), 1236  
mouse\_double\_click\_time  
    (bpy.types.UserPreferencesInput attribute), 1021  
mouse\_event (bpy.types.MouseSensor attribute), 612  
MouseSensor (class in bpy.types), 612  
MOUSEX (in module bge.events), 1261  
MOUSEY (in module bge.events), 1261  
move() (in module bpy.ops.console), 44  
move() (in module bpy.ops.font), 58  
move() (in module bpy.ops.marker), 73  
move() (in module bpy.ops.text), 136  
move() (in module bpy.ops.view3d), 156  
move\_down() (in module bpy.ops.constraint), 45  
move\_down() (in module bpy.ops.nla), 88  
move\_select() (in module bpy.ops.font), 58  
move\_select() (in module bpy.ops.text), 136  
move\_to\_layer() (in module bpy.ops.object), 101  
move\_up() (in module bpy.ops.constraint), 45  
move\_up() (in module bpy.ops.nla), 88  
movie\_strip (bpy.types.ThemeSequenceEditor attribute), 958  
movie\_strip\_add() (in module bpy.ops.sequencer), 127  
MovieSequence (class in bpy.types), 613  
MovieSequence.color\_balance (in module bpy.types), 613  
MovieSequence.crop (in module bpy.types), 613  
MovieSequence.elements (in module bpy.types), 613  
MovieSequence.proxy (in module bpy.types), 613  
MovieSequence.transform (in module bpy.types), 613  
mpeg\_preseek (bpy.types.MovieSequence attribute), 613  
ms\_diffusion (bpy.types.MaterialVolume attribute), 571  
ms\_intensity (bpy.types.MaterialVolume attribute), 571  
ms\_spread (bpy.types.MaterialVolume attribute), 571  
multicam\_source (bpy.types.MulticamSequence attribute), 616  
MulticamSequence (class in bpy.types), 615  
MulticamSequence.color\_balance (in module bpy.types), 616  
MulticamSequence.crop (in module bpy.types), 616  
MulticamSequence.proxy (in module bpy.types), 616  
MulticamSequence.transform (in module bpy.types), 616  
multiply\_speed (bpy.types.SpeedControlSequence attribute), 876  
multires\_base\_apply() (in module bpy.ops.object), 101  
multires\_external\_pack() (in module bpy.ops.object), 101  
multires\_external\_save() (in module bpy.ops.object), 101  
multires\_higher\_levels\_delete() (in module bpy.ops.object), 102  
multires\_reshape() (in module bpy.ops.object), 102  
multires\_subdivide() (in module bpy.ops.object), 102  
MultiresModifier (class in bpy.types), 618  
MultiresModifier.is\_external (in module bpy.types), 618  
MultiresModifier.total\_levels (in module bpy.types), 619

**musgrave\_type** (bpy.types.MusgraveTexture attribute), 620  
**MusgraveTexture** (class in bpy.types), 619  
**MusgraveTexture.users\_material** (in module bpy.types), 620  
**MusgraveTexture.users\_object\_modifier** (in module bpy.types), 620  
**mute** (bpy.types.Constraint attribute), 352  
**mute** (bpy.types.FCurve attribute), 413  
**mute** (bpy.types.FModifier attribute), 418  
**mute** (bpy.types.NlaStrip attribute), 624  
**mute** (bpy.types.NlaTrack attribute), 627  
**mute** (bpy.types.Sequence attribute), 796  
**mute** (bpy.types.ShapeKey attribute), 825  
**mute()** (in module bpy.ops.sequencer), 128  
**mute\_toggle()** (in module bpy.ops.nla), 88  
**mute\_toggle()** (in module bpy.ops.node), 91

## N

**nabla** (bpy.types.CloudsTexture attribute), 282  
**nabla** (bpy.types.DistortedNoiseTexture attribute), 380  
**nabla** (bpy.types.MarbleTexture attribute), 544  
**nabla** (bpy.types.MusgraveTexture attribute), 620  
**nabla** (bpy.types.VoronoiTexture attribute), 1040  
**nabla** (bpy.types.WoodTexture attribute), 1054  
**name** (bge.types.BL\_ArmatureBone attribute), 1233  
**name** (bge.types.BL\_ArmatureChannel attribute), 1229  
**name** (bge.types.BL\_ArmatureConstraint attribute), 1228  
**name** (bge.types.CValue attribute), 1163  
**name** (bge.types.KX\_GameObject attribute), 1174  
**name** (bge.types.KX\_Scene attribute), 1204  
**name** (bge.types.SCA\_ILogicBrick attribute), 1163  
**name** (bpy.types.ActionGroup attribute), 176  
**name** (bpy.types.Actuator attribute), 179  
**name** (bpy.types.BoidRule attribute), 242  
**name** (bpy.types.BoidState attribute), 251  
**name** (bpy.types.Bone attribute), 253  
**name** (bpy.types.BoneGroup attribute), 256  
**name** (bpy.types.Constraint attribute), 352  
**name** (bpy.types.Controller attribute), 360  
**name** (bpy.types.DriverVariable attribute), 389  
**name** (bpy.types.EditBone attribute), 393  
**name** (bpy.types.GameProperty attribute), 456  
**name** (bpy.types.ID attribute), 472  
**name** (bpy.types.KeyConfig attribute), 496  
**name** (bpy.types.KeyingSet attribute), 513  
**name** (bpy.types.MeshColorLayer attribute), 581  
**name** (bpy.types.MeshFloatPropertyLayer attribute), 588  
**name** (bpy.types.MeshIntPropertyLayer attribute), 590  
**name** (bpy.types.MeshStringPropertyLayer attribute), 592  
**name** (bpy.types.MeshTextureFaceLayer attribute), 595  
**name** (bpy.types.Modifier attribute), 608  
**name** (bpy.types.NlaStrip attribute), 624  
**name** (bpy.types.NlaTrack attribute), 627  
**name** (bpy.types.Node attribute), 629  
**name** (bpy.types.NodeSocket attribute), 633  
**name** (bpy.types.OperatorFileListElement attribute), 662  
**name** (bpy.types.ParticleSystem attribute), 702  
**name** (bpy.types.PointCache attribute), 712  
**name** (bpy.types.PoseBone attribute), 725  
**name** (bpy.types.PropertyGroup attribute), 732  
**name** (bpy.types.SceneRenderLayer attribute), 781  
**name** (bpy.types.Sensor attribute), 793  
**name** (bpy.types.Sequence attribute), 796  
**name** (bpy.types.ShapeKey attribute), 825  
**name** (bpy.types.Theme attribute), 932  
**name** (bpy.types.TimelineMarker attribute), 973  
**name** (bpy.types.TransformOrientation attribute), 984  
**name** (bpy.types.VertexGroup attribute), 1035  
**NandController** (class in bpy.types), 621  
**narrowness** (bpy.types.WaveModifier attribute), 1047  
**ndof\_fly\_helicopter** (bpy.types.UserPreferencesInput attribute), 1022  
**ndof\_lock\_horizon** (bpy.types.UserPreferencesInput attribute), 1022  
**ndof\_orbit()** (in module bpy.ops.view3d), 156  
**ndof\_orbit\_invert\_axes** (bpy.types.UserPreferencesInput attribute), 1022  
**ndof\_pan()** (in module bpy.ops.view3d), 156  
**ndof\_sensitivity** (bpy.types.UserPreferencesInput attribute), 1022  
**ndof\_sensitivity\_change()** (in module bpy.ops.wm), 165  
**ndof\_show\_guide** (bpy.types.UserPreferencesInput attribute), 1022  
**ndof\_zoom\_invert** (bpy.types.UserPreferencesInput attribute), 1022  
**ndof\_zoom\_updown** (bpy.types.UserPreferencesInput attribute), 1022  
**near** (bge.types.KX\_Camera attribute), 1220  
**NearSensor** (class in bpy.types), 622  
**negate()** (mathutils.Vector method), 1094  
**new()** (bpy.types.ActionFCurves method), 174  
**new()** (bpy.types.ActionGroups method), 177  
**new()** (bpy.types.ActionPoseMarkers method), 178  
**new()** (bpy.types.Addons class method), 181  
**new()** (bpy.types.ArmatureEditBones method), 203  
**new()** (bpy.types.BlendDataActions method), 215  
**new()** (bpy.types.BlendDataArmatures method), 216  
**new()** (bpy.types.BlendDataBrushes method), 217  
**new()** (bpy.types.BlendDataCameras method), 218  
**new()** (bpy.types.BlendDataCurves method), 219  
**new()** (bpy.types.BlendDataGroups method), 221  
**new()** (bpy.types.BlendDataImages method), 222  
**new()** (bpy.types.BlendDataLamps method), 224  
**new()** (bpy.types.BlendDataLattices method), 225  
**new()** (bpy.types.BlendDataMaterials method), 227  
**new()** (bpy.types.BlendDataMeshes method), 228  
**new()** (bpy.types.BlendDataMetaBalls method), 229

new() (bpy.types.BlendDataNodeTrees method), 230  
new() (bpy.types.BlendDataObjects method), 231  
new() (bpy.types.BlendDataParticles method), 232  
new() (bpy.types.BlendDataScenes method), 233  
new() (bpy.types.BlendDataTexts method), 236  
new() (bpy.types.BlendDataTextures method), 237  
new() (bpy.types.BlendDataWorlds method), 239  
new() (bpy.types.ChannelDriverVariables method), 272  
new() (bpy.types.ColorRampElements method), 290  
new() (bpy.types.CompositorNodes method), 350  
new() (bpy.types.CurveSplines method), 375  
new() (bpy.types.FCurveModifiers method), 417  
new() (bpy.types.GroupInputs method), 465  
new() (bpy.types.GroupOutputs method), 467  
new() (bpy.types.KeyConfigurations method), 497  
new() (bpy.types.KeyingSets method), 518  
new() (bpy.types.KeyMapItems method), 503  
new() (bpy.types.KeyMaps method), 507  
new() (bpy.types.MetaBallElements method), 602  
new() (bpy.types.NlaStrips method), 626  
new() (bpy.types.NlaTracks method), 628  
new() (bpy.types.NodeLinks method), 632  
new() (bpy.types.ObjectConstraints method), 652  
new() (bpy.types.ObjectModifiers method), 653  
new() (bpy.types.PoseBoneConstraints method), 727  
new() (bpy.types.ShaderNodes method), 823  
new() (bpy.types.TextureNodes method), 929  
new() (bpy.types.TimelineMarkers method), 973  
new() (bpy.types.UVTextures method), 1012  
new() (bpy.types.VertexColors method), 1034  
new() (bpy.types.VertexGroups method), 1037  
new() (in module bpy.ops.action), 34  
new() (in module bpy.ops.image), 64  
new() (in module bpy.ops.material), 74  
new() (in module bpy.ops.particle), 113  
new() (in module bpy.ops.poselib), 118  
new() (in module bpy.ops.scene), 120  
new() (in module bpy.ops.screen), 122  
new() (in module bpy.ops.text), 136  
new() (in module bpy.ops.texture), 139  
new() (in module bpy.ops.world), 170  
new\_modal() (bpy.types.KeyMapItems method), 505  
new\_target() (in module bpy.ops.particle), 113  
next() (in module bpy.ops.file), 55  
next\_edit() (in module bpy.ops.sequencer), 128  
next\_marker() (in module bpy.ops.text), 136  
ngon\_tesselate() (in module bpy\_extras.mesh\_utils), 1160  
NINEKEY (in module bge.events), 1262  
NKEY (in module bge.events), 1261  
NlaStrip (class in bpy.types), 623  
NlaStrip.active (in module bpy.types), 623  
NlaStrip.fcurves (in module bpy.types), 624  
NlaStrip.modifiers (in module bpy.types), 624  
NlaStrip.strips (in module bpy.types), 625  
NlaStrip.type (in module bpy.types), 625  
NlaStrips (class in bpy.types), 626  
NlaTrack (class in bpy.types), 627  
NlaTrack.active (in module bpy.types), 627  
NlaTrack.is\_solo (in module bpy.types), 627  
NlaTrack.strips (in module bpy.types), 627  
NlaTracks (class in bpy.types), 628  
Node (class in bpy.types), 629  
Node.inputs (in module bpy.types), 629  
Node.outputs (in module bpy.types), 629  
node\_backdrop (bpy.types.ThemeNodeEditor attribute),  
    953  
node\_output (bpy.types.CompositorNodeTexture attribute), 341  
node\_output (bpy.types.ShaderNodeTexture attribute),  
    818  
node\_output (bpy.types.TextureNodeTexture attribute),  
    925  
node\_tree (bpy.types.NodeGroup attribute), 630  
NodeGroup (class in bpy.types), 630  
NodeLink (class in bpy.types), 631  
NodeLink.from\_node (in module bpy.types), 631  
NodeLink.from\_socket (in module bpy.types), 631  
NodeLink.to\_node (in module bpy.types), 631  
NodeLink.to\_socket (in module bpy.types), 631  
NodeLinks (class in bpy.types), 632  
NodeSocket (class in bpy.types), 633  
NodeSocket.type (in module bpy.types), 633  
NodeTree (class in bpy.types), 634  
NodeTree.animation\_data (in module bpy.types), 634  
NodeTree.inputs (in module bpy.types), 634  
NodeTree.links (in module bpy.types), 634  
NodeTree.outputs (in module bpy.types), 634  
NodeTree.type (in module bpy.types), 634  
noise (bpy.types.FieldSettings attribute), 430  
noise() (in module bpy.ops.mesh), 79  
noise\_basis (bpy.types.CloudsTexture attribute), 282  
noise\_basis (bpy.types.DistortedNoiseTexture attribute),  
    380  
noise\_basis (bpy.types.MarbleTexture attribute), 544  
noise\_basis (bpy.types.MusgraveTexture attribute), 620  
noise\_basis (bpy.types.PointDensity attribute), 715  
noise\_basis (bpy.types.StucciTexture attribute), 892  
noise\_basis (bpy.types.WoodTexture attribute), 1054  
noise\_basis\_2 (bpy.types.MarbleTexture attribute), 544  
noise\_basis\_2 (bpy.types.WoodTexture attribute), 1054  
noise\_depth (bpy.types.CloudsTexture attribute), 282  
noise\_depth (bpy.types.MagicTexture attribute), 542  
noise\_depth (bpy.types.MarbleTexture attribute), 544  
noise\_distortion (bpy.types.DistortedNoiseTexture  
    attribute), 380  
noise\_intensity (bpy.types.MusgraveTexture attribute),  
    620

noise\_intensity (bpy.types.VoronoiTexture attribute), [1040](#)  
 noise\_scale (bpy.types.CloudsTexture attribute), [282](#)  
 noise\_scale (bpy.types.DistortedNoiseTexture attribute), [380](#)  
 noise\_scale (bpy.types.MarbleTexture attribute), [544](#)  
 noise\_scale (bpy.types.MusgraveTexture attribute), [620](#)  
 noise\_scale (bpy.types.StucciTexture attribute), [892](#)  
 noise\_scale (bpy.types.VoronoiTexture attribute), [1040](#)  
 noise\_scale (bpy.types.WoodTexture attribute), [1054](#)  
 noise\_type (bpy.types.CloudsTexture attribute), [282](#)  
 noise\_type (bpy.types.MarbleTexture attribute), [545](#)  
 noise\_type (bpy.types.SmokeDomainSettings attribute), [834](#)  
 noise\_type (bpy.types.StucciTexture attribute), [892](#)  
 noise\_type (bpy.types.WoodTexture attribute), [1054](#)  
 NoiseTexture (class in bpy.types), [635](#)  
 NoiseTexture.users\_material (in module bpy.types), [635](#)  
 NoiseTexture.users\_object\_modifier (in module bpy.types), [635](#)  
 noodle\_curving (bpy.types.ThemeNodeEditor attribute), [953](#)  
 NorController (class in bpy.types), [637](#)  
 normal (bge.types.KX\_VertexProxy attribute), [1210](#)  
 normal (bpy.types.MeshVertex attribute), [596](#)  
 normal (bpy.types.ThemeBoneColorSet attribute), [935](#)  
 normal (bpy.types.ThemeView3D attribute), [968](#)  
 normal() (in module mathutils.geometry), [1115](#)  
 normal\_angle (bpy.types.ImagePaint attribute), [480](#)  
 normal\_factor (bpy.types.MaterialTextureSlot attribute), [566](#)  
 normal\_factor (bpy.types.ParticleSettings attribute), [691](#)  
 normal\_map\_space (bpy.types.MaterialTextureSlot attribute), [566](#)  
 normal\_size (bpy.types.ToolSettings attribute), [976](#)  
 normal\_weight (bpy.types.Brush attribute), [261](#)  
 normalize() (mathutils.Vector method), [1094](#)  
 normalized() (mathutils.Vector method), [1094](#)  
 normals\_make\_consistent() (in module bpy.ops.mesh), [79](#)  
 numAxis (bge.types.SCA\_JoystickSensor attribute), [1215](#)  
 numButtons (bge.types.SCA\_JoystickSensor attribute), [1215](#)  
 numHats (bge.types.SCA\_JoystickSensor attribute), [1215](#)  
 numMaterials (bge.types.KX\_MeshProxy attribute), [1187](#)  
 numPolygons (bge.types.KX\_MeshProxy attribute), [1187](#)  
 nurb\_sel\_uiline (bpy.types.ThemeView3D attribute), [968](#)  
 nurb\_sel\_vline (bpy.types.ThemeView3D attribute), [968](#)  
 nurb\_uiline (bpy.types.ThemeView3D attribute), [968](#)  
 nurb\_vline (bpy.types.ThemeView3D attribute), [968](#)  
  
**O**  
 obj() (in module bpy.ops.export\_scene), [53](#)  
 obj() (in module bpy.ops.import\_scene), [69](#)  
 object (bge.types.KX\_CameraActuator attribute), [1172](#)  
 object (bge.types.KX\_ParentActuator attribute), [1192](#)  
 object (bge.types.KX\_SCA\_AddObjectActuator attribute), [1201](#)  
 object (bge.types.KX\_TrackToActuator attribute), [1207](#)  
 object (bpy.types.ArmatureModifier attribute), [204](#)  
 object (bpy.types.BoidRuleAvoid attribute), [244](#)  
 object (bpy.types.BoidRuleFollowLeader attribute), [246](#)  
 object (bpy.types.BoidRuleGoal attribute), [247](#)  
 object (bpy.types.BooleanModifier attribute), [257](#)  
 object (bpy.types.CameraActuator attribute), [270](#)  
 object (bpy.types.CastModifier attribute), [271](#)  
 object (bpy.types.CurveModifier attribute), [374](#)  
 object (bpy.types.EditObjectActuator attribute), [396](#)  
 object (bpy.types.HookModifier attribute), [471](#)  
 object (bpy.types.LampTextureSlot attribute), [526](#)  
 object (bpy.types.LatticeModifier attribute), [530](#)  
 object (bpy.types.MaterialTextureSlot attribute), [566](#)  
 object (bpy.types.MeshDeformModifier attribute), [582](#)  
 object (bpy.types.ParentActuator attribute), [673](#)  
 object (bpy.types.ParticleInstanceModifier attribute), [681](#)  
 object (bpy.types.ParticleSettingsTextureSlot attribute), [697](#)  
 object (bpy.types.ParticleTarget attribute), [707](#)  
 object (bpy.types.PointDensity attribute), [715](#)  
 object (bpy.types.PropertyActuator attribute), [730](#)  
 object (bpy.types.ScrewModifier attribute), [790](#)  
 object (bpy.types.UVProjector attribute), [1011](#)  
 object (bpy.types.WorldTextureSlot attribute), [1062](#)  
 Object (class in bpy.types), [637](#)  
 object (in module bpy.context), [28, 29](#)  
 Object.active\_shape\_key (in module bpy.types), [637](#)  
 Object.animation\_data (in module bpy.types), [638](#)  
 Object.animation\_visualisation (in module bpy.types), [638](#)  
 Object.bound\_box (in module bpy.types), [638](#)  
 Object.children (in module bpy.types), [644](#)  
 Object.collision (in module bpy.types), [638](#)  
 Object.constraints (in module bpy.types), [638](#)  
 Object.duplicati\_list (in module bpy.types), [639](#)  
 Object.field (in module bpy.types), [640](#)  
 Object.game (in module bpy.types), [640](#)  
 Object.is\_duplicator (in module bpy.types), [640](#)  
 Object.material\_slots (in module bpy.types), [641](#)  
 Object.mode (in module bpy.types), [641](#)  
 Object.modifiers (in module bpy.types), [641](#)  
 Object.motion\_path (in module bpy.types), [641](#)  
 Object.particle\_systems (in module bpy.types), [642](#)  
 Object.pose (in module bpy.types), [642](#)  
 Object.proxy (in module bpy.types), [642](#)  
 Object.proxy\_group (in module bpy.types), [642](#)  
 Object.soft\_body (in module bpy.types), [643](#)  
 Object.type (in module bpy.types), [643](#)  
 Object.users\_group (in module bpy.types), [644](#)  
 Object.users\_scene (in module bpy.types), [644](#)

Object.vertex\_groups (in module bpy.types), 644  
object\_active (bpy.types.ThemeView3D attribute), 968  
object\_align (bpy.types.UserPreferencesEdit attribute), 1016  
object\_align\_factor (bpy.types.ParticleSettings attribute), 691  
object\_as\_camera() (in module bpy.ops.view3d), 156  
object\_data\_add() (in module bpy\_extras.object\_utils), 1157  
object\_factor (bpy.types.ParticleSettings attribute), 691  
object\_from (bpy.types.WarpModifier attribute), 1045  
object\_grouped (bpy.types.ThemeView3D attribute), 968  
object\_grouped\_active (bpy.types.ThemeView3D attribute), 968  
object\_operation() (in module bpy.ops.outliner), 110  
object\_origin\_size (bpy.types.UserPreferencesView attribute), 1027  
object\_property (bpy.types.PropertyActuator attribute), 730  
object\_selected (bpy.types.ThemeView3D attribute), 969  
object\_to (bpy.types.WarpModifier attribute), 1045  
ObjectActuator (class in bpy.types), 648  
ObjectBase (class in bpy.types), 651  
ObjectBase.object (in module bpy.types), 651  
ObjectConstraints (class in bpy.types), 652  
objectLastCreated (bge.types.KX\_SCA\_AddObjectActuator attribute), 1201  
ObjectModifiers (class in bpy.types), 653  
objects (bge.types.KX\_Scene attribute), 1204  
objects\_add\_active() (in module bpy.ops.group), 64  
objects\_remove() (in module bpy.ops.group), 64  
objects\_remove\_active() (in module bpy.ops.group), 64  
objectsInactive (bge.types.KX\_Scene attribute), 1204  
ObstacleFluidSettings (class in bpy.types), 654  
occlusion (bge.types.KX\_GameObject attribute), 1175  
occlusion\_culling\_resolution (bpy.types.SceneGameData attribute), 777  
octaves (bpy.types.MusgraveTexture attribute), 620  
octree\_resolution (bpy.types.RenderSettings attribute), 758  
offset (bpy.types.CompositorNodeColorBalance attribute), 300  
offset (bpy.types.CompositorNodeMapValue attribute), 327  
offset (bpy.types.CompositorNodeTonemap attribute), 343  
offset (bpy.types.Curve attribute), 367  
offset (bpy.types.FloorConstraint attribute), 438  
offset (bpy.types.FollowPathConstraint attribute), 442  
offset (bpy.types.MusgraveTexture attribute), 620  
offset (bpy.types.PivotConstraint attribute), 708  
offset (bpy.types.ShrinkwrapModifier attribute), 830  
offset (bpy.types.SolidifyModifier attribute), 844  
offset (bpy.types.TextureNodeBricks attribute), 912  
offset (bpy.types.TextureSlot attribute), 931  
offset\_clear() (in module bpy.ops.sequencer), 128  
offset\_factor (bpy.types.FollowPathConstraint attribute), 442  
offset\_frequency (bpy.types.TextureNodeBricks attribute), 912  
offset\_location (bpy.types.ObjectActuator attribute), 649  
offset\_object (bpy.types.ArrayModifier attribute), 206  
offset\_rotation (bpy.types.ObjectActuator attribute), 649  
offset\_x (bpy.types.BackgroundImage attribute), 208  
offset\_x (bpy.types.SequenceTransform attribute), 802  
offset\_x (bpy.types.SpaceSequenceEditor attribute), 865  
offset\_x (bpy.types.TextCurve attribute), 904  
offset\_y (bpy.types.BackgroundImage attribute), 208  
offset\_y (bpy.types.SequenceTransform attribute), 802  
offset\_y (bpy.types.SpaceSequenceEditor attribute), 865  
offset\_y (bpy.types.TextCurve attribute), 905  
offset\_z (bpy.types.Material attribute), 549  
OKEY (in module bge.events), 1261  
ONEKEY (in module bge.events), 1262  
opacity (bpy.types.BackgroundImage attribute), 208  
open() (in module bpy.ops.font), 58  
open() (in module bpy.ops.image), 65  
open() (in module bpy.ops.sound), 132  
open() (in module bpy.ops.text), 136  
open\_left\_mouse\_delay (bpy.types.UserPreferencesView attribute), 1028  
open\_mainfile() (in module bpy.ops.wm), 165  
open\_right\_mouse\_delay (bpy.types.UserPreferencesView attribute), 1028  
open\_sublevel\_delay (bpy.types.UserPreferencesView attribute), 1028  
open\_toplevel\_delay (bpy.types.UserPreferencesView attribute), 1028  
opengl() (in module bpy.ops.render), 119  
operation (bge.types.KX\_StateActuator attribute), 1207  
operation (bpy.types.BooleanModifier attribute), 258  
operation (bpy.types.CompositorNodeMath attribute), 328  
operation (bpy.types.ShaderNodeMath attribute), 811  
operation (bpy.types.ShaderNodeVectorMath attribute), 822  
operation (bpy.types.StateActuator attribute), 887  
operation (bpy.types.TextureNodeMath attribute), 920  
operation() (in module bpy.ops.outliner), 110  
Operator (class in bpy.types), 660  
operator() (bpy.typesUILayout method), 996  
Operator.has\_reports (in module bpy.types), 660  
Operator.layout (in module bpy.types), 660  
Operator.name (in module bpy.types), 660  
Operator.properties (in module bpy.types), 660  
operator\_cheat\_sheet() (in module bpy.ops.help), 64  
operator\_context (bpy.typesUILayout attribute), 987

operator\_enum() (bpy.typesUILayout method), 999  
 operator\_menu\_enum() (bpy.typesUILayout method), 999  
 operator\_node (bpy.types.ThemeNodeEditor attribute), 953  
 operator\_preset\_add() (in module bpy.ops.wm), 166  
**OperatorFileListElement** (class in bpy.types), 662  
**OperatorMousePath** (class in bpy.types), 663  
**OperatorProperties** (class in bpy.types), 663  
**OperatorStrokeElement** (class in bpy.types), 664  
**OperatorTypeMacro** (class in bpy.types), 665  
**OperatorTypeMacro.properties** (in module bpy.types), 665  
 option (bge.types.KX\_ConstraintActuator attribute), 1173  
**OrController** (class in bpy.types), 666  
 order (mathutils.Euler attribute), 1085  
 order\_u (bpy.types.Spline attribute), 878  
 order\_v (bpy.types.Spline attribute), 878  
 orient\_weight (bpy.types.KinematicConstraint attribute), 521  
 orientation (aud.Handle attribute), 1156  
 orientation (bge.types.KX\_GameObject attribute), 1175  
 orientation (bge.types.KX\_SoundActuator attribute), 1207  
 origin (bpy.types.SimpleDeformModifier attribute), 832  
 origin\_clear() (in module bpy.ops.object), 102  
 origin\_set() (in module bpy.ops.object), 102  
 ortho\_scale (bge.types.KX\_Camera attribute), 1220  
 ortho\_scale (bpy.types.Camera attribute), 268  
 OrthoProjection() (mathutils.Matrix class method), 1085  
 oskey (bpy.types.KeyMapItem attribute), 501  
 OutflowFluidSettings (class in bpy.types), 666  
 outline (bpy.types.ThemeWidgetColors attribute), 970  
 outline\_width (bpy.types.ThemeView3D attribute), 969  
 output\_node (bpy.types.TextureSlot attribute), 931  
 overlay\_frame (bpy.types.SequenceEditor attribute), 800  
 overlay\_lock (bpy.types.SequenceEditor attribute), 800  
 overwrite\_toggle() (in module bpy.ops.text), 137  
 owner (bge.types.SCAILogicBrick attribute), 1163  
 owner (mathutils.Color attribute), 1084  
 owner (mathutils.Euler attribute), 1085  
 owner (mathutils.Matrix attribute), 1089  
 owner (mathutils.Quaternion attribute), 1091  
 owner (mathutils.Vector attribute), 1096  
 owner\_space (bpy.types.Constraint attribute), 352

**P**

pack() (in module bpy.ops.image), 65  
 pack() (in module bpy.ops.sound), 132  
 pack\_all() (in module bpy.ops.file), 55  
 pack\_islands() (in module bpy.ops.uv), 151  
**PackedFile** (class in bpy.types), 667  
 PackedFile.size (in module bpy.types), 667  
 PAD0 (in module bge.events), 1263  
 PAD1 (in module bge.events), 1263  
 PAD2 (in module bge.events), 1263  
 PAD3 (in module bge.events), 1263  
 PAD4 (in module bge.events), 1263  
 PAD5 (in module bge.events), 1263  
 PAD6 (in module bge.events), 1263  
 PAD7 (in module bge.events), 1263  
 PAD8 (in module bge.events), 1263  
 PAD9 (in module bge.events), 1263  
**PADASTERKEY** (in module bge.events), 1263  
**PADENTER** (in module bge.events), 1263  
**PADMINUS** (in module bge.events), 1263  
**PADPERIOD** (in module bge.events), 1263  
**PADPLUSKEY** (in module bge.events), 1263  
**PADSLASHKEY** (in module bge.events), 1263  
**PAGEDOWNKEY** (in module bge.events), 1264  
**PAGEUPKEY** (in module bge.events), 1264  
**Paint** (class in bpy.types), 668  
 pan() (in module bpy.ops.view2d), 153  
 panel (bpy.types.ThemeGraphEditor attribute), 945  
 panel (bpy.types.ThemeLogicEditor attribute), 949  
 panel (bpy.types.ThemeProperties attribute), 956  
 panel (bpy.types.ThemeView3D attribute), 969  
**Panel** (class in bpy.types), 671  
**Panel.layout** (in module bpy.types), 671  
 para1 (bge.types.SCA\_RandomActuator attribute), 1218  
 para2 (bge.types.SCA\_RandomActuator attribute), 1218  
 parent (bge.types.BL\_ArmatureBone attribute), 1235  
 parent (bge.types.BL\_ArmatureChannel attribute), 1229  
 parent (bge.types.KX\_GameObject attribute), 1175  
 parent (bpy.types.EditBone attribute), 393  
 parent (bpy.types.Object attribute), 641  
 parent (bpy.types.ParticleSystem attribute), 703  
 parent() (in module bpy.ops.file), 55  
 parent\_bone (bpy.types.Object attribute), 641  
 parent\_clear() (in module bpy.ops.armature), 40  
 parent\_clear() (in module bpy.ops.object), 102  
 parent\_index() (bpy.types.Bone method), 255  
 parent\_index() (bpy.types.EditBone method), 395  
 parent\_index() (bpy.types.PoseBone method), 726  
 parent\_no\_inverse\_set() (in module bpy.ops.object), 102  
 parent\_set() (in module bpy.ops.armature), 40  
 parent\_set() (in module bpy.ops.object), 102  
 parent\_type (bpy.types.Object attribute), 641  
 parent\_vertices (bpy.types.Object attribute), 642  
**ParentActuator** (class in bpy.types), 672  
 partial\_slip\_factor (bpy.types.DomainFluidSettings attribute), 382  
 partial\_slip\_factor (bpy.types.ObstacleFluidSettings attribute), 654  
**Particle** (class in bpy.types), 673  
**Particle.hair\_keys** (in module bpy.types), 674  
**Particle.is\_exist** (in module bpy.types), 674

Particle.is\_visible (in module bpy.types), 674  
Particle.particle\_keys (in module bpy.types), 674  
particle\_cache\_space (bpy.types.PointDensity attribute), 715  
particle\_edit\_object (in module bpy.context), 28  
particle\_edit\_toggle() (in module bpy.ops.particle), 113  
particle\_factor (bpy.types.ParticleSettings attribute), 691  
particle\_influence (bpy.types.ParticleFluidSettings attribute), 679  
particle\_size (bpy.types.ParticleSettings attribute), 691  
particle\_system (bpy.types.PointDensity attribute), 715  
particle\_system (bpy.types.SmokeFlowSettings attribute), 836  
particle\_system (in module bpy.context), 30  
particle\_system\_add() (in module bpy.ops.object), 102  
particle\_system\_editable (in module bpy.context), 30  
particle\_system\_index (bpy.types.ParticleInstanceModifier attribute), 681  
particle\_system\_remove() (in module bpy.ops.object), 102  
particle\_uv (bpy.types.ExplodeModifier attribute), 410  
ParticleBrush (class in bpy.types), 675  
ParticleBrush.curve (in module bpy.types), 675  
ParticleDupliWeight (class in bpy.types), 676  
ParticleDupliWeight.name (in module bpy.types), 676  
ParticleEdit (class in bpy.types), 677  
ParticleEdit.brush (in module bpy.types), 677  
ParticleEdit.is\_editable (in module bpy.types), 678  
ParticleEdit.is\_hair (in module bpy.types), 678  
ParticleEdit.object (in module bpy.types), 678  
ParticleFluidSettings (class in bpy.types), 679  
ParticleHairKey (class in bpy.types), 680  
ParticleInstanceModifier (class in bpy.types), 681  
ParticleKey (class in bpy.types), 683  
ParticleSettings (class in bpy.types), 684  
ParticleSettings.active\_dupliweight (in module bpy.types), 684  
ParticleSettings.animation\_data (in module bpy.types), 685  
ParticleSettings.boids (in module bpy.types), 686  
ParticleSettings.dupli\_weights (in module bpy.types), 688  
ParticleSettings.effector\_weights (in module bpy.types), 688  
ParticleSettings.fluid (in module bpy.types), 688  
ParticleSettings.force\_field\_1 (in module bpy.types), 688  
ParticleSettings.force\_field\_2 (in module bpy.types), 688  
ParticleSettings.is\_fluid (in module bpy.types), 689  
ParticleSettings.texture\_slots (in module bpy.types), 693  
ParticleSettingsTextureSlot (class in bpy.types), 697  
ParticleSettingsTextureSlots (class in bpy.types), 700  
ParticleSystem (class in bpy.types), 701  
ParticleSystem.active\_particle\_target (in module bpy.types), 701  
ParticleSystem.child\_particles (in module bpy.types), 701  
ParticleSystem.cloth (in module bpy.types), 701  
ParticleSystem.has\_multiple\_caches (in module bpy.types), 701  
ParticleSystem.is\_editable (in module bpy.types), 702  
ParticleSystem.is\_edited (in module bpy.types), 702  
ParticleSystem.is\_global\_hair (in module bpy.types), 702  
ParticleSystem.particles (in module bpy.types), 703  
ParticleSystem.point\_cache (in module bpy.types), 703  
ParticleSystem.targets (in module bpy.types), 703  
ParticleSystemModifier (class in bpy.types), 705  
ParticleSystemModifier.particle\_system (in module bpy.types), 705  
ParticleSystems (class in bpy.types), 706  
ParticleSystems.active (in module bpy.types), 706  
ParticleTarget (class in bpy.types), 707  
ParticleTarget.name (in module bpy.types), 707  
parts\_x (bpy.types.RenderSettings attribute), 758  
parts\_y (bpy.types.RenderSettings attribute), 758  
pass\_index (bpy.types.Material attribute), 549  
pass\_index (bpy.types.Object attribute), 642  
passepertout\_alpha (bpy.types.Camera attribute), 268  
passes (bpy.types.WorldLighting attribute), 1059  
passNumber (bge.types.SCA\_2DFilterActuator attribute), 1213  
paste() (in module bpy.ops.action), 34  
paste() (in module bpy.ops.console), 44  
paste() (in module bpy.ops.graph), 61  
paste() (in module bpy.ops.material), 74  
paste() (in module bpy.ops.pose), 116  
paste() (in module bpy.ops.sequencer), 128  
paste() (in module bpy.ops.text), 137  
paste\_driver\_button() (in module bpy.ops.anim), 38  
path\_duration (bpy.types.Curve attribute), 368  
path\_end (bpy.types.ParticleSettings attribute), 691  
path\_from\_id() (bpy.types.bpy\_struct method), 1071  
path\_menu() (bpy.types.Menu method), 575  
path\_open() (in module bpy.ops.wm), 166  
path\_reference() (in module bpy\_extras.io\_utils), 1158  
path\_reference\_copy() (in module bpy\_extras.io\_utils), 1158  
path\_reference\_mode (in module bpy\_extras.io\_utils), 1159  
path\_resolve() (bpy.types.bpy\_struct method), 1071  
path\_start (bpy.types.ParticleSettings attribute), 691  
paths\_calculate() (in module bpy.ops.object), 103  
paths\_calculate() (in module bpy.ops.pose), 116  
paths\_clear() (in module bpy.ops.object), 103  
paths\_clear() (in module bpy.ops.pose), 116  
pause() (bge.texture.VideoFFmpeg method), 1254  
PAUSEKEY (in module bge.events), 1264  
pen\_flip (bpy.types.OperatorStrokeElement attribute), 664  
PERIODKEY (in module bge.events), 1264  
permeability (bpy.types.CollisionSettings attribute), 287

perspective (bge.types.KX\_Camera attribute), 1221  
 phase (bpy.types.FModifierNoise attribute), 426  
 phase\_factor (bpy.types.ParticleSettings attribute), 691  
 phase\_factor\_random (bpy.types.ParticleSettings attribute), 691  
 phase\_multiplier (bpy.types.FModifierFunctionGenerator attribute), 423  
 phase\_offset (bpy.types.FModifierFunctionGenerator attribute), 423  
 physics\_engine (bpy.types.SceneGameData attribute), 777  
 physics\_gravity (bpy.types.SceneGameData attribute), 777  
 physics\_step\_max (bpy.types.SceneGameData attribute), 777  
 physics\_step\_sub (bpy.types.SceneGameData attribute), 777  
 physics\_type (bpy.types.GameObjectSettings attribute), 453  
 physics\_type (bpy.types.ParticleSettings attribute), 691  
 pid (bge.types.KX\_ObjectActuator attribute), 1192  
 pin (bpy.types.Actuator attribute), 179  
 pin (bpy.types.Sensor attribute), 793  
 pin() (in module bpy.ops.uv), 151  
 pin\_id (bpy.types.SpaceProperties attribute), 864  
 pin\_stiffness (bpy.types.ClothSettings attribute), 280  
 pin\_uv (bpy.types.MeshTextureFace attribute), 593  
 pitch (aud.Handle attribute), 1156  
 pitch (bge.types.KX\_SoundActuator attribute), 1206  
 pitch (bpy.types.BoidSettings attribute), 249  
 pitch (bpy.types.SoundActuator attribute), 847  
 pivot\_point (bpy.types.SpaceGraphEditor attribute), 854  
 pivot\_point (bpy.types.SpaceUVEditor attribute), 870  
 pivot\_point (bpy.types.SpaceView3D attribute), 873  
 pivot\_type (bpy.types.RigidBodyJointConstraint attribute), 766  
 pivot\_x (bpy.types.RigidBodyJointConstraint attribute), 766  
 pivot\_y (bpy.types.RigidBodyJointConstraint attribute), 766  
 pivot\_z (bpy.types.RigidBodyJointConstraint attribute), 766  
 PivotConstraint (class in bpy.types), 708  
 pixel\_aspect\_x (bpy.types.RenderSettings attribute), 758  
 pixel\_aspect\_y (bpy.types.RenderSettings attribute), 759  
 pixel\_filter\_type (bpy.types.RenderSettings attribute), 759  
 pixels (bpy.types.Image attribute), 477  
 PKEY (in module bge.events), 1261  
 plane\_offset (bpy.types.Brush attribute), 261  
 plane\_trim (bpy.types.Brush attribute), 261  
 plastic (bpy.types.SoftBodySettings attribute), 841  
 plasticity (bpy.types.SPFFluidSettings attribute), 768  
 play() (bge.texture.VideoFFmpeg method), 1254  
 play\_mode (bpy.types.ActionActuator attribute), 172  
 play\_rendered\_anim() (in module bpy.ops.render), 119  
 play\_type (bpy.types.FCurveActuator attribute), 414  
 plot() (bge.texture.ImageBuff method), 1255  
 plugin\_strip (bpy.types.ThemeSequenceEditor attribute), 958  
 PluginSequence (class in bpy.types), 709  
 PluginSequence.filename (in module bpy.types), 709  
 PluginTexture (class in bpy.types), 710  
 PluginTexture.users\_material (in module bpy.types), 711  
 PluginTexture.users\_object\_modifier (in module bpy.types), 711  
 ply() (in module bpy.ops.export\_mesh), 51  
 ply() (in module bpy.ops.import\_mesh), 69  
 point\_cache\_compress\_type  
     (bpy.types.SmokeDomainSettings attribute), 834  
 point\_source (bpy.types.PointDensity attribute), 715  
 PointCache (class in bpy.types), 712  
 PointCache.frames\_skipped (in module bpy.types), 712  
 PointCache.info (in module bpy.types), 712  
 PointCache.is\_baked (in module bpy.types), 712  
 PointCache.is\_baking (in module bpy.types), 712  
 PointCache.is\_outdated (in module bpy.types), 712  
 PointCache.point\_caches (in module bpy.types), 713  
 PointCaches (class in bpy.types), 714  
 PointDensity (class in bpy.types), 714  
 PointDensity.color\_ramp (in module bpy.types), 714  
 PointDensity.falloff\_curve (in module bpy.types), 715  
 PointDensityTexture (class in bpy.types), 717  
 PointDensityTexture.point\_density (in module bpy.types), 717  
 PointDensityTexture.users\_material (in module bpy.types), 717  
 PointDensityTexture.users\_object\_modifier (in module bpy.types), 717  
 PointerProperty (class in bpy.types), 720  
 PointerProperty() (in module bpy.props), 1081  
 PointerProperty.fixed\_type (in module bpy.types), 720  
 pointInsideFrustum() (bge.types.KX\_Camera method), 1222  
 PointLamp (class in bpy.types), 718  
 PointLamp.falloff\_curve (in module bpy.types), 718  
 points (bpy.types.ThemeFontStyle attribute), 942  
 points\_u (bpy.types.Lattice attribute), 529  
 points\_v (bpy.types.Lattice attribute), 529  
 points\_w (bpy.types.Lattice attribute), 529  
 POINTTOPOINT\_CONSTRAINT (in module bge.constraints), 1270  
 pole\_angle (bpy.types.KinematicConstraint attribute), 521  
 pole\_subtarget (bpy.types.KinematicConstraint attribute), 521

position (bpy.types.KinematicConstraint attribute), 521  
poll() (bpy.types.KeyingSetInfo method), 514  
poll() (bpy.types.Macro class method), 541  
poll() (bpy.types.Menu class method), 574  
poll() (bpy.types.Operator class method), 660  
poll() (bpy.types.Panel class method), 672  
poly\_order (bpy.types.FModifierGenerator attribute), 424  
pop() (bpy.types.IDMaterials method), 474  
Pose (class in bpy.types), 721  
Pose.animation\_visualisation (in module bpy.types), 721  
Pose.bone\_groups (in module bpy.types), 721  
Pose.bones (in module bpy.types), 721  
Pose.ik\_param (in module bpy.types), 721  
pose\_add() (in module bpy.ops.poselib), 118  
pose\_bone (in module bpy.context), 30  
pose\_head (bge.types.BL\_ArmatureChannel attribute), 1232  
pose\_library (bpy.types.Object attribute), 642  
pose\_matrix (bge.types.BL\_ArmatureChannel attribute), 1232  
pose\_position (bpy.types.Armature attribute), 199  
pose\_remove() (in module bpy.ops.poselib), 118  
pose\_rename() (in module bpy.ops.poselib), 118  
pose\_tail (bge.types.BL\_ArmatureChannel attribute), 1232  
PoseBone (class in bpy.types), 722  
PoseBone.basename (in module bpy.types), 725  
PoseBone.bone (in module bpy.types), 722  
PoseBone.center (in module bpy.types), 725  
PoseBone.child (in module bpy.types), 722  
PoseBone.children (in module bpy.types), 726  
PoseBone.children\_recursive (in module bpy.types), 726  
PoseBone.children\_recursive\_basename (in module bpy.types), 726  
PoseBone.constraints (in module bpy.types), 722  
PoseBone.head (in module bpy.types), 722  
PoseBone.is\_in\_ik\_chain (in module bpy.types), 723  
PoseBone.matrix\_channel (in module bpy.types), 724  
PoseBone.motion\_path (in module bpy.types), 724  
PoseBone.parent (in module bpy.types), 725  
PoseBone.parent\_recursive (in module bpy.types), 726  
PoseBone.tail (in module bpy.types), 725  
PoseBone.vector (in module bpy.types), 726  
PoseBone.x\_axis (in module bpy.types), 726  
PoseBone.y\_axis (in module bpy.types), 726  
PoseBone.z\_axis (in module bpy.types), 726  
PoseBoneConstraints (class in bpy.types), 727  
posemode\_toggle() (in module bpy.ops.object), 103  
position (aud.Handle attribute), 1157  
position (bge.texture.ImageViewport attribute), 1257  
position (bge.types.KX\_GameObject attribute), 1175  
position (bge.types.KX\_SoundActuator attribute), 1206  
position (bge.types.SCA\_MouseSensor attribute), 1188  
position (bge.types.SCA\_PythonMouse attribute), 1164  
position (bpy.types.ColorRampElement attribute), 289  
position (bpy.types.ParticleInstanceModifier attribute), 682  
position() (in module blf), 1148  
positive (bge.types.SCA\_ISensor attribute), 1165  
post\_draw (bge.types.KX\_Scene attribute), 1205  
power (bpy.types.CompositorNodeColorBalance attribute), 300  
pre\_draw (bge.types.KX\_Scene attribute), 1205  
pre\_roll (bpy.types.ClothSettings attribute), 280  
precision (bpy.types.Itasc attribute), 491  
precision (bpy.types.MeshDeformModifier attribute), 582  
prefetch\_frames (bpy.types.UserPreferencesSystem attribute), 1025  
premul (bpy.types.CompositorNodeAlphaOver attribute), 294  
prepend() (bpy.types.Header class method), 468  
prepend() (bpy.types.Menu class method), 575  
prepend() (bpy.types.Panel class method), 672  
preseek (bge.texture.VideoFFmpeg attribute), 1254  
preset\_add() (in module bpy.ops.cloth), 43  
preset\_add() (in module bpy.ops.render), 119  
preset\_find() (in module bpy.utils), 1072  
preset\_paths() (in module bpy.utils), 1072  
pressure (bpy.types.GPencilStrokePoint attribute), 448  
pressure (bpy.types.OperatorStrokeElement attribute), 664  
prev.angular\_velocity (bpy.types.Particle attribute), 674  
prev.location (bpy.types.Particle attribute), 674  
prev.rotation (bpy.types.Particle attribute), 674  
prev.velocity (bpy.types.Particle attribute), 674  
preview\_render\_type (bpy.types.Material attribute), 549  
preview\_resolution (bpy.types.DomainFluidSettings attribute), 382  
preview\_toggle() (in module bpy.ops.node), 92  
previewrange\_clear() (in module bpy.ops.anim), 38  
previewrange\_set() (in module bpy.ops.action), 34  
previewrange\_set() (in module bpy.ops.anim), 38  
previewrange\_set() (in module bpy.ops.graph), 62  
previous (bge.texture.FilterBlueScreen attribute), 1258  
previous (bge.texture.FilterColor attribute), 1258  
previous (bge.texture.FilterGray attribute), 1258  
previous (bge.texture.FilterLevel attribute), 1259  
previous (bge.texture.FilterNormal attribute), 1259  
previous() (in module bpy.ops.file), 55  
previous\_edit() (in module bpy.ops.sequencer), 128  
previous\_marker() (in module bpy.ops.text), 137  
primitive\_bezier\_circle\_add() (in module bpy.ops.curve), 46  
primitive\_bezier\_curve\_add() (in module bpy.ops.curve), 47  
primitive\_circle\_add() (in module bpy.ops.mesh), 79  
primitive\_cone\_add() (in module bpy.ops.mesh), 79

primitive\_cube\_add() (in module bpy.ops.mesh), 80  
 primitive\_cylinder\_add() (in module bpy.ops.mesh), 80  
 primitive\_grid\_add() (in module bpy.ops.mesh), 80  
 primitive\_ico\_sphere\_add() (in module bpy.ops.mesh), 81  
 primitive\_monkey\_add() (in module bpy.ops.mesh), 81  
 primitive\_nurbs\_circle\_add() (in module bpy.ops.curve), 47  
 primitive\_nurbs\_curve\_add() (in module bpy.ops.curve), 48  
 primitive\_nurbs\_path\_add() (in module bpy.ops.curve), 48  
 primitive\_nurbs\_surface\_circle\_add() (in module bpy.ops.surface), 132  
 primitive\_nurbs\_surface\_curve\_add() (in module bpy.ops.surface), 133  
 primitive\_nurbs\_surface\_cylinder\_add() (in module bpy.ops.surface), 133  
 primitive\_nurbs\_surface\_sphere\_add() (in module bpy.ops.surface), 134  
 primitive\_nurbs\_surface\_surface\_add() (in module bpy.ops.surface), 134  
 primitive\_nurbs\_surface\_torus\_add() (in module bpy.ops.surface), 134  
 primitive\_plane\_add() (in module bpy.ops.mesh), 82  
 primitive\_torus\_add() (in module bpy.ops.mesh), 82  
 primitive\_uv\_sphere\_add() (in module bpy.ops.mesh), 83  
 PrintGLInfo() (in module bge.logic), 1240  
 priority (bge.types.BL\_ActionActuator attribute), 1166  
 priority (bge.types.BL\_ShapeActionActuator attribute), 1170  
 priority (bpy.types.ActionActuator attribute), 172  
 priority (bpy.types.ShapeActionActuator attribute), 824  
 progression (bpy.types.BlendTexture attribute), 240  
 project\_apply() (in module bpy.ops.image), 65  
 project\_edit() (in module bpy.ops.image), 65  
 project\_from\_view() (in module bpy.ops.uv), 151  
 project\_image() (in module bpy.ops.paint), 111  
 projection\_matrix (bge.types.KX\_Camera attribute), 1221  
 projector\_count (bpy.types.UVProjectModifier attribute), 1010  
 prompt (bpy.types.SpaceConsole attribute), 851  
 prop() (bpy.typesUILayout method), 988  
 prop\_enum() (bpy.typesUILayout method), 992  
 prop\_menu\_enum() (bpy.typesUILayout method), 990  
 prop\_search() (bpy.typesUILayout method), 994  
 propagate() (in module bpy.ops.pose), 116  
 properties() (in module bpy.ops.graph), 62  
 properties() (in module bpy.ops.image), 65  
 properties() (in module bpy.ops.logic), 72  
 properties() (in module bpy.ops.nla), 88  
 properties() (in module bpy.ops.node), 92  
 properties() (in module bpy.ops.sequencer), 128  
 properties() (in module bpy.ops.text), 137  
 properties() (in module bpy.ops.view3d), 156  
 properties\_add() (in module bpy.ops.wm), 166  
 properties\_context\_change() (in module bpy.ops.wm), 166  
 properties\_edit() (in module bpy.ops.wm), 167  
 properties\_remove() (in module bpy.ops.wm), 167  
 property (bpy.types.ActionActuator attribute), 172  
 property (bpy.types.CollisionSensor attribute), 285  
 property (bpy.types.ConstraintActuator attribute), 355  
 property (bpy.types.FCurveActuator attribute), 414  
 property (bpy.types.NearSensor attribute), 622  
 property (bpy.types.PropertyActuator attribute), 730  
 property (bpy.types.PropertySensor attribute), 734  
 property (bpy.types.RadarSensor attribute), 738  
 property (bpy.types.RandomActuator attribute), 740  
 property (bpy.types.RaySensor attribute), 742  
 property (bpy.types.ShapeActionActuator attribute), 824  
 Property (class in bpy.types), 728  
 Property.description (in module bpy.types), 728  
 Property.identifier (in module bpy.types), 728  
 Property.is\_enum\_flag (in module bpy.types), 728  
 Property.is\_hidden (in module bpy.types), 728  
 Property.is\_never\_none (in module bpy.types), 728  
 Property.is\_output (in module bpy.types), 728  
 Property.is\_READONLY (in module bpy.types), 728  
 Property.is\_registered (in module bpy.types), 729  
 Property.is\_registered\_optional (in module bpy.types), 729  
 Property.is\_REQUIRED (in module bpy.types), 729  
 Property.is\_RUNTIME (in module bpy.types), 729  
 Property.is\_SKIP\_SAVE (in module bpy.types), 729  
 Property.name (in module bpy.types), 729  
 Property.srna (in module bpy.types), 729  
 Property.subtype (in module bpy.types), 729  
 Property.type (in module bpy.types), 729  
 Property.unit (in module bpy.types), 729  
 PropertyActuator (class in bpy.types), 730  
 PropertyGroup (class in bpy.types), 732  
 PropertyGroupItem (class in bpy.types), 733  
 PropertyGroupItem.collection (in module bpy.types), 733  
 PropertyGroupItem.group (in module bpy.types), 733  
 PropertyGroupItem.idp\_array (in module bpy.types), 733  
 PropertySensor (class in bpy.types), 734  
 propName (bge.types.BL\_ActionActuator attribute), 1166  
 propName (bge.types.BL\_ShapeActionActuator attribute), 1170  
 propName (bge.types.KX\_ConstraintActuator attribute), 1173  
 propName (bge.types.KX\_IpoActuator attribute), 1184  
 propName (bge.types.KX\_NetworkMessageActuator attribute), 1190  
 propName (bge.types.KX\_RaySensor attribute), 1200  
 propName (bge.types.KX\_TouchSensor attribute), 1189

propName (bge.types.SCA\_PropertyActuator attribute), 1217  
propName (bge.types.SCA\_PropertySensor attribute), 1217  
propName (bge.types.SCA\_RandomActuator attribute), 1218  
proportional\_coefficient (bpy.types.ObjectActuator attribute), 649  
proportional\_edit (bpy.types.ToolSettings attribute), 976  
proportional\_edit\_falloff (bpy.types.ToolSettings attribute), 976  
proportional\_size (bpy.types.ToolSettings attribute), 977  
props\_enum() (bpy.typesUILayout method), 990  
propvalue (bpy.types.KeyMapItem attribute), 501  
protect (bpy.types.ExplodeModifier attribute), 410  
proxy\_make() (in module bpy.ops.object), 103  
proxy\_render\_size (bpy.types.SpaceSequenceEditor attribute), 865  
puff\_mode (bpy.types.ParticleBrush attribute), 675  
pull (bpy.types.SoftBodySettings attribute), 842  
push (bpy.types.SoftBodySettings attribute), 842  
push() (in module bpy.ops.pose), 117  
push\_pull() (in module bpy.ops.transform), 141  
PyObjectPlus (class in bge.types), 1163  
python\_file\_run() (in module bpy.ops.script), 123  
PythonConstraint (class in bpy.types), 735  
PythonConstraint.has\_script\_error (in module bpy.types), 735  
PythonConstraint.targets (in module bpy.types), 735  
PythonController (class in bpy.types), 736

**Q**

QKEY (in module bge.events), 1262  
quad\_attenuation (bge.types.KX\_LightObject attribute), 1186  
quadratic\_attenuation (bpy.types.PointLamp attribute), 718  
quadratic\_attenuation (bpy.types.SpotLamp attribute), 884  
quadratic\_drag (bpy.types.FieldSettings attribute), 430  
quads\_convert\_to\_tris() (in module bpy.ops.mesh), 83  
quality (bpy.types.ClothSettings attribute), 280  
quality (bpy.types.CompositorNodeGlare attribute), 318  
quality (bpy.types.CompositorNodeOutputFile attribute), 331  
quality (bpy.types.ControlFluidSettings attribute), 359  
quality (bpy.types.GlowSequence attribute), 460  
Quaternion (class in mathutils), 1089  
Quaternion.conjugate() (in module mathutils), 1089  
Quaternion.conjugated() (in module mathutils), 1089  
Quaternion.copy() (in module mathutils), 1089  
Quaternion.difference() (in module mathutils), 1090  
Quaternion.identity() (in module mathutils), 1090  
Quaternion.invert() (in module mathutils), 1090  
Quaternion.inverted() (in module mathutils), 1090  
Quaternion.negate() (in module mathutils), 1090  
Quaternion.normalize() (in module mathutils), 1090  
Quaternion.normalized() (in module mathutils), 1090  
Quaternion.slerp() (in module mathutils), 1091  
quaternions\_flip() (in module bpy.ops.pose), 117  
queue\_count (bpy.types.BoidRuleFollowLeader attribute), 246  
quick\_explode() (in module bpy.ops.object), 103  
quick\_fluid() (in module bpy.ops.object), 103  
quick\_fur() (in module bpy.ops.object), 103  
quick\_smoke() (in module bpy.ops.object), 104  
quit\_blender() (in module bpy.ops.wm), 167  
QUOTEKEY (in module bge.events), 1264

**R**

r (bge.types.KX\_VertexProxy attribute), 1211  
r (mathutils.Color attribute), 1084  
RadarSensor (class in bpy.types), 738  
radial\_control() (in module bpy.ops.wm), 167  
radial\_falloff (bpy.types.FieldSettings attribute), 430  
radial\_max (bpy.types.FieldSettings attribute), 430  
radial\_min (bpy.types.FieldSettings attribute), 430  
radial\_symmetry (bpy.types.Sculpt attribute), 791  
radius (bpy.types.BezierSplinePoint attribute), 211  
radius (bpy.types.CastModifier attribute), 271  
radius (bpy.types.GameObjectSettings attribute), 453  
radius (bpy.types.MaterialSubsurfaceScattering attribute), 563  
radius (bpy.types.MetaElement attribute), 603  
radius (bpy.types.PointDensity attribute), 715  
radius (bpy.types.SplinePoint attribute), 882  
radius\_interpolation (bpy.types.Spline attribute), 878  
radius\_set() (in module bpy.ops.curve), 48  
random\_position (bpy.types.ParticleInstanceModifier attribute), 682  
RandomActuator (class in bpy.types), 739  
randomize\_transform() (in module bpy.ops.object), 104  
RandomSensor (class in bpy.types), 741  
range (bge.texture.VideoFFmpeg attribute), 1254  
range (bge.types.KX\_RaySensor attribute), 1200  
range (bpy.types.BoidSettings attribute), 249  
range (bpy.types.ConstraintActuator attribute), 355  
range (bpy.types.RaySensor attribute), 742  
range() (bpy.types.FCurve method), 413  
RAS\_2DFILTER\_BLUR (in module bge.logic), 1247  
RAS\_2DFILTER\_CUSTOMFILTER (in module bge.logic), 1247  
RAS\_2DFILTER\_DILATION (in module bge.logic), 1247  
RAS\_2DFILTER\_DISABLED (in module bge.logic), 1247  
RAS\_2DFILTER\_ENABLED (in module bge.logic), 1247

RAS\_2DFILTER\_EROSION (in module bge.logic), 1247  
 RAS\_2DFILTER\_GRAYSCALE (in module bge.logic), 1247  
 RAS\_2DFILTER\_INVERT (in module bge.logic), 1247  
 RAS\_2DFILTER\_LAPLACIAN (in module bge.logic), 1247  
 RAS\_2DFILTER\_MOTIONBLUR (in module bge.logic), 1248  
 RAS\_2DFILTER\_NOFILTER (in module bge.logic), 1248  
 RAS\_2DFILTER\_PREWITT (in module bge.logic), 1248  
 RAS\_2DFILTER\_SEPIA (in module bge.logic), 1248  
 RAS\_2DFILTER\_SHARPEN (in module bge.logic), 1248  
 RAS\_2DFILTER\_SOBEL (in module bge.logic), 1248  
 rate (aud.Device attribute), 1151  
 rate (bpy.types.Brush attribute), 261  
 ratio (bpy.types.CompositorNodeColorSpill attribute), 302  
 ratio (bpy.types.DecimateModifier attribute), 377  
 ray\_cast() (bpy.types.Object method), 645  
 ray\_type (bpy.types.RaySensor attribute), 742  
 rayCast() (bge.types.KX\_GameObject method), 1182  
 rayCastTo() (bge.types.KX\_GameObject method), 1182  
 rayDirection (bge.types.KX\_MouseFocusSensor attribute), 1189  
 rayDirection (bge.types.KX\_RaySensor attribute), 1201  
 rayLength (bge.types.KX\_ConstraintActuator attribute), 1173  
 raymir\_factor (bpy.types.MaterialTextureSlot attribute), 566  
 RaySensor (class in bpy.types), 742  
 raySource (bge.types.KX\_MouseFocusSensor attribute), 1188  
 rayTarget (bge.types.KX\_MouseFocusSensor attribute), 1189  
 raytrace\_method (bpy.types.RenderSettings attribute), 759  
 react\_event (bpy.types.ParticleSettings attribute), 691  
 reactor\_factor (bpy.types.ParticleSettings attribute), 691  
 reactor\_target\_object (bpy.types.ParticleSystem attribute), 703  
 reactor\_target\_particle\_system (bpy.types.ParticleSystem attribute), 703  
 read\_factory\_settings() (in module bpy.ops.wm), 167  
 read\_fullsamplelayers() (in module bpy.ops.node), 92  
 read\_homefile() (in module bpy.ops.wm), 167  
 read\_renderlayers() (in module bpy.ops.node), 92  
 reassign\_inputs() (in module bpy.ops.sequencer), 128  
 recent\_files (bpy.types.UserPreferencesFilePaths attribute), 1019  
 record\_composite() (in module bpy.ops.image), 65  
 recover\_auto\_save() (in module bpy.ops.wm), 167  
 recover\_last\_session() (in module bpy.ops.wm), 168  
 rect (bpy.types.RenderLayer attribute), 750  
 rect (bpy.types.RenderPass attribute), 754  
 redo() (in module bpy.ops.ed), 50  
 redo\_last() (in module bpy.ops.screen), 122  
 redraw\_timer() (in module bpy.ops.wm), 168  
 reference (bge.types.KX\_ObjectActuator attribute), 1192  
 reference\_axis (bpy.types.KinematicConstraint attribute), 521  
 reference\_object (bpy.types.ObjectActuator attribute), 649  
 reference\_value (bpy.types.FModifierEnvelope attribute), 421  
 reflect() (mathutils.Vector method), 1094  
 reflect\_factor (bpy.types.MaterialRaytraceMirror attribute), 558  
 reflection (bpy.types.MaterialVolume attribute), 571  
 reflection\_color (bpy.types.MaterialVolume attribute), 571  
 reflection\_color\_factor (bpy.types.MaterialTextureSlot attribute), 566  
 reflection\_factor (bpy.types.MaterialTextureSlot attribute), 566  
 refresh() (bge.texture.ImageFFmpeg method), 1255  
 refresh() (bge.texture.ImageMirror method), 1256  
 refresh() (bge.texture.ImageMix method), 1256  
 refresh() (bge.texture.ImageRender method), 1257  
 refresh() (bge.texture.ImageViewport method), 1257  
 refresh() (bge.texture.Texture method), 1258  
 refresh() (bge.texture.VideoFFmpeg method), 1254  
 refresh() (in module bpy.ops.file), 56  
 refresh\_all() (in module bpy.ops.sequencer), 128  
 refresh\_pyconstraints() (in module bpy.ops.text), 137  
 refresh\_script\_paths() (in module bpy.utils), 1072  
 Region (class in bpy.types), 743  
 Region.height (in module bpy.types), 743  
 Region.id (in module bpy.types), 743  
 Region.type (in module bpy.types), 743  
 Region.width (in module bpy.types), 743  
 region\_2d\_to\_location\_3d() (in module bpy\_extras.view3d\_utils), 1161  
 region\_2d\_to\_vector\_3d() (in module bpy\_extras.view3d\_utils), 1161  
 region\_flip() (in module bpy.ops.screen), 122  
 region\_quadview() (in module bpy.ops.screen), 122  
 region\_scale() (in module bpy.ops.screen), 122  
 region\_to\_loop() (in module bpy.ops.mesh), 83  
 RegionView3D (class in bpy.types), 744  
 RegionView3D.perspective\_matrix (in module bpy.types), 744  
 register\_class() (in module bpy.utils), 1073  
 register\_module() (in module bpy.utils), 1073  
 regrow\_hair (bpy.types.ParticleSettings attribute), 691  
 reinstancePhysicsMesh() (bge.types.KX\_GameObject method), 1184

reiteration\_method (bpy.types.Itasc attribute), 492  
rekey() (in module bpy.ops.particle), 113  
rel\_max\_x (bpy.types.CompositorNodeCrop attribute), 307  
rel\_max\_y (bpy.types.CompositorNodeCrop attribute), 307  
rel\_min\_x (bpy.types.CompositorNodeCrop attribute), 307  
rel\_min\_y (bpy.types.CompositorNodeCrop attribute), 307  
relative (aud.Handle attribute), 1157  
relative (bpy.types.CompositorNodeCrop attribute), 307  
relative\_key (bpy.types.ShapeKey attribute), 825  
relative\_offset\_displace (bpy.types.ArrayModifier attribute), 206  
relax() (in module bpy.ops.pose), 117  
reload() (bge.texture.ImageFFmpeg method), 1255  
reload() (bpy.types.Image method), 478  
reload() (in module bpy.ops.image), 65  
reload() (in module bpy.ops.script), 123  
reload() (in module bpy.ops.sequencer), 128  
reload() (in module bpy.ops.text), 137  
relpath() (in module bpy.path), 1074  
remove() (bpy.types.ActionFCurves method), 175  
remove() (bpy.types.ActionGroups method), 177  
remove() (bpy.types.ActionPoseMarkers method), 178  
remove() (bpy.types.Addons class method), 182  
remove() (bpy.types.ArmatureEditBones method), 203  
remove() (bpy.types.BlendDataActions method), 215  
remove() (bpy.types.BlendDataArmatures method), 216  
remove() (bpy.types.BlendDataBrushes method), 217  
remove() (bpy.types.BlendDataCameras method), 218  
remove() (bpy.types.BlendDataCurves method), 219  
remove() (bpy.types.BlendDataFonts method), 220  
remove() (bpy.types.BlendDataGroups method), 222  
remove() (bpy.types.BlendDataImages method), 223  
remove() (bpy.types.BlendDataLamps method), 224  
remove() (bpy.types.BlendDataLattices method), 225  
remove() (bpy.types.BlendDataMaterials method), 227  
remove() (bpy.types.BlendDataMeshes method), 228  
remove() (bpy.types.BlendDataMetaBalls method), 229  
remove() (bpy.types.BlendDataNodeTrees method), 230  
remove() (bpy.types.BlendDataObjects method), 231  
remove() (bpy.types.BlendDataParticles method), 232  
remove() (bpy.types.BlendDataScenes method), 233  
remove() (bpy.types.BlendDataTexts method), 236  
remove() (bpy.types.BlendDataTextures method), 237  
remove() (bpy.types.BlendDataWorlds method), 239  
remove() (bpy.types.ChannelDriverVariables method), 272  
remove() (bpy.types.ColorRampElements method), 290  
remove() (bpy.types.CompositorNodes method), 350  
remove() (bpy.types.CurveSplines method), 375  
remove() (bpy.types.FCurveKeyframePoints method), 416  
remove() (bpy.types.FCurveModifiers method), 417  
remove() (bpy.types.Header class method), 468  
remove() (bpy.types.KeyConfigurations method), 497  
remove() (bpy.types.KeyingSetPaths method), 517  
remove() (bpy.types.KeyMapItems method), 506  
remove() (bpy.types.Menu class method), 575  
remove() (bpy.types.MetaBallElements method), 602  
remove() (bpy.types.NlaStrips method), 626  
remove() (bpy.types.NlaTracks method), 628  
remove() (bpy.types.NodeLinks method), 632  
remove() (bpy.types.ObjectConstraints method), 652  
remove() (bpy.types.ObjectModifiers method), 653  
remove() (bpy.types.Panel class method), 672  
remove() (bpy.types.PoseBoneConstraints method), 727  
remove() (bpy.types.ShaderNodes method), 823  
remove() (bpy.types.TextureNodes method), 930  
remove() (bpy.types.TimelineMarkers method), 974  
remove() (bpy.types.VertexGroup method), 1035  
remove() (bpy.types.VertexGroups method), 1037  
remove() (in module bpy.ops.ptcache), 119  
remove\_doubles() (in module bpy.ops.mesh), 83  
remove\_doubles() (in module bpy.ops.particle), 113  
removeConstraint() (in module bge.constraints), 1266  
removeParent() (bge.types.KX\_GameObject method), 1181  
RemoveProperty() (in module bpy.props), 1081  
rename() (in module bpy.ops.file), 56  
rename() (in module bpy.ops.marker), 73  
render() (bpy.types.RenderEngine method), 747  
render() (in module bpy.ops.render), 120  
render\_border() (in module bpy.ops.view3d), 157  
render\_changed() (in module bpy.ops.node), 92  
render\_display\_mode (bpy.types.DomainFluidSettings attribute), 382  
render\_layer\_add() (in module bpy.ops.scene), 120  
render\_layer\_remove() (in module bpy.ops.scene), 120  
render\_levels (bpy.types.MultiresModifier attribute), 618  
render\_levels (bpy.types.SubsurfModifier attribute), 894  
render\_output\_directory (bpy.types.UserPreferencesFilePaths attribute), 1019  
render\_resolution (bpy.types.MetaBall attribute), 600  
render\_resolution\_u (bpy.types.Curve attribute), 368  
render\_resolution\_v (bpy.types.Curve attribute), 368  
render\_step (bpy.types.ParticleSettings attribute), 691  
render\_steps (bpy.types.ScrewModifier attribute), 790  
render\_type (bpy.types.ParticleSettings attribute), 692  
renderability\_toggle() (in module bpy.ops.outliner), 110  
rendered\_child\_count (bpy.types.ParticleSettings attribute), 692  
RenderEngine (class in bpy.types), 747  
RenderLayer (class in bpy.types), 748

RenderLayer.exclude\_ambient\_occlusion (in module bpy.types), 749  
 RenderLayer.exclude\_emit (in module bpy.types), 749  
 RenderLayer.exclude\_environment (in module bpy.types), 749  
 RenderLayer.exclude\_indirect (in module bpy.types), 749  
 RenderLayer.exclude\_reflection (in module bpy.types), 749  
 RenderLayer.exclude\_refraction (in module bpy.types), 749  
 RenderLayer.exclude\_shadow (in module bpy.types), 749  
 RenderLayer.exclude\_specular (in module bpy.types), 749  
 RenderLayer.invert\_zmask (in module bpy.types), 749  
 RenderLayer.layers (in module bpy.types), 749  
 RenderLayer.layers\_zmask (in module bpy.types), 749  
 RenderLayer.light\_override (in module bpy.types), 749  
 RenderLayer.material\_override (in module bpy.types), 749  
 RenderLayer.name (in module bpy.types), 750  
 RenderLayer.passes (in module bpy.types), 750  
 RenderLayer.use (in module bpy.types), 750  
 RenderLayer.use\_all\_z (in module bpy.types), 750  
 RenderLayer.use\_edge\_enhance (in module bpy.types), 750  
 RenderLayer.use\_halo (in module bpy.types), 750  
 RenderLayer.use\_pass\_ambient\_occlusion (in module bpy.types), 750  
 RenderLayer.use\_pass\_color (in module bpy.types), 750  
 RenderLayer.use\_pass\_combined (in module bpy.types), 750  
 RenderLayer.use\_pass\_diffuse (in module bpy.types), 750  
 RenderLayer.use\_pass\_emit (in module bpy.types), 750  
 RenderLayer.use\_pass\_environment (in module bpy.types), 750  
 RenderLayer.use\_pass\_indirect (in module bpy.types), 750  
 RenderLayer.use\_pass\_material\_index (in module bpy.types), 751  
 RenderLayer.use\_pass\_mist (in module bpy.types), 751  
 RenderLayer.use\_pass\_normal (in module bpy.types), 751  
 RenderLayer.use\_pass\_object\_index (in module bpy.types), 751  
 RenderLayer.use\_pass\_reflection (in module bpy.types), 751  
 RenderLayer.use\_pass\_refraction (in module bpy.types), 751  
 RenderLayer.use\_pass\_shadow (in module bpy.types), 751  
 RenderLayer.use\_pass\_specular (in module bpy.types), 751  
 RenderLayer.use\_pass\_uv (in module bpy.types), 751  
 RenderLayer.use\_pass\_vector (in module bpy.types), 751  
 RenderLayer.use\_pass\_z (in module bpy.types), 751  
 RenderLayer.use\_sky (in module bpy.types), 751  
 RenderLayer.use\_solid (in module bpy.types), 751  
 RenderLayer.use\_strand (in module bpy.types), 752  
 RenderLayer.use\_zmask (in module bpy.types), 752  
 RenderLayer.use\_ztransp (in module bpy.types), 752  
 RenderLayers (class in bpy.types), 753  
 RenderPass (class in bpy.types), 753  
 RenderPass.channel\_id (in module bpy.types), 753  
 RenderPass.channels (in module bpy.types), 753  
 RenderPass.name (in module bpy.types), 754  
 RenderPass.type (in module bpy.types), 754  
 RenderResult (class in bpy.types), 754  
 RenderResult.layers (in module bpy.types), 754  
 RenderResult.resolution\_x (in module bpy.types), 755  
 RenderResult.resolution\_y (in module bpy.types), 755  
 RenderSettings (class in bpy.types), 755  
 RenderSettings.file\_extension (in module bpy.types), 757  
 RenderSettings.has\_multiple\_engines (in module bpy.types), 758  
 RenderSettings.is\_movie\_format (in module bpy.types), 758  
 RenderSettings.layers (in module bpy.types), 758  
 RenderSettings.use\_game\_engine (in module bpy.types), 761  
 rendersize() (in module bpy.ops.sequencer), 128  
 repeat (bge.texture.VideoFFmpeg attribute), 1254  
 repeat (bge.types.SCA\_DelaySensor attribute), 1214  
 repeat (bpy.types.NlaStrip attribute), 624  
 repeat\_history() (in module bpy.ops.screen), 122  
 repeat\_last() (in module bpy.ops.screen), 122  
 repeat\_x (bpy.types.ImageTexture attribute), 485  
 repeat\_y (bpy.types.ImageTexture attribute), 485  
 repel\_force (bpy.types.ClothCollisionSettings attribute), 277  
 replace() (bge.types.KX\_Scene method), 1205  
 replace() (in module bpy.ops.image), 66  
 replace() (in module bpy.ops.text), 137  
 replace\_set\_selected() (in module bpy.ops.text), 137  
 replace\_text (bpy.types.SpaceTextEditor attribute), 867  
 replaceMesh() (bge.types.KX\_GameObject method), 1177  
 report() (bpy.types.Macro method), 541  
 report() (bpy.types.Operator method), 660  
 report() (bpy.types.RenderEngine method), 748  
 report\_copy() (in module bpy.ops.info), 70  
 report\_delete() (in module bpy.ops.info), 70  
 report\_missing\_files() (in module bpy.ops.file), 56  
 report\_replay() (in module bpy.ops.info), 70  
 reports\_display\_update() (in module bpy.ops.info), 70  
 reports\_to\_textblock() (in module bpy.ops.ui), 148  
 repulsion (bpy.types.SPHFluidSettings attribute), 768  
 reset() (bge.types.SCA\_ISensor method), 1165  
 reset() (in module bpy.ops.brush), 42

reset() (in module bpy.ops.uv), 151  
reset() (in module bpy.ops.view2d), 154  
reset\_default\_button() (in module bpy.ops.ui), 148  
reset\_default\_theme() (in module bpy.ops.ui), 148  
reset\_distance (bpy.types.NearSensor attribute), 622  
resetDistance (bge.types.KX\_NearSensor attribute), 1190  
resize() (in module bpy.ops.node), 92  
resize() (in module bpy.ops.transform), 141  
resize\_2d() (mathutils.Vector method), 1094  
resize\_3d() (mathutils.Vector method), 1094  
resize\_4d() (mathutils.Vector method), 1095  
resize\_4x4() (mathutils.Matrix method), 1087  
resolution (bpy.types.DomainFluidSettings attribute), 382  
resolution (bpy.types.EnvironmentMap attribute), 404  
resolution (bpy.types.Image attribute), 477  
resolution (bpy.types.MetaBall attribute), 600  
resolution (bpy.types.VoxelData attribute), 1042  
resolution\_max (bpy.types.SmokeDomainSettings attribute), 834  
resolution\_percentage (bpy.types.RenderSettings attribute), 759  
resolution\_u (bpy.types.Curve attribute), 368  
resolution\_u (bpy.types.Spline attribute), 878  
resolution\_v (bpy.types.Curve attribute), 368  
resolution\_v (bpy.types.Spline attribute), 878  
resolution\_x (bpy.types.RenderSettings attribute), 759  
resolution\_x (bpy.types.SceneGameData attribute), 777  
resolution\_y (bpy.types.RenderSettings attribute), 759  
resolution\_y (bpy.types.SceneGameData attribute), 777  
resolve\_conflict() (in module bpy.ops.text), 137  
resolve\_ncase() (in module bpy.path), 1075  
resource\_path() (in module bpy.utils), 1073  
rest\_density (bpy.types.SPHFluidSettings attribute), 768  
rest\_length (bpy.types.FieldSettings attribute), 431  
rest\_length (bpy.types.SPHFluidSettings attribute), 768  
rest\_length (bpy.types.StretchToConstraint attribute), 888  
rest\_shape\_key (bpy.types.ClothSettings attribute), 280  
restart() (bge.types.KX\_Scene method), 1205  
restartGame() (in module bge.logic), 1237  
restore\_item\_to\_default() (bpy.types.KeyMap method), 499  
restore\_to\_default() (bpy.types.KeyMap method), 499  
restoreDynamics() (bge.types.KX\_GameObject method), 1180  
resume() (bge.types.KX\_Scene method), 1205  
RETKEY (in module bge.events), 1264  
reveal() (in module bpy.ops.armature), 40  
reveal() (in module bpy.ops.curve), 48  
reveal() (in module bpy.ops.mesh), 83  
reveal() (in module bpy.ops.particle), 114  
reveal() (in module bpy.ops.pose), 117  
reveal() (in module bpy.ops.uv), 151  
reveal\_metaelems() (in module bpy.ops.mball), 74  
reverse() (bge.types.CListValue method), 1171

RGBANodeSocket (class in bpy.types), 737  
RIGHTALTKEY (in module bge.events), 1262  
RIGHTARROWKEY (in module bge.events), 1263  
RIGHTBRACKETKEY (in module bge.events), 1264  
RIGHTCTRLKEY (in module bge.events), 1262  
RIGHTMOUSE (in module bge.events), 1261  
RIGHTSHIFTKEY (in module bge.events), 1262  
RigidBodyJointConstraint (class in bpy.types), 765  
ring\_count (bpy.types.MaterialHalo attribute), 555  
rip() (in module bpy.ops.mesh), 83  
rip\_move() (in module bpy.ops.mesh), 83  
RKEY (in module bge.events), 1262  
roll (bge.types.BL\_ArmatureBone attribute), 1234  
roll (bpy.types.EditBone attribute), 393  
rolloff\_factor\_3d (bpy.types.SoundActuator attribute), 847  
rollOffFactor (bge.types.KX\_SoundActuator attribute), 1206  
root\_size (bpy.types.MaterialStrand attribute), 562  
rot\_clear() (in module bpy.ops.pose), 117  
rot\_error (bge.types.BL\_ArmatureConstraint attribute), 1228  
rotate() (in module bpy.ops.transform), 142  
rotate() (in module bpy.ops.view3d), 157  
rotate() (mathutils.Euler method), 1084  
rotate() (mathutils.Matrix method), 1087  
rotate() (mathutils.Quaternion method), 1090  
rotate\_axis() (mathutils.Euler method), 1084  
rotation (bpy.types.MetaElement attribute), 603  
rotation (bpy.types.Particle attribute), 674  
rotation (bpy.types.ParticleKey attribute), 683  
rotation (bpy.types.ShaderNodeMapping attribute), 809  
rotation (bpy.types.TexMapping attribute), 899  
ROTATION (in module blf), 1146  
rotation() (in module blf), 1148  
Rotation() (mathutils.Matrix class method), 1086  
rotation\_angle (bpy.types.UserPreferencesView attribute), 1028  
rotation\_axis\_angle (bpy.types.Object attribute), 642  
rotation\_axis\_angle (bpy.types.PoseBone attribute), 725  
rotation\_clear() (in module bpy.ops.object), 104  
rotation\_damping (bpy.types.GameObjectSettings attribute), 453  
rotation\_estimate (bpy.types.SoftBodySettings attribute), 842  
rotation\_euler (bge.types.BL\_ArmatureChannel attribute), 1231  
rotation\_euler (bpy.types.Object attribute), 642  
rotation\_euler (bpy.types.PoseBone attribute), 725  
rotation\_factor\_random (bpy.types.ParticleSettings attribute), 692  
rotation\_max (bpy.types.ConstraintActuator attribute), 355

rotation\_mode (bge.types.BL\_ArmatureChannel attribute), 1231  
 rotation\_mode (bpy.types.Object attribute), 642  
 rotation\_mode (bpy.types.ParticleSettings attribute), 692  
 rotation\_mode (bpy.types.PoseBone attribute), 725  
 rotation\_quaternion (bge.types.BL\_ArmatureChannel attribute), 1231  
 rotation\_quaternion (bpy.types.Object attribute), 642  
 rotation\_quaternion (bpy.types.PoseBone attribute), 725  
 rotation\_range (bpy.types.PivotConstraint attribute), 708  
 rotation\_start (bpy.types.TransformSequence attribute), 985  
 rotDamp (bge.types.KX\_ConstraintActuator attribute), 1173  
 rough\_factor (bpy.types.ParticleSettingsTextureSlot attribute), 697  
 roughness (bpy.types.Material attribute), 549  
 roughness\_1 (bpy.types.ParticleSettings attribute), 692  
 roughness\_1\_size (bpy.types.ParticleSettings attribute), 692  
 roughness\_2 (bpy.types.ParticleSettings attribute), 692  
 roughness\_2\_size (bpy.types.ParticleSettings attribute), 692  
 roughness\_2\_threshold (bpy.types.ParticleSettings attribute), 692  
 roughness\_end\_shape (bpy.types.ParticleSettings attribute), 692  
 roughness\_endpoint (bpy.types.ParticleSettings attribute), 692  
 row() (bpy.typesUILayout method), 987  
 row\_size (mathutils.Matrix attribute), 1089  
 rule\_add() (in module bpy.ops.boid), 41  
 rule\_del() (in module bpy.ops.boid), 41  
 rule\_fuzzy (bpy.types.BoidState attribute), 251  
 rule\_move\_down() (in module bpy.ops.boid), 41  
 rule\_move\_up() (in module bpy.ops.boid), 41  
 ruleset\_type (bpy.types.BoidState attribute), 251  
 run\_script() (in module bpy.ops.text), 137

## S

s (mathutils.Color attribute), 1084  
 sample() (in module bpy.ops.action), 34  
 sample() (in module bpy.ops.graph), 62  
 sample() (in module bpy.ops.image), 66  
 sample\_color() (in module bpy.ops.paint), 111  
 sample\_line() (in module bpy.ops.image), 66  
 sample\_method (bpy.types.WorldLighting attribute), 1059  
 samples (bpy.types.CompositorNodeDefocus attribute), 311  
 samples (bpy.types.CompositorNodeVecBlur attribute), 347  
 samples (bpy.types.WorldLighting attribute), 1059  
 saturation (bpy.types.Texture attribute), 909  
 save() (bpy.types.Image method), 478  
 save() (in module bpy.ops.image), 66  
 save() (in module bpy.ops.text), 137  
 save\_as() (in module bpy.ops.image), 66  
 save\_as() (in module bpy.ops.text), 137  
 save\_as\_mainfile() (in module bpy.ops.wm), 168  
 save\_dirty() (in module bpy.ops.image), 67  
 save\_homefile() (in module bpy.ops.wm), 169  
 save\_mainfile() (in module bpy.ops.wm), 169  
 save\_render() (bpy.types.Image method), 478  
 save\_sequence() (in module bpy.ops.image), 67  
 save\_version (bpy.types.UserPreferencesFilePaths attribute), 1019  
 saveGlobalDict() (in module bge.logic), 1237  
 SCA\_2DFilterActuator (class in bge.types), 1213  
 SCA\_ActuatorSensor (class in bge.types), 1213  
 SCA\_AlwaysSensor (class in bge.types), 1213  
 SCA\_ANDController (class in bge.types), 1213  
 SCA\_DelaySensor (class in bge.types), 1213  
 SCA\_IActuator (class in bge.types), 1166  
 SCA\_IController (class in bge.types), 1165  
 SCAILogicBrick (class in bge.types), 1163  
 SCA\_IObject (class in bge.types), 1164  
 SCA\_ISensor (class in bge.types), 1164  
 SCA\_JoystickSensor (class in bge.types), 1214  
 SCA\_KeyboardSensor (class in bge.types), 1216  
 SCA\_MouseSensor (class in bge.types), 1188  
 SCA\_NANDController (class in bge.types), 1217  
 SCA\_NORController (class in bge.types), 1217  
 SCA\_ORController (class in bge.types), 1217  
 SCA\_PropertyActuator (class in bge.types), 1217  
 SCA\_PropertySensor (class in bge.types), 1217  
 SCA\_PythonController (class in bge.types), 1217  
 SCA\_PythonKeyboard (class in bge.types), 1163  
 SCA\_PythonMouse (class in bge.types), 1164  
 SCA\_RandomActuator (class in bge.types), 1218  
 SCA\_RandomSensor (class in bge.types), 1220  
 SCA\_XNORController (class in bge.types), 1220  
 SCA\_XORController (class in bge.types), 1220  
 scale (bge.texture.ImageBuff attribute), 1255  
 scale (bge.texture.ImageFFmpeg attribute), 1255  
 scale (bge.texture.ImageMirror attribute), 1256  
 scale (bge.texture.ImageMix attribute), 1256  
 scale (bge.texture.ImageRender attribute), 1257  
 scale (bge.texture.ImageViewport attribute), 1258  
 scale (bge.texture.VideoFFmpeg attribute), 1254  
 scale (bge.types.BL\_ArmatureChannel attribute), 1230  
 scale (bpy.types.FModifierNoise attribute), 426  
 scale (bpy.types.MaterialSubsurfaceScattering attribute), 563  
 scale (bpy.types.NlaStrip attribute), 624  
 scale (bpy.types.Object attribute), 642  
 scale (bpy.types.PoseBone attribute), 725  
 scale (bpy.types.ShaderNodeMapping attribute), 809

scale (bpy.types.TexMapping attribute), 899  
scale (bpy.types.TextureSlot attribute), 931  
Scale() (mathutils.Matrix class method), 1086  
scale\_clear() (in module bpy.ops.object), 104  
scale\_clear() (in module bpy.ops.pose), 117  
scale\_estimate (bpy.types.SoftBodySettings attribute), 842  
scale\_length (bpy.types.UnitSettings attribute), 1012  
scale\_size() (in module bpy.ops.brush), 42  
scale\_start\_x (bpy.types.TransformSequence attribute), 985  
scale\_start\_y (bpy.types.TransformSequence attribute), 985  
scale\_to\_length (bpy.types.SpeedControlSequence attribute), 876  
scale\_x (bpy.typesUILayout attribute), 987  
scale\_x (bpy.types.UVProjectModifier attribute), 1010  
scale\_y (bpy.typesUILayout attribute), 987  
scale\_y (bpy.types.UVProjectModifier attribute), 1010  
scaling (bge.types.KX\_GameObject attribute), 1175  
scattering (bpy.types.MaterialVolume attribute), 571  
scattering\_factor (bpy.types.MaterialTextureSlot attribute), 566  
scene (bge.types.KX\_SceneActuator attribute), 1206  
scene (bpy.types.CompositorNodeRLayers attribute), 334  
scene (bpy.types.SceneActuator attribute), 774  
scene (bpy.types.SceneSequence attribute), 785  
scene (bpy.types.Screen attribute), 788  
Scene (class in bpy.types), 769  
scene (in module bpy.context), 27  
Scene.animation\_data (in module bpy.types), 769  
Scene.frame\_subframe (in module bpy.types), 770  
Scene.game\_settings (in module bpy.types), 771  
Scene.is\_nla\_tweakmode (in module bpy.types), 771  
Scene.keying\_sets (in module bpy.types), 771  
Scene.keying\_sets\_all (in module bpy.types), 771  
Scene.node\_tree (in module bpy.types), 771  
Scene.object\_bases (in module bpy.types), 771  
Scene.objects (in module bpy.types), 771  
Scene.orientations (in module bpy.types), 771  
Scene.render (in module bpy.types), 771  
Scene.sequence\_editor (in module bpy.types), 771  
Scene.timeline\_markers (in module bpy.types), 771  
Scene.tool\_settings (in module bpy.types), 772  
Scene.unit\_settings (in module bpy.types), 772  
scene\_camera (bpy.types.SceneSequence attribute), 785  
scene\_strip (bpy.types.ThemeSequenceEditor attribute), 958  
scene\_strip\_add() (in module bpy.ops.sequencer), 128  
SceneActuator (class in bpy.types), 774  
SceneBases (class in bpy.types), 775  
SceneGameData (class in bpy.types), 775  
SceneObjects (class in bpy.types), 779  
SceneRenderLayer (class in bpy.types), 780  
SceneSequence (class in bpy.types), 784  
SceneSequence.color\_balance (in module bpy.types), 784  
SceneSequence.crop (in module bpy.types), 785  
SceneSequence.proxy (in module bpy.types), 785  
SceneSequence.transform (in module bpy.types), 785  
scope\_back (bpy.types.ThemeImageEditor attribute), 947  
Scopes (class in bpy.types), 787  
scopes() (in module bpy.ops.image), 67  
Scopes.histogram (in module bpy.types), 787  
screen (bpy.types.Window attribute), 1049  
Screen (class in bpy.types), 788  
Screen.areas (in module bpy.types), 788  
Screen.is\_animation\_playing (in module bpy.types), 788  
Screen.show\_fullscreen (in module bpy.types), 788  
screen\_full\_area() (in module bpy.ops.screen), 122  
screen\_grab\_size (bpy.types.ImagePaint attribute), 480  
screen\_set() (in module bpy.ops.screen), 122  
screencast() (in module bpy.ops.screen), 122  
screencast\_fps (bpy.types.UserPreferencesSystem attribute), 1025  
screencast\_wait\_time (bpy.types.UserPreferencesSystem attribute), 1025  
screenshot() (in module bpy.ops.screen), 122  
screw() (in module bpy.ops.mesh), 84  
screw\_offset (bpy.types.ScrewModifier attribute), 790  
ScrewModifier (class in bpy.types), 790  
script (bge.types.SCA\_PythonController attribute), 1217  
script\_directory (bpy.types.UserPreferencesFilePaths attribute), 1019  
script\_paths() (in module bpy.utils), 1073  
scroll() (in module bpy.ops.text), 138  
scroll\_bar (bpy.types.ThemeTextEditor attribute), 960  
scroll\_bar() (in module bpy.ops.text), 138  
scroll\_down() (in module bpy.ops.view2d), 154  
scroll\_handle (bpy.types.ThemeFileBrowser attribute), 941  
scroll\_left() (in module bpy.ops.view2d), 154  
scroll\_page() (in module bpy.ops.outliner), 110  
scroll\_right() (in module bpy.ops.view2d), 154  
scroll\_up() (in module bpy.ops.view2d), 154  
scrollback (bpy.types.UserPreferencesSystem attribute), 1025  
scrollback\_append() (in module bpy.ops.console), 45  
scrollbar (bpy.types.ThemeFileBrowser attribute), 941  
scroller\_activate() (in module bpy.ops.view2d), 154  
Sculpt (class in bpy.types), 791  
sculpt\_levels (bpy.types.MultiresModifier attribute), 618  
sculpt\_object (in module bpy.context), 28  
sculpt\_paint\_overlay\_color (bpy.types.UserPreferencesEdit attribute), 1016  
sculpt\_paint\_use\_unified\_size (bpy.types.ToolSettings attribute), 977

sculpt\_paint\_use\_unified\_strength  
    (bpy.types.ToolSettings attribute), 977

sculpt\_plane (bpy.types.Brush attribute), 261

sculpt\_tool (bpy.types.Brush attribute), 261

sculpt\_tool\_set() (in module bpy.ops.brush), 42

sculptmode\_toggle() (in module bpy.ops.sculpt), 123

seam\_bleed (bpy.types.ImagePaint attribute), 480

search\_menu() (in module bpy.ops.wm), 169

secondary\_target (bpy.types.ArmatureActuator attribute), 201

seed (bge.types.SCA\_RandomActuator attribute), 1218

seed (bge.types.SCA\_RandomSensor attribute), 1220

seed (bpy.types.BuildModifier attribute), 266

seed (bpy.types.FieldSettings attribute), 431

seed (bpy.types.MaterialHalo attribute), 555

seed (bpy.types.ParticleSystem attribute), 703

seed (bpy.types.RandomActuator attribute), 740

seed (bpy.types.RandomSensor attribute), 741

select (bpy.types.ActionGroup attribute), 176

select (bpy.types.Bone attribute), 253

select (bpy.types.CurveMapPoint attribute), 371

select (bpy.types.EditBone attribute), 393

select (bpy.types.FCurve attribute), 413

select (bpy.types.FCurveSample attribute), 417

select (bpy.types.GPencilFrame attribute), 445

select (bpy.types.GPencilLayer attribute), 446

select (bpy.types.MeshEdge attribute), 583

select (bpy.types.MeshFace attribute), 585

select (bpy.types.MeshVertex attribute), 597

select (bpy.types.MotionPathVert attribute), 611

select (bpy.types.NlaStrip attribute), 624

select (bpy.types.NlaTrack attribute), 627

select (bpy.types.Object attribute), 642

select (bpy.types.ObjectBase attribute), 651

select (bpy.types.Sequence attribute), 796

select (bpy.types.SplinePoint attribute), 882

select (bpy.types.ThemeBoneColorSet attribute), 935

select (bpy.types.TimelineMarker attribute), 973

select() (in module bpy.ops.file), 56

select() (in module bpy.ops.marker), 73

select() (in module bpy.ops.node), 92

select() (in module bpy.ops.sequencer), 128

select() (in module bpy.ops.sketch), 131

select() (in module bpy.ops.uv), 151

select() (in module bpy.ops.view3d), 157

select\_active\_side() (in module bpy.ops.sequencer), 129

select\_all() (in module bpy.ops.armature), 40

select\_all() (in module bpy.ops.curve), 48

select\_all() (in module bpy.ops.lattice), 71

select\_all() (in module bpy.ops.marker), 73

select\_all() (in module bpy.ops.mball), 74

select\_all() (in module bpy.ops.mesh), 84

select\_all() (in module bpy.ops.node), 92

select\_all() (in module bpy.ops.object), 104

select\_all() (in module bpy.ops.particle), 114

select\_all() (in module bpy.ops.pose), 117

select\_all() (in module bpy.ops.text), 138

select\_all() (in module bpy.ops.uv), 151

select\_all\_toggle() (in module bpy.ops.action), 34

select\_all\_toggle() (in module bpy.ops.file), 56

select\_all\_toggle() (in module bpy.ops.graph), 62

select\_all\_toggle() (in module bpy.ops.info), 70

select\_all\_toggle() (in module bpy.ops.nla), 88

select\_all\_toggle() (in module bpy.ops.sequencer), 129

select\_axis() (in module bpy.ops.mesh), 84

select\_bookmark() (in module bpy.ops.file), 56

select\_border() (in module bpy.ops.action), 34

select\_border() (in module bpy.ops.file), 56

select\_border() (in module bpy.ops.graph), 62

select\_border() (in module bpy.ops.info), 70

select\_border() (in module bpy.ops.marker), 73

select\_border() (in module bpy.ops.nla), 88

select\_border() (in module bpy.ops.node), 92

select\_border() (in module bpy.ops.sequencer), 129

select\_border() (in module bpy.ops.uv), 151

select\_border() (in module bpy.ops.view3d), 157

select\_by\_layer() (in module bpy.ops.object), 104

select\_by\_number\_vertices() (in module bpy.ops.mesh), 84

select\_by\_type() (in module bpy.ops.object), 105

select\_camera() (in module bpy.ops.object), 105

select\_circle() (in module bpy.ops.view3d), 157

select\_column() (in module bpy.ops.action), 34

select\_column() (in module bpy.ops.graph), 62

select\_constraint\_target() (in module bpy.ops.pose), 117

select\_control\_point (bpy.types.BezierSplinePoint attribute), 211

select\_control\_point (bpy.types.Keyframe attribute), 512

select\_end (bpy.types.SpaceConsole attribute), 851

select\_flip\_active() (in module bpy.ops.pose), 117

select\_grouped() (in module bpy.ops.object), 105

select\_grouped() (in module bpy.ops.pose), 117

select\_handles() (in module bpy.ops.sequencer), 129

select\_head (bpy.types.Bone attribute), 253

select\_head (bpy.types.EditBone attribute), 393

select\_hierarchy() (in module bpy.ops.armature), 40

select\_hierarchy() (in module bpy.ops.object), 105

select\_hierarchy() (in module bpy.ops.pose), 117

select\_inverse() (in module bpy.ops.armature), 40

select\_inverse() (in module bpy.ops.curve), 48

select\_inverse() (in module bpy.ops.mesh), 84

select\_inverse() (in module bpy.ops.object), 105

select\_inverse() (in module bpy.ops.particle), 114

select\_inverse() (in module bpy.ops.pose), 118

select\_inverse() (in module bpy.ops.sequencer), 129

select\_inverse\_metalems() (in module bpy.ops.mball), 74

select\_lasso() (in module bpy.ops.view3d), 157

select\_left\_handle (bpy.types.BezierSplinePoint attribute), 211  
select\_left\_handle (bpy.types.Keyframe attribute), 512  
select\_left\_handle (bpy.types.Sequence attribute), 796  
select\_leftright() (in module bpy.ops.action), 34  
select\_leftright() (in module bpy.ops.graph), 62  
select\_leftright() (in module bpy.ops.nla), 89  
select\_less() (in module bpy.ops.action), 34  
select\_less() (in module bpy.ops.curve), 48  
select\_less() (in module bpy.ops.graph), 62  
select\_less() (in module bpy.ops.mesh), 84  
select\_less() (in module bpy.ops.particle), 114  
select\_less() (in module bpy.ops.sequencer), 129  
select\_line() (in module bpy.ops.text), 138  
select\_link\_viewer() (in module bpy.ops.node), 92  
select\_linked() (in module bpy.ops.action), 35  
select\_linked() (in module bpy.ops.armature), 40  
select\_linked() (in module bpy.ops.curve), 48  
select\_linked() (in module bpy.ops.graph), 62  
select\_linked() (in module bpy.ops.mesh), 84  
select\_linked() (in module bpy.ops.object), 105  
select\_linked() (in module bpy.ops.particle), 114  
select\_linked() (in module bpy.ops.pose), 118  
select\_linked() (in module bpy.ops.sequencer), 129  
select\_linked() (in module bpy.ops.uv), 152  
select\_linked\_from() (in module bpy.ops.node), 92  
select\_linked\_pick() (in module bpy.ops.curve), 49  
select\_linked\_pick() (in module bpy.ops.mesh), 84  
select\_linked\_pick() (in module bpy.ops.sequencer), 129  
select\_linked\_pick() (in module bpy.ops.uv), 152  
select\_linked\_to() (in module bpy.ops.node), 92  
select\_loop() (in module bpy.ops.uv), 152  
select\_mirror() (in module bpy.ops.mesh), 84  
select\_mirror() (in module bpy.ops.object), 105  
select\_mode (bpy.types.ParticleEdit attribute), 678  
select\_more() (in module bpy.ops.action), 35  
select\_more() (in module bpy.ops.curve), 49  
select\_more() (in module bpy.ops.graph), 62  
select\_more() (in module bpy.ops.mesh), 85  
select\_more() (in module bpy.ops.particle), 114  
select\_more() (in module bpy.ops.sequencer), 129  
select\_mouse (bpy.types.UserPreferencesInput attribute), 1022  
select\_name() (in module bpy.ops.object), 105  
select\_next() (in module bpy.ops.curve), 49  
select\_non\_manifold() (in module bpy.ops.mesh), 85  
select\_nth() (in module bpy.ops.curve), 49  
select\_nth() (in module bpy.ops.mesh), 85  
select\_orientation() (in module bpy.ops.transform), 143  
select\_parent() (in module bpy.ops.pose), 118  
select\_pattern() (in module bpy.ops.object), 106  
select\_pick() (in module bpy.ops.info), 71  
select\_pinned() (in module bpy.ops.uv), 152  
select\_previous() (in module bpy.ops.curve), 49  
at-  
select\_random() (in module bpy.ops.curve), 49  
select\_random() (in module bpy.ops.mesh), 85  
select\_random() (in module bpy.ops.object), 106  
select\_random\_metaelems() (in module bpy.ops.mball), 74  
select\_right\_handle (bpy.types.BezierSplinePoint attribute), 211  
select\_right\_handle (bpy.types.Keyframe attribute), 512  
select\_right\_handle (bpy.types.Sequence attribute), 796  
select\_roots() (in module bpy.ops.particle), 114  
select\_row() (in module bpy.ops.curve), 49  
select\_same\_group() (in module bpy.ops.object), 106  
select\_same\_type() (in module bpy.ops.node), 93  
select\_same\_type\_next() (in module bpy.ops.node), 93  
select\_same\_type\_prev() (in module bpy.ops.node), 93  
select\_set() (in module bpy.ops.console), 45  
select\_shortest\_path() (in module bpy.ops.mesh), 85  
select\_similar() (in module bpy.ops.mesh), 85  
select\_start (bpy.types.SpaceConsole attribute), 851  
select\_tail (bpy.types.Bone attribute), 253  
select\_tail (bpy.types.EditBone attribute), 393  
select\_tips() (in module bpy.ops.particle), 114  
select\_uv (bpy.types.MeshTextureFace attribute), 593  
select\_vertex\_path() (in module bpy.ops.mesh), 85  
select\_word() (in module bpy.ops.text), 138  
selectability\_toggle() (in module bpy.ops.outliner), 110  
selectable\_bases (in module bpy.context), 27, 29  
selectable\_objects (in module bpy.context), 27, 29  
selected\_bases (in module bpy.context), 27, 29  
selected\_bones (in module bpy.context), 28  
selected\_editable\_bases (in module bpy.context), 27, 29  
selected\_editable\_bones (in module bpy.context), 28  
selected\_editable\_objects (in module bpy.context), 27, 29  
selected\_editable\_sequences (in module bpy.context), 28  
selected\_file (bpy.types.ThemeFileBrowser attribute), 941  
selected\_nodes (in module bpy.context), 31  
selected\_objects (in module bpy.context), 27, 29  
selected\_pose\_bones (in module bpy.context), 28  
selected\_sequences (in module bpy.context), 28  
selected\_text (bpy.types.ThemeNodeEditor attribute), 953  
selected\_text (bpy.types.ThemeTextEditor attribute), 960  
selected\_toggle() (in module bpy.ops.outliner), 110  
selection\_set() (in module bpy.ops.text), 138  
self\_collision\_quality (bpy.types.ClothCollisionSettings attribute), 277  
self\_distance\_min (bpy.types.ClothCollisionSettings attribute), 277  
self\_friction (bpy.types.ClothCollisionSettings attribute), 277  
SEMICOLONKEY (in module bge.events), 1264  
sendMessage() (bge.types.KX\_GameObject method), 1183

**sendMessage()** (in module `bge.logic`), 1238  
**Sensor** (class in `bpy.types`), 793  
**sensor\_add()** (in module `bpy.ops.logic`), 72  
**sensor\_move()** (in module `bpy.ops.logic`), 72  
**sensor\_remove()** (in module `bpy.ops.logic`), 73  
**sensors** (`bge.types.KX_GameObject` attribute), 1176  
**sensors** (`bge.types.SCA_IController` attribute), 1165  
**separate()** (in module `bpy.ops.armature`), 41  
**separate()** (in module `bpy.ops.curve`), 49  
**separate()** (in module `bpy.ops.mesh`), 85  
**separator()** (`bpy.typesUILayout` method), 1005  
**seq\_slide()** (in module `bpy.ops.transform`), 143  
**Sequence** (class in `bpy.types`), 794  
**Sequence.frame\_duration** (in module `bpy.types`), 795  
**Sequence.frame\_offset\_end** (in module `bpy.types`), 795  
**Sequence.frame\_offset\_start** (in module `bpy.types`), 795  
**Sequence.frame\_still\_end** (in module `bpy.types`), 795  
**Sequence.frame\_still\_start** (in module `bpy.types`), 795  
**Sequence.input\_1** (in module `bpy.types`), 795  
**Sequence.input\_2** (in module `bpy.types`), 795  
**Sequence.input\_3** (in module `bpy.types`), 795  
**Sequence.input\_count** (in module `bpy.types`), 795  
**Sequence.type** (in module `bpy.types`), 796  
**sequence\_plugin\_directory**  
     (`bpy.types.UserPreferencesFilePaths` attribute), 1020  
**SequenceColorBalance** (class in `bpy.types`), 797  
**SequenceCrop** (class in `bpy.types`), 798  
**SequenceEditor** (class in `bpy.types`), 799  
**SequenceEditor.meta\_stack** (in module `bpy.types`), 799  
**SequenceEditor.sequences** (in module `bpy.types`), 800  
**SequenceEditor.sequences\_all** (in module `bpy.types`), 800  
**SequenceElement** (class in `bpy.types`), 800  
**SequenceElement.orig\_height** (in module `bpy.types`), 801  
**SequenceElement.orig\_width** (in module `bpy.types`), 801  
**SequenceProxy** (class in `bpy.types`), 801  
**sequencer\_gl\_preview** (`bpy.types.RenderSettings` attribute), 759  
**sequencer\_gl\_render** (`bpy.types.RenderSettings` attribute), 759  
**sequences** (in module `bpy.context`), 28  
**SequenceTransform** (class in `bpy.types`), 802  
**set\_persistent\_base()** (in module `bpy.ops.sculpt`), 123  
**setActive()** (`bge.types.KX_PhysicsObjectWrapper` method), 1192  
**setAmbientColor()** (in module `bge.render`), 1250  
**setAngularVelocity()** (`bge.types.KX_GameObject` method), 1180  
**setAngularVelocity()** (`bge.types.KX_PhysicsObjectWrapper` method), 1193  
**setAttrib()** (`bge.types.BL_Shader` method), 1168  
**setBackgroundColor()** (in module `bge.render`), 1250  
**setBlending()** (`bge.types.KX_BlenderMaterial` method), 1172  
**setBoolBernouilli()** (`bge.types.SCA_RandomActuator` method), 1219  
**setBoolConst()** (`bge.types.SCA_RandomActuator` method), 1219  
**setBoolUniform()** (`bge.types.SCA_RandomActuator` method), 1219  
**setCcdMode()** (in module `bge.constraints`), 1266  
**setChannel()** (`bge.types.BL_ActionActuator` method), 1167  
**setCollisionMargin()** (`bge.types.KX_GameObject` method), 1183  
**setContactBreakingTreshold()** (in module `bge.constraints`), 1266  
**setCustomMaterial()** (`bge.types.KX_PolygonMaterial` method), 1199  
**setDeactivationAngularTreshold()** (in module `bge.constraints`), 1266  
**setDeactivationLinearTreshold()** (in module `bge.constraints`), 1267  
**setDeactivationTime()** (in module `bge.constraints`), 1267  
**setDebugMode()** (in module `bge.constraints`), 1267  
**setEyeSeparation()** (in module `bge.render`), 1251  
**setFloatConst()** (`bge.types.SCA_RandomActuator` method), 1219  
**setFloatNegativeExponential()**  
     (`bge.types.SCA_RandomActuator` method), 1219  
**setFloatNormal()** (`bge.types.SCA_RandomActuator` method), 1219  
**setFloatUniform()** (`bge.types.SCA_RandomActuator` method), 1219  
**setFocalLength()** (in module `bge.render`), 1251  
**setGLSLMaterialSetting()** (in module `bge.render`), 1251  
**setGravity()** (in module `bge.constraints`), 1267  
**setGravity()** (in module `bge.logic`), 1238  
**setIntConst()** (`bge.types.SCA_RandomActuator` method), 1219  
**setIntPoisson()** (`bge.types.SCA_RandomActuator` method), 1219  
**setIntUniform()** (`bge.types.SCA_RandomActuator` method), 1219  
**setLinearAirDamping()** (in module `bge.constraints`), 1267  
**setLinearVelocity()** (`bge.types.KX_GameObject` method), 1179  
**setLinearVelocity()** (`bge.types.KX_PhysicsObjectWrapper` method), 1193  
**setLogicTicRate()** (in module `bge.logic`), 1239  
**setMaterialMode()** (in module `bge.render`), 1251  
**setMaxLogicFrame()** (in module `bge.logic`), 1238  
**setMaxPhysicsFrame()** (in module `bge.logic`), 1239  
**setMistColor()** (in module `bge.render`), 1250  
**setMistEnd()** (in module `bge.render`), 1251  
**setMistStart()** (in module `bge.render`), 1251  
**setMousePosition()** (in module `bge.render`), 1250

setNormal() (bge.types.KX\_VertexProxy method), 1212  
setNumberOfPasses() (bge.types.BL\_Shader method), 1168  
setNumIterations() (in module bge.constraints), 1267  
setNumTimeSubSteps() (in module bge.constraints), 1268  
setOcclusion() (bge.types.KX\_GameObject method), 1178  
setOnTop() (bge.types.KX\_Camera method), 1223  
setParent() (bge.types.KX\_GameObject method), 1181  
setPhysicsTicRate() (in module bge.logic), 1239  
setRGBA() (bge.types.KX\_VertexProxy method), 1212  
setRollInfluence() (bge.types.KX\_VehicleWrapper method), 1209  
setSampler() (bge.types.BL\_Shader method), 1168  
setSeed() (bge.types.SCA\_RandomSensor method), 1220  
setSolverDamping() (in module bge.constraints), 1268  
setSolverTau() (in module bge.constraints), 1268  
setSolverType() (in module bge.constraints), 1268  
setSorConstant() (in module bge.constraints), 1268  
setSource() (bge.texture.ImageMix method), 1256  
setSource() (bge.types.BL\_Shader method), 1168  
setSteeringValue() (bge.types.KX\_VehicleWrapper method), 1209  
setSuspensionCompression() (bge.types.KX\_VehicleWrapper method), 1209  
setSuspensionDamping() (bge.types.KX\_VehicleWrapper method), 1209  
setSuspensionStiffness() (bge.types.KX\_VehicleWrapper method), 1209  
setTexture() (bge.types.KX\_PolygonMaterial method), 1198  
settings ( bpy.types.ParticleSystem attribute), 703  
setTyreFriction() (bge.types.KX\_VehicleWrapper method), 1209  
setUniform1f() (bge.types.BL\_Shader method), 1168  
setUniform1i() (bge.types.BL\_Shader method), 1168  
setUniform2f() (bge.types.BL\_Shader method), 1168  
setUniform2i() (bge.types.BL\_Shader method), 1168  
setUniform3f() (bge.types.BL\_Shader method), 1168  
setUniform3i() (bge.types.BL\_Shader method), 1169  
setUniform4f() (bge.types.BL\_Shader method), 1169  
setUniform4i() (bge.types.BL\_Shader method), 1169  
setUniformDef() (bge.types.BL\_Shader method), 1169  
setUniformfv() (bge.types.BL\_Shader method), 1167  
setUniformiv() (bge.types.BL\_Shader method), 1170  
setUniformMatrix3() (bge.types.BL\_Shader method), 1169  
setUniformMatrix4() (bge.types.BL\_Shader method), 1170  
setUseEpa() (in module bge.constraints), 1268  
setUV() (bge.types.KX\_VertexProxy method), 1211  
setUV2() (bge.types.KX\_VertexProxy method), 1211  
setViewport() (bge.types.KX\_Camera method), 1223  
setVisible() (bge.types.KX\_GameObject method), 1177  
setWeight() (bge.texture.ImageMix method), 1256  
setXYZ() (bge.types.KX\_VertexProxy method), 1211  
SEVENKEY (in module bge.events), 1262  
shade\_flat() (in module bpy.ops.curve), 49  
shade\_flat() (in module bpy.ops.object), 106  
shade\_smooth() (in module bpy.ops.curve), 49  
shade\_smooth() (in module bpy.ops.object), 106  
shadedown (bpy.types.ThemeWidgetColors attribute), 970  
ShaderNode (class in bpy.types), 803  
ShaderNode.type (in module bpy.types), 803  
ShaderNodeCameraData (class in bpy.types), 804  
ShaderNodeCombineRGB (class in bpy.types), 805  
ShaderNodeExtendedMaterial (class in bpy.types), 806  
ShaderNodeGeometry (class in bpy.types), 807  
ShaderNodeHueSaturation (class in bpy.types), 807  
ShaderNodeInvert (class in bpy.types), 808  
ShaderNodeMapping (class in bpy.types), 809  
ShaderNodeMaterial (class in bpy.types), 810  
ShaderNodeMath (class in bpy.types), 811  
ShaderNodeMixRGB (class in bpy.types), 812  
ShaderNodeNormal (class in bpy.types), 813  
ShaderNodeOutput (class in bpy.types), 813  
ShaderNodeRGB (class in bpy.types), 814  
ShaderNodeRGBCurve (class in bpy.types), 815  
ShaderNodeRGBCurve.mapping (in module bpy.types), 815  
ShaderNodeRGBToBW (class in bpy.types), 816  
ShaderNodes (class in bpy.types), 822  
ShaderNodeSeparateRGB (class in bpy.types), 816  
ShaderNodeSqueeze (class in bpy.types), 817  
ShaderNodeTexture (class in bpy.types), 818  
ShaderNodeTree (class in bpy.types), 818  
ShaderNodeTree.nodes (in module bpy.types), 819  
ShaderNodeValToRGB (class in bpy.types), 819  
ShaderNodeValToRGB.color\_ramp (in module bpy.types), 819  
ShaderNodeValue (class in bpy.types), 820  
ShaderNodeVectorCurve (class in bpy.types), 821  
ShaderNodeVectorCurve.mapping (in module bpy.types), 821  
ShaderNodeVectorMath (class in bpy.types), 822  
shaderText (bge.types.SCA\_2DFilterActuator attribute), 1213  
shadetop (bpy.types.ThemeWidgetColors attribute), 970  
shadow (bpy.types.ThemeFontStyle attribute), 942  
SHADOW (in module blf), 1146  
shadow() (in module blf), 1148  
shadow\_adaptive\_threshold (bpy.types.AreaLamp attribute), 195

shadow\_adaptive\_threshold (bpy.types.PointLamp attribute), 718  
shadow\_adaptive\_threshold (bpy.types.SpotLamp attribute), 884  
shadow\_adaptive\_threshold (bpy.types.SunLamp attribute), 895  
shadow\_adjust (bpy.types.CompositorNodeChromaMatte attribute), 299  
shadow\_buffer\_bias (bpy.types.Material attribute), 549  
shadow\_buffer\_bias (bpy.types.SpotLamp attribute), 884  
shadow\_buffer\_clip\_end (bpy.types.SpotLamp attribute), 885  
shadow\_buffer\_clip\_start (bpy.types.SpotLamp attribute), 885  
shadow\_buffer\_samples (bpy.types.SpotLamp attribute), 885  
shadow\_buffer\_size (bpy.types.SpotLamp attribute), 885  
shadow\_buffer\_soft (bpy.types.SpotLamp attribute), 885  
shadow\_buffer\_type (bpy.types.SpotLamp attribute), 885  
shadow\_cast\_alpha (bpy.types.Material attribute), 549  
shadow\_color (bpy.types.AreaLamp attribute), 195  
shadow\_color (bpy.types.PointLamp attribute), 718  
shadow\_color (bpy.types.SpotLamp attribute), 885  
shadow\_color (bpy.types.SunLamp attribute), 895  
shadow\_factor (bpy.types.LampTextureSlot attribute), 526  
shadow\_filter\_type (bpy.types.SpotLamp attribute), 885  
shadow\_method (bpy.types.AreaLamp attribute), 195  
shadow\_method (bpy.types.PointLamp attribute), 718  
shadow\_method (bpy.types.SpotLamp attribute), 885  
shadow\_method (bpy.types.SunLamp attribute), 895  
shadow\_offset() (in module blf), 1148  
shadow\_offset\_x (bpy.types.ThemeFontStyle attribute), 942  
shadow\_offset\_y (bpy.types.ThemeFontStyle attribute), 942  
shadow\_only\_type (bpy.types.Material attribute), 549  
shadow\_ray\_bias (bpy.types.Material attribute), 549  
shadow\_ray\_sample\_method (bpy.types.AreaLamp attribute), 195  
shadow\_ray\_sample\_method (bpy.types.PointLamp attribute), 719  
shadow\_ray\_sample\_method (bpy.types.SpotLamp attribute), 885  
shadow\_ray\_sample\_method (bpy.types.SunLamp attribute), 895  
shadow\_ray\_samples (bpy.types.PointLamp attribute), 719  
shadow\_ray\_samples (bpy.types.SpotLamp attribute), 885  
shadow\_ray\_samples (bpy.types.SunLamp attribute), 895  
shadow\_ray\_samples\_x (bpy.types.AreaLamp attribute), 195  
shadow\_ray\_samples\_y (bpy.types.AreaLamp attribute), 195  
shadow\_sample\_buffers (bpy.types.SpotLamp attribute), 885  
shadow\_soft\_size (bpy.types.AreaLamp attribute), 196  
shadow\_soft\_size (bpy.types.PointLamp attribute), 719  
shadow\_soft\_size (bpy.types.SpotLamp attribute), 885  
shadow\_soft\_size (bpy.types.SunLamp attribute), 895  
shadowalpha (bpy.types.ThemeFontStyle attribute), 942  
shadowcolor (bpy.types.ThemeFontStyle attribute), 942  
shape (bpy.types.AreaLamp attribute), 196  
shape (bpy.types.FieldSettings attribute), 431  
shape (bpy.types.MaterialStrand attribute), 562  
shape\_key\_add() (bpy.types.Object method), 645  
shape\_key\_add() (in module bpy.ops.object), 106  
shape\_key\_clear() (in module bpy.ops.object), 106  
shape\_key\_mirror() (in module bpy.ops.object), 106  
shape\_key\_move() (in module bpy.ops.object), 106  
shape\_key\_remove() (in module bpy.ops.object), 106  
shape\_key\_transfer() (in module bpy.ops.object), 106  
shape\_propagate\_to\_all() (in module bpy.ops.mesh), 85  
shape\_threshold (bpy.types.GameSoftBodySettings attribute), 457  
ShapeActionActuator (class in bpy.types), 824  
ShapeKey (class in bpy.types), 825  
ShapeKey.data (in module bpy.types), 825  
ShapeKey.frame (in module bpy.types), 825  
ShapeKeyBezierPoint (class in bpy.types), 826  
ShapeKeyCurvePoint (class in bpy.types), 827  
ShapeKeyPoint (class in bpy.types), 828  
SHD\_TANGENT (in module bge.logic), 1248  
shear (bpy.types.SoftBodySettings attribute), 842  
shear (bpy.types.TextCurve attribute), 905  
shear() (in module bpy.ops.transform), 143  
Shear() (mathutils.Matrix class method), 1086  
shift (bpy.types.KeyMapItem attribute), 501  
shift\_x (bpy.types.Camera attribute), 268  
shift\_y (bpy.types.Camera attribute), 268  
shininess (bge.types.KX\_PolygonMaterial attribute), 1198  
show\_active() (in module bpy.ops.outliner), 110  
show\_actuators (bpy.types.GameObjectSettings attribute), 453  
show\_actuators\_active\_object (bpy.types.SpaceLogicEditor attribute), 859  
show\_actuators\_active\_states (bpy.types.SpaceLogicEditor attribute), 859  
show\_actuators\_linked\_controller (bpy.types.SpaceLogicEditor attribute), 859  
show\_actuators\_selected\_objects (bpy.types.SpaceLogicEditor attribute), 859  
show\_alive (bpy.types.ExplodeModifier attribute), 410  
show\_alive (bpy.types.ParticleInstanceModifier attribute), 682

show\_all\_edges (bpy.types.Mesh attribute), 576  
show\_all\_objects\_origin (bpy.types.SpaceView3D attribute), 873  
show\_armatures (bpy.types.DopeSheet attribute), 384  
show\_axes (bpy.types.Armature attribute), 199  
show\_axis (bpy.types.Object attribute), 642  
show\_axis\_x (bpy.types.SpaceView3D attribute), 874  
show\_axis\_y (bpy.types.SpaceView3D attribute), 874  
show\_axis\_z (bpy.types.SpaceView3D attribute), 874  
showBackdrop (bpy.types.SpaceNodeEditor attribute), 862  
showBackground\_images (bpy.types.SpaceView3D attribute), 874  
showBoneCustomShapes (bpy.types.Armature attribute), 199  
showBounds (bpy.types.Object attribute), 643  
showBrush (bpy.types.Paint attribute), 668  
showBrushOnSurface (bpy.types.Paint attribute), 668  
showCache (bpy.types.SpaceTimeline attribute), 868  
showCameras (bpy.types.DopeSheet attribute), 384  
showColoredConstraints  
    (bpy.types.ThemeBoneColorSet attribute), 935  
showColumnLayout (bpy.types.UserPreferencesView attribute), 1028  
showCone (bpy.types.SpotLamp attribute), 885  
showControllers (bpy.types.GameObjectSettings attribute), 454  
showControllersActiveObject  
    (bpy.types.SpaceLogicEditor attribute), 859  
showControllersLinkedController  
    (bpy.types.SpaceLogicEditor attribute), 859  
showControllersSelectedObjects  
    (bpy.types.SpaceLogicEditor attribute), 859  
showCursor (bpy.types.SpaceGraphEditor attribute), 854  
showCurves (bpy.types.DopeSheet attribute), 384  
showCyclicDependencies() (in module bpy.ops.node), 93  
showDead (bpy.types.ExplodeModifier attribute), 410  
showDead (bpy.types.ParticleInstanceModifier attribute), 682  
showDebug (bpy.types.GameProperty attribute), 456  
showDebugInfo (bpy.types.Driver attribute), 387  
showDebugProperties (bpy.types.SceneGameData attribute), 777  
showDebugState (bpy.types.GameObjectSettings attribute), 454  
showDoubleSided (bpy.types.Mesh attribute), 576  
showEdgeBevelWeight (bpy.types.Mesh attribute), 576  
showEdgeCrease (bpy.types.Mesh attribute), 576  
showEdgeSeams (bpy.types.Mesh attribute), 576  
showEdgeSharp (bpy.types.Mesh attribute), 576  
showEdges (bpy.types.Mesh attribute), 576  
showExpanded (bpy.types.ActionGroup attribute), 176  
showExpanded (bpy.types.Actuator attribute), 179  
showExpanded (bpy.types.BackgroundImage attribute), 208  
showExpanded (bpy.types.Constraint attribute), 352  
showExpanded (bpy.types.Controller attribute), 360  
showExpanded (bpy.types.FModifier attribute), 419  
showExpanded (bpy.types.KeyMapItem attribute), 501  
showExpanded (bpy.types.Modifier attribute), 608  
showExpanded (bpy.types.Sensor attribute), 793  
showExpandedChildren (bpy.types.KeyMap attribute), 498  
showExpandedItems (bpy.types.KeyMap attribute), 498  
showExpandedSummary (bpy.types.DopeSheet attribute), 384  
showExtraEdgeLength (bpy.types.Mesh attribute), 576  
showExtraFaceAngle (bpy.types.Mesh attribute), 576  
showExtraFaceArea (bpy.types.Mesh attribute), 577  
showFaces (bpy.types.Mesh attribute), 577  
showFaces (bpy.types.SpaceUVEditor attribute), 870  
showFloor (bpy.types.SpaceView3D attribute), 874  
showFrameIndicator (bpy.types.SpaceDopeSheetEditor attribute), 852  
showFrameIndicator (bpy.types.SpaceGraphEditor attribute), 855  
showFrameIndicator (bpy.types.SpaceNLA attribute), 860  
showFrameIndicator (bpy.types.SpaceSequenceEditor attribute), 865  
showFrameIndicator (bpy.types.SpaceTimeline attribute), 869  
showFrameNumbers (bpy.types.AnimVizMotionPaths attribute), 190  
showFramerateProfile (bpy.types.SceneGameData attribute), 777  
showFrames (bpy.types.SpaceSequenceEditor attribute), 865  
showFullscreen (bpy.types.SceneGameData attribute), 777  
showGroupColors (bpy.types.Armature attribute), 199  
showGuide (bpy.types.Camera attribute), 268  
showHandles (bpy.types.Curve attribute), 368  
showHandles (bpy.types.SpaceGraphEditor attribute), 855  
showHealth (bpy.types.ParticleSettings attribute), 692  
showHidden (bpy.types.DopeSheet attribute), 385  
showHidden (bpy.types.FileSelectParams attribute), 433  
showHiddenFilesDatablocks  
    (bpy.types.UserPreferencesFilePaths attribute), 1020  
showHierarchy() (in module bpy.ops.outliner), 110  
showHighResolution (bpy.types.SmokeDomainSettings attribute), 834  
showInEditMode (bpy.types.Modifier attribute), 609

|                                                                              |                                                                           |
|------------------------------------------------------------------------------|---------------------------------------------------------------------------|
| show_keyframe_action_all<br>(bpy.types.AnimVizMotionPaths<br>attribute), 190 | show_only_ghost_selected<br>(bpy.types.Armature attribute), 199           |
| show_keyframe_highlight<br>(bpy.types.AnimVizMotionPaths<br>attribute), 190  | show_only_group_objects<br>(bpy.types.DopeSheet attribute), 385           |
| show_keyframe_numbers<br>(bpy.types.AnimVizMotionPaths<br>attribute), 190    | show_only_matching_fcurves<br>(bpy.types.DopeSheet attribute), 385        |
| show_lamps (bpy.types.DopeSheet attribute), 385                              | show_only_render<br>(bpy.types.SpaceView3D attribute), 874                |
| show_large_cursors (bpy.types.UserPreferencesView attribute), 1028           | show_only_selected<br>(bpy.types.AnimVizOnionSkinning attribute), 192     |
| show_lattices (bpy.types.DopeSheet attribute), 385                           | show_only_selected (bpy.types.DopeSheet attribute), 385                   |
| show_limits (bpy.types.Camera attribute), 268                                | show_only_selected (bpy.types.SpaceTimeline attribute), 869               |
| show_line_highlight (bpy.types.SpaceTextEditor attribute), 867               | show_only_shape_key<br>(bpy.types.Object attribute), 643                  |
| show_line_numbers (bpy.types.SpaceTextEditor attribute), 867                 | show_other_objects (bpy.types.SpaceUVEditor attribute), 870               |
| show_low_resolution (bpy.types.Paint attribute), 668                         | show_outline_selected<br>(bpy.types.SpaceView3D attribute), 874           |
| show_manipulator (bpy.types.SpaceView3D attribute), 874                      | show_overlay (bpy.types.SequenceEditor attribute), 800                    |
| show_manipulator (bpy.types.UserPreferencesView attribute), 1028             | show_particles (bpy.types.DopeSheet attribute), 385                       |
| show_margin (bpy.types.SpaceTextEditor attribute), 867                       | show_particles (bpy.types.ParticleEdit attribute), 678                    |
| show_materials (bpy.types.DopeSheet attribute), 385                          | show_passepartout (bpy.types.Camera attribute), 269                       |
| show_menus (bpy.types.Area attribute), 194                                   | show_physics_visualization<br>(bpy.types.SceneGameData attribute), 777    |
| show_meshes (bpy.types.DopeSheet attribute), 385                             | show_pivot (bpy.types.RigidBodyJointConstraint attribute), 766            |
| show_metaballs (bpy.types.DopeSheet attribute), 385                          | show_playback_fps<br>(bpy.types.UserPreferencesView attribute), 1028      |
| show_mini_axis (bpy.types.UserPreferencesView attribute), 1028               | show_points (bpy.types.GPencilLayer attribute), 447                       |
| show_missing_nla (bpy.types.DopeSheet attribute), 385                        | show_pose_markers<br>(bpy.types.SpaceDopeSheetEditor attribute), 852      |
| show_mist (bpy.types.Camera attribute), 268                                  | show_relationship_lines<br>(bpy.types.SpaceView3D attribute), 874         |
| show_modified_edges (bpy.types.SpaceUVEditor attribute), 870                 | show_render (bpy.types.Modifier attribute), 609                           |
| show_mouse (bpy.types.SceneGameData attribute), 777                          | show_repeat (bpy.types.SpaceImageEditor attribute), 857                   |
| show_name (bpy.types.Camera attribute), 269                                  | show_report_debug<br>(bpy.types.SpaceInfo attribute), 858                 |
| show_name (bpy.types.Object attribute), 643                                  | show_report_error<br>(bpy.types.SpaceInfo attribute), 858                 |
| show_names (bpy.types.Armature attribute), 199                               | show_report_info<br>(bpy.types.SpaceInfo attribute), 858                  |
| show_nodes (bpy.types.DopeSheet attribute), 385                              | show_report_operator<br>(bpy.types.SpaceInfo attribute), 858              |
| show_normal_face (bpy.types.Curve attribute), 368                            | show_report_warning<br>(bpy.types.SpaceInfo attribute), 858               |
| show_normal_face (bpy.types.Mesh attribute), 577                             | show_restrict_columns<br>(bpy.types.SpaceOutliner attribute), 863         |
| show_normal_vertex (bpy.types.Mesh attribute), 577                           | show_safe_margin<br>(bpy.types.SpaceSequenceEditor attribute), 865        |
| show_normalized_coords (bpy.types.SpaceUVEditor attribute), 870              | show_scenes (bpy.types.DopeSheet attribute), 385                          |
| show_number (bpy.types.ParticleSettings attribute), 692                      | show_sensors<br>(bpy.types.GameObjectSettings attribute), 454             |
| show_object_info (bpy.types.UserPreferencesView attribute), 1028             | show_sensors_active_object<br>(bpy.types.SpaceLogicEditor attribute), 859 |
| show_on_cage (bpy.types.Modifier attribute), 609                             | show_sensors_active_states<br>(bpy.types.SpaceLogicEditor attribute), 859 |
| show_one_level() (in module bpy.ops.outliner), 110                           |                                                                           |
| show_only_control_edges (bpy.types.MultiresModifier attribute), 618          |                                                                           |
| show_only_control_edges (bpy.types.SubsurfModifier attribute), 894           |                                                                           |

show\_sensors\_linked\_controller  
    (bpy.types.SpaceLogicEditor attribute), 859  
show\_sensors\_selected\_objects  
    (bpy.types.SpaceLogicEditor attribute), 859  
show\_separate\_color (bpy.types.SpaceSequenceEditor attribute), 865  
show\_shaded (bpy.types.ThemeWidgetColors attribute), 970  
show\_shapekeys (bpy.types.DopeSheet attribute), 385  
show\_size (bpy.types.ParticleSettings attribute), 693  
show\_sliders (bpy.types.SpaceDopeSheetEditor attribute), 852  
show\_sliders (bpy.types.SpaceGraphEditor attribute), 855  
show\_smooth\_edges (bpy.types.SpaceUVEditor attribute), 870  
show\_splash (bpy.types.UserPreferencesView attribute), 1028  
show\_state\_panel (bpy.types.GameObjectSettings attribute), 454  
show\_stretch (bpy.types.SpaceUVEditor attribute), 870  
show\_strip\_curves (bpy.types.SpaceNLA attribute), 860  
show\_summary (bpy.types.DopeSheet attribute), 386  
show\_sync\_view (bpy.types.RegionView3D attribute), 744  
show\_syntax\_highlight (bpy.types.SpaceTextEditor attribute), 867  
show\_texture\_space (bpy.types.Object attribute), 643  
show\_textured\_solid (bpy.types.SpaceView3D attribute), 874  
show\_textures (bpy.types.DopeSheet attribute), 386  
show\_thumbnails (bpy.types.UserPreferencesFilePaths attribute), 1020  
show\_title\_safe (bpy.types.Camera attribute), 269  
show\_tooltips (bpy.types.UserPreferencesView attribute), 1028  
show\_tooltips\_python (bpy.types.UserPreferencesView attribute), 1028  
show\_tracer (bpy.types.ParticleFluidSettings attribute), 680  
show\_transforms (bpy.types.DopeSheet attribute), 386  
show\_transparent (bpy.types.Object attribute), 643  
show\_unborn (bpy.types.ExplodeModifier attribute), 410  
show\_unborn (bpy.types.ParticleInstanceModifier attribute), 682  
show\_unborn (bpy.types.ParticleSettings attribute), 693  
show\_uv\_local\_view (bpy.types.ToolSettings attribute), 977  
show\_velocity (bpy.types.ParticleSettings attribute), 693  
show\_view\_name (bpy.types.UserPreferencesView attribute), 1029  
show\_viewport (bpy.types.Modifier attribute), 609  
show\_wire (bpy.types.Bone attribute), 253  
show\_wire (bpy.types.EditBone attribute), 393  
show\_wire (bpy.types.Object attribute), 643  
show\_word\_wrap (bpy.types.SpaceTextEditor attribute), 867  
show\_worlds (bpy.types.DopeSheet attribute), 386  
show\_x\_ray (bpy.types.GPencilLayer attribute), 447  
show\_x\_ray (bpy.types.Object attribute), 643  
showMouse() (in module bge.render), 1250  
shrink\_fatten() (in module bpy.ops.transform), 144  
shrinkwrap\_type (bpy.types.ShrinkwrapConstraint attribute), 829  
ShrinkwrapConstraint (class in bpy.types), 829  
ShrinkwrapModifier (class in bpy.types), 830  
sigma\_color (bpy.types.CompositorNodeBilateralblur attribute), 294  
sigma\_space (bpy.types.CompositorNodeBilateralblur attribute), 295  
SimpleDeformModifier (class in bpy.types), 831  
simplify\_ao\_sss (bpy.types.RenderSettings attribute), 759  
simplify\_child\_particles (bpy.types.RenderSettings attribute), 759  
simplify\_rate (bpy.types.ParticleSettings attribute), 693  
simplify\_resize (bpy.types.ParticleSettings attribute), 693  
simplify\_shadow\_samples (bpy.types.RenderSettings attribute), 759  
simplify\_subdivision (bpy.types.RenderSettings attribute), 759  
simplify\_transition (bpy.types.ParticleSettings attribute), 693  
simplify\_viewport (bpy.types.ParticleSettings attribute), 693  
simulation\_scale (bpy.types.DomainFluidSettings attribute), 382  
single\_axis\_number (bpy.types.JoystickSensor attribute), 493  
SIXKEY (in module bge.events), 1262  
size (bge.texture.ImageBuff attribute), 1255  
size (bge.texture.ImageFFmpeg attribute), 1255  
size (bge.texture.ImageMirror attribute), 1256  
size (bge.texture.ImageRender attribute), 1257  
size (bge.texture.ImageViewport attribute), 1258  
size (bge.texture.VideoFFmpeg attribute), 1254  
size (bpy.types.AreaLamp attribute), 196  
size (bpy.types.BackgroundImage attribute), 208  
size (bpy.types.Brush attribute), 261  
size (bpy.types.CastModifier attribute), 271  
size (bpy.types.CompositorNodeGlare attribute), 318  
size (bpy.types.CompositorNodeMapValue attribute), 327  
size (bpy.types.FieldSettings attribute), 431  
size (bpy.types.MaterialHalo attribute), 555  
size (bpy.types.Particle attribute), 674  
size (bpy.types.ParticleBrush attribute), 675  
size (bpy.types.TextCurve attribute), 905  
size (bpy.types.WorldStarsSettings attribute), 1061  
size() (in module blf), 1148

size\_factor (bpy.types.ParticleSettingsTextureSlot attribute), 698  
 size\_min (bpy.types.MaterialStrand attribute), 562  
 size\_random (bpy.types.ParticleSettings attribute), 693  
 size\_x (bpy.types.CompositorNodeBlur attribute), 296  
 size\_x (bpy.types.MetaElement attribute), 603  
 size\_y (bpy.types.AreaLamp attribute), 196  
 size\_y (bpy.types.CompositorNodeBlur attribute), 296  
 size\_y (bpy.types.MetaElement attribute), 603  
 size\_z (bpy.types.MetaElement attribute), 603  
 SKEY (in module bge.events), 1262  
 sky\_blend (bpy.types.LampSkySettings attribute), 525  
 sky\_blend\_type (bpy.types.LampSkySettings attribute), 525  
 sky\_color\_space (bpy.types.LampSkySettings attribute), 525  
 sky\_exposure (bpy.types.LampSkySettings attribute), 525  
 SLASHKEY (in module bge.events), 1264  
 slider\_max (bpy.types.ShapeKey attribute), 825  
 slider\_min (bpy.types.ShapeKey attribute), 826  
 slip\_type (bpy.types.DomainFluidSettings attribute), 382  
 slip\_type (bpy.types.ObstacleFluidSettings attribute), 654  
 slope (bpy.types.CompositorNodeColorBalance attribute), 300  
 slot\_copy() (in module bpy.ops.texture), 139  
 slot\_move() (in module bpy.ops.texture), 139  
 slot\_paste() (in module bpy.ops.texture), 139  
 slow\_parent\_clear() (in module bpy.ops.object), 107  
 slow\_parent\_set() (in module bpy.ops.object), 107  
 slurph (bpy.types.Key attribute), 494  
 small\_caps\_scale (bpy.types.TextCurve attribute), 905  
 smart\_project() (in module bpy.ops.uv), 152  
 smoke (in module bpy.context), 30  
 smoke\_data\_type (bpy.types.VoxelData attribute), 1042  
 smoke\_type (bpy.types.SmokeModifier attribute), 837  
 SmokeCollSettings (class in bpy.types), 833  
 SmokeDomainSettings (class in bpy.types), 833  
 SmokeDomainSettings.effector\_weights (in module bpy.types), 834  
 SmokeDomainSettings.point\_cache (in module bpy.types), 834  
 SmokeFlowSettings (class in bpy.types), 836  
 SmokeModifier (class in bpy.types), 837  
 SmokeModifier.coll\_settings (in module bpy.types), 837  
 SmokeModifier.domain\_settings (in module bpy.types), 837  
 SmokeModifier.flow\_settings (in module bpy.types), 837  
 smooth() (in module bpy.ops.curve), 49  
 smooth() (in module bpy.ops.graph), 62  
 smooth\_emitter (bpy.types.SmokeDomainSettings attribute), 835  
 smooth\_radius() (in module bpy.ops.curve), 49  
 smooth\_stroke\_factor (bpy.types.Brush attribute), 261  
 smooth\_stroke\_radius (bpy.types.Brush attribute), 261  
 smooth\_view (bpy.types.UserPreferencesView attribute), 1029  
 SmoothModifier (class in bpy.types), 838  
 smoothscroll() (in module bpy.ops.file), 56  
 smoothview() (in module bpy.ops.view3d), 158  
 smpte\_from\_frame() (in module bpy.utils), 1073  
 smpte\_from\_seconds() (in module bpy.utils), 1073  
 snap() (in module bpy.ops.action), 35  
 snap() (in module bpy.ops.graph), 63  
 snap() (in module bpy.ops.nla), 89  
 snap() (in module bpy.ops.sequencer), 129  
 snap\_cursor() (in module bpy.ops.uv), 152  
 snap\_cursor\_to\_active() (in module bpy.ops.view3d), 158  
 snap\_cursor\_to\_center() (in module bpy.ops.view3d), 158  
 snap\_cursor\_to\_grid() (in module bpy.ops.view3d), 158  
 snap\_cursor\_to\_selected() (in module bpy.ops.view3d), 158  
 snap\_element (bpy.types.ToolSettings attribute), 977  
 snap\_selected() (in module bpy.ops.uv), 152  
 snap\_selected\_to\_cursor() (in module bpy.ops.view3d), 158  
 snap\_selected\_to\_grid() (in module bpy.ops.view3d), 158  
 snap\_target (bpy.types.ToolSettings attribute), 977  
 snap\_type() (in module bpy.ops.transform), 144  
 soft\_body (in module bpy.context), 30  
 SoftBodyModifier (class in bpy.types), 839  
 SoftBodyModifier.point\_cache (in module bpy.types), 839  
 SoftBodyModifier.settings (in module bpy.types), 839  
 SoftBodySettings (class in bpy.types), 840  
 SoftBodySettings.effector\_weights (in module bpy.types), 841  
 solidify() (in module bpy.ops.mesh), 85  
 SolidifyModifier (class in bpy.types), 844  
 solver (bpy.types.Itasc attribute), 492  
 sort\_faces() (in module bpy.ops.mesh), 85  
 sort\_method (bpy.types.FileSelectParams attribute), 433  
 sound (bpy.types.SoundActuator attribute), 847  
 Sound (class in bpy.types), 845  
 Sound.packed\_file (in module bpy.types), 846  
 sound\_bake() (in module bpy.ops.graph), 63  
 sound\_directory (bpy.types.UserPreferencesFilePaths attribute), 1020  
 sound\_strip\_add() (in module bpy.ops.sequencer), 129  
 SoundActuator (class in bpy.types), 847  
 SoundSequence (class in bpy.types), 848  
 SoundSequence.sound (in module bpy.types), 849  
 source (bge.texture.Texture attribute), 1258  
 source (bpy.types.EnvironmentMap attribute), 405  
 source (bpy.types.Image attribute), 477  
 space (bpy.types.CompositorNodeScale attribute), 336  
 Space (class in bpy.types), 850  
 Space.type (in module bpy.types), 850  
 space\_character (bpy.types.TextCurve attribute), 905

space\_line (bpy.types.TextCurve attribute), 905  
space\_word (bpy.types.TextCurve attribute), 905  
SpaceConsole (class in bpy.types), 851  
SpaceConsole.history (in module bpy.types), 851  
SpaceConsole.scrollback (in module bpy.types), 851  
spacedata\_cleanup() (in module bpy.ops.screen), 123  
SpaceDopeSheetEditor (class in bpy.types), 852  
SpaceDopeSheetEditor.dopesheet (in module bpy.types), 852  
SpaceDopeSheetEditor.show\_seconds (in module bpy.types), 852  
SpaceFileBrowser (class in bpy.types), 853  
SpaceFileBrowser.operator (in module bpy.types), 853  
SpaceFileBrowser.params (in module bpy.types), 853  
SpaceGraphEditor (class in bpy.types), 854  
SpaceGraphEditor.dopesheet (in module bpy.types), 854  
SpaceGraphEditor.show\_seconds (in module bpy.types), 855  
SpaceImageEditor (class in bpy.types), 856  
SpaceImageEditor.curve (in module bpy.types), 856  
SpaceImageEditor.image\_user (in module bpy.types), 856  
SpaceImageEditor.sample\_histogram (in module bpy.types), 856  
SpaceImageEditor.scopes (in module bpy.types), 856  
SpaceImageEditor.show\_paint (in module bpy.types), 856  
SpaceImageEditor.show\_render (in module bpy.types), 856  
SpaceImageEditor.show\_uvedit (in module bpy.types), 857  
SpaceImageEditor.uv\_editor (in module bpy.types), 857  
SpaceImageEditor.zoom (in module bpy.types), 857  
SpaceInfo (class in bpy.types), 858  
SPACEKEY (in module bge.events), 1264  
SpaceLogicEditor (class in bpy.types), 859  
SpaceNLA (class in bpy.types), 860  
SpaceNLA.dopesheet (in module bpy.types), 860  
SpaceNLA.show\_seconds (in module bpy.types), 860  
SpaceNodeEditor (class in bpy.types), 861  
SpaceNodeEditor.id (in module bpy.types), 861  
SpaceNodeEditor.id\_from (in module bpy.types), 861  
SpaceNodeEditor.node\_tree (in module bpy.types), 862  
SpaceOutliner (class in bpy.types), 862  
SpaceProperties (class in bpy.types), 864  
SpaceSequenceEditor (class in bpy.types), 865  
SpaceSequenceEditor.grease\_pencil (in module bpy.types), 865  
SpaceTextEditor (class in bpy.types), 866  
SpaceTimeline (class in bpy.types), 868  
SpaceUserPreferences (class in bpy.types), 871  
SpaceUVEditor (class in bpy.types), 869  
SpaceView3D (class in bpy.types), 872  
SpaceView3D.background\_images (in module bpy.types), 872  
SpaceView3D.current\_orientation (in module bpy.types), 872  
SpaceView3D.layers\_used (in module bpy.types), 873  
SpaceView3D.local\_view (in module bpy.types), 873  
SpaceView3D.region\_3d (in module bpy.types), 873  
SpaceView3D.region\_quadview (in module bpy.types), 873  
spacing (bpy.types.Brush attribute), 261  
specular (bge.types.KX\_PolygonMaterial attribute), 1198  
specular\_alpha (bpy.types.Material attribute), 550  
specular\_color (bpy.types.Material attribute), 550  
specular\_color (bpy.types.UserSolidLight attribute), 1030  
specular\_color\_factor (bpy.types.MaterialTextureSlot attribute), 566  
specular\_factor (bpy.types.MaterialTextureSlot attribute), 566  
specular\_hardness (bpy.types.Material attribute), 550  
specular\_intensity (bpy.types.Material attribute), 550  
specular\_ior (bpy.types.Material attribute), 550  
specular\_ramp\_blend (bpy.types.Material attribute), 550  
specular\_ramp\_factor (bpy.types.Material attribute), 550  
specular\_ramp\_input (bpy.types.Material attribute), 550  
specular\_shader (bpy.types.Material attribute), 550  
specular\_slope (bpy.types.Material attribute), 550  
specular\_toon\_size (bpy.types.Material attribute), 550  
specular\_toon\_smooth (bpy.types.Material attribute), 550  
specularity (bge.types.KX\_PolygonMaterial attribute), 1198  
speed (bpy.types.BoidRuleAverageSpeed attribute), 243  
speed (bpy.types.SoftBodySettings attribute), 842  
speed (bpy.types.WaveModifier attribute), 1047  
speed\_factor (bpy.types.Sequence attribute), 796  
speed\_max (bpy.types.CompositorNodeVecBlur attribute), 347  
speed\_min (bpy.types.CompositorNodeVecBlur attribute), 347  
speed\_of\_sound (aud.Device attribute), 1151  
speed\_scale (bpy.types.PointDensity attribute), 715  
SpeedControlSequence (class in bpy.types), 875  
sphere\_project() (in module bpy.ops.uv), 152  
sphereInsideFrustum() (bge.types.KX\_Camera method), 1221  
SPHFluidSettings (class in bpy.types), 767  
spin (bpy.types.CompositorNodeDBlur attribute), 310  
spin() (in module bpy.ops.curve), 49  
spin() (in module bpy.ops.mesh), 85  
splash() (in module bpy.ops.wm), 170  
Spline (class in bpy.types), 877  
Spline.bezier\_points (in module bpy.types), 877  
Spline.character\_index (in module bpy.types), 877  
Spline.point\_count\_u (in module bpy.types), 878  
Spline.point\_count\_v (in module bpy.types), 878  
Spline.points (in module bpy.types), 878  
spline\_type\_set() (in module bpy.ops.curve), 49

spline\_weight\_set() (in module bpy.ops.curve), 49  
**SplineBezierPoints** (class in bpy.types), 880  
**SplineIKConstraint** (class in bpy.types), 880  
**SplinePoint** (class in bpy.types), 882  
**SplinePoints** (class in bpy.types), 883  
**split()** (bpy.typesUILayout method), 988  
**split()** (in module bpy.ops.mesh), 86  
**split()** (in module bpy.ops.nla), 89  
**split\_angle** (bpy.types.EdgeSplitModifier attribute), 391  
**spot\_blend** (bpy.types.SpotLamp attribute), 886  
**spot\_size** (bpy.types.SpotLamp attribute), 886  
**spotblend** (bge.types.KX\_LightObject attribute), 1186  
**SpotLamp** (class in bpy.types), 884  
**SpotLamp.falloff\_curve** (in module bpy.types), 884  
**spotsize** (bge.types.KX\_LightObject attribute), 1186  
**spread** (bpy.types.LampSkySettings attribute), 525  
**spring\_damping** (bpy.types.ClothSettings attribute), 280  
**spring\_force** (bpy.types.SPHFluidSettings attribute), 768  
**spring\_frames** (bpy.types.SPHFluidSettings attribute), 768  
**spring\_length** (bpy.types.SoftBodySettings attribute), 842  
**squash** (bpy.types.TextureNodeBricks attribute), 912  
**squash\_frequency** (bpy.types.TextureNodeBricks attribute), 912  
**sss\_preset\_add()** (in module bpy.ops.material), 74  
**stamp\_background** (bpy.types.RenderSettings attribute), 759  
**stamp\_font\_size** (bpy.types.RenderSettings attribute), 760  
**stamp\_foreground** (bpy.types.RenderSettings attribute), 760  
**stamp\_note\_text** (bpy.types.RenderSettings attribute), 760  
**standard\_derivation** (bpy.types.RandomActuator attribute), 740  
**star\_tip\_count** (bpy.types.MaterialHalo attribute), 555  
**start** (bpy.types.WorldMistSettings attribute), 1060  
**start\_cap** (bpy.types.ArrayModifier attribute), 207  
**start\_frame\_set()** (in module bpy.ops.time), 139  
**start\_position\_object** (bpy.types.WaveModifier attribute), 1047  
**start\_position\_x** (bpy.types.WaveModifier attribute), 1047  
**start\_position\_y** (bpy.types.WaveModifier attribute), 1047  
**start\_time** (bpy.types.ControlFluidSettings attribute), 359  
**start\_time** (bpy.types.DomainFluidSettings attribute), 383  
**startGame()** (in module bge.logic), 1237  
**state** (bge.types.KX\_GameObject attribute), 1176  
**state** (bge.types.SCA\_IController attribute), 1165  
**state\_add()** (in module bpy.ops.boid), 41  
**state\_del()** (in module bpy.ops.boid), 41  
**state\_move\_down()** (in module bpy.ops.boid), 41  
**state\_move\_up()** (in module bpy.ops.boid), 41  
**StateActuator** (class in bpy.types), 887  
**states** (bpy.types.Controller attribute), 360  
**states** (bpy.types.StateActuator attribute), 887  
**states\_initial** (bpy.types.GameObjectSettings attribute), 454  
**states\_visible** (bpy.types.GameObjectSettings attribute), 454  
**statistics()** (bpy.types.Scene method), 772  
**status** (aud.Handle attribute), 1157  
**status** (bge.texture.ImageFFmpeg attribute), 1255  
**status** (bge.texture.VideoFFmpeg attribute), 1254  
**status** (bge.types.SCA\_ISensor attribute), 1165  
**step\_count** (bpy.types.Itasc attribute), 492  
**step\_max** (bpy.types.Itasc attribute), 492  
**step\_max** (bpy.types.SoftBodySettings attribute), 842  
**step\_method** (bpy.types.MaterialVolume attribute), 571  
**step\_min** (bpy.types.Itasc attribute), 492  
**step\_min** (bpy.types.SoftBodySettings attribute), 842  
**step\_size** (bpy.types.MaterialVolume attribute), 571  
**steps** (bpy.types.ParticleBrush attribute), 675  
**steps** (bpy.types.ScrewModifier attribute), 790  
**stereo** (bpy.types.SceneGameData attribute), 778  
**stereo\_eye\_separation** (bpy.types.SceneGameData attribute), 778  
**stereo\_mode** (bpy.types.SceneGameData attribute), 778  
**stickiness** (bpy.types.CollisionSettings attribute), 287  
**sticky\_add()** (in module bpy.ops.mesh), 86  
**sticky\_remove()** (in module bpy.ops.mesh), 86  
**sticky\_select\_mode** (bpy.types.SpaceUVEditor attribute), 870  
**stiff\_viscosity** (bpy.types.SPHFluidSettings attribute), 768  
**stiffness** (bpy.types.MetaElement attribute), 603  
**stiffness** (bpy.types.SPHFluidSettings attribute), 769  
**still\_frame** (bpy.types.VoxelData attribute), 1042  
**stitch()** (in module bpy.ops.uv), 153  
**stl()** (in module bpy.ops.export\_mesh), 51  
**stl()** (in module bpy.ops.import\_mesh), 69  
**stop()** (bge.texture.VideoFFmpeg method), 1254  
**stopDSP()** (in module bge.logic), 1238  
**streaks** (bpy.types.CompositorNodeGlare attribute), 318  
**strength** (bpy.types.BoidSettings attribute), 250  
**strength** (bpy.types.Brush attribute), 261  
**strength** (bpy.types.DisplaceModifier attribute), 379  
**strength** (bpy.types.FieldSettings attribute), 431  
**strength** (bpy.types.FModifierNoise attribute), 426  
**strength** (bpy.types.ParticleBrush attribute), 676  
**strength** (bpy.types.SmokeDomainSettings attribute), 835  
**strength** (bpy.types.WarpModifier attribute), 1045  
**stretchto\_reset()** (in module bpy.ops.constraint), 45  
**StretchToConstraint** (class in bpy.types), 888  
**string** (bpy.types.PropertyGroupItem attribute), 733  
**StringProperty** (class in bpy.types), 889  
**StringProperty()** (in module bpy.props), 1081

StringProperty.default (in module bpy.types), 889  
StringProperty.length\_max (in module bpy.types), 890  
strip\_time (bpy.types.NlaStrip attribute), 624  
strips (bpy.types.ThemeNLAEditor attribute), 951  
strips\_selected (bpy.types.ThemeNLAEditor attribute), 951  
stroke (bpy.types.AdjustmentSequence attribute), 183  
stroke (bpy.types.EffectSequence attribute), 398  
stroke (bpy.types.ImageSequence attribute), 482  
stroke (bpy.types.MetaSequence attribute), 605  
stroke (bpy.types.MovieSequence attribute), 613  
stroke (bpy.types.MulticamSequence attribute), 616  
stroke (bpy.types.SceneSequence attribute), 785  
stroke\_method (bpy.types.Brush attribute), 261  
Struct (class in bpy.types), 891  
Struct.base (in module bpy.types), 891  
Struct.description (in module bpy.types), 891  
Struct.functions (in module bpy.types), 891  
Struct.identifier (in module bpy.types), 891  
Struct.name (in module bpy.types), 891  
Struct.name\_property (in module bpy.types), 891  
Struct.nested (in module bpy.types), 891  
Struct.properties (in module bpy.types), 891  
structural\_stiffness (bpy.types.ClothSettings attribute), 281  
structural\_stiffness\_max (bpy.types.ClothSettings attribute), 281  
stucci\_type (bpy.types.StucciTexture attribute), 892  
StucciTexture (class in bpy.types), 892  
StucciTexture.users\_material (in module bpy.types), 892  
StucciTexture.users\_object\_modifier (in module bpy.types), 892  
style\_set() (in module bpy.ops.font), 58  
style\_toggle() (in module bpy.ops.font), 58  
subdivide() (in module bpy.ops.armature), 41  
subdivide() (in module bpy.ops.curve), 50  
subdivide() (in module bpy.ops.mesh), 86  
subdivide() (in module bpy.ops.particle), 114  
subdivision\_set() (in module bpy.ops.object), 107  
subdivision\_type (bpy.types.MultiresModifier attribute), 619  
subdivision\_type (bpy.types.SubsurfModifier attribute), 894  
subframes (bpy.types.ParticleSettings attribute), 693  
subject (bge.types.KX\_NetworkMessageActuator attribute), 1190  
subject (bge.types.KX\_NetworkMessageSensor attribute), 1190  
subject (bpy.types.MessageActuator attribute), 598  
subject (bpy.types.MessageSensor attribute), 599  
subjects (bge.types.KX\_NetworkMessageSensor attribute), 1190  
subsurf\_levels (bpy.types.ShrinkwrapModifier attribute), 830  
SubsurfModifier (class in bpy.types), 894  
subtarget (bge.types.BL\_ArmatureActuator attribute), 1225  
subtarget (bge.types.BL\_ArmatureConstraint attribute), 1228  
subtarget (bpy.types.ActionConstraint attribute), 173  
subtarget (bpy.types.ChildOfConstraint attribute), 273  
subtarget (bpy.types.ConstraintTarget attribute), 356  
subtarget (bpy.types.CopyLocationConstraint attribute), 362  
subtarget (bpy.types.CopyRotationConstraint attribute), 363  
subtarget (bpy.types.CopyScaleConstraint attribute), 365  
subtarget (bpy.types.CopyTransformsConstraint attribute), 366  
subtarget (bpy.types.DampedTrackConstraint attribute), 376  
subtarget (bpy.types.FloorConstraint attribute), 438  
subtarget (bpy.types.HookModifier attribute), 471  
subtarget (bpy.types.KinematicConstraint attribute), 521  
subtarget (bpy.types.LimitDistanceConstraint attribute), 533  
subtarget (bpy.types.LockedTrackConstraint attribute), 539  
subtarget (bpy.types.PivotConstraint attribute), 708  
subtarget (bpy.types.StretchToConstraint attribute), 888  
subtarget (bpy.types.TrackToConstraint attribute), 980  
subtarget (bpy.types.TransformConstraint attribute), 982  
sun\_brightness (bpy.types.LampSkySettings attribute), 525  
sun\_intensity (bpy.types.LampSkySettings attribute), 525  
sun\_size (bpy.types.LampSkySettings attribute), 525  
SunLamp (class in bpy.types), 895  
SunLamp.sky (in module bpy.types), 895  
sunsky\_preset\_add() (in module bpy.ops.lamp), 71  
surface\_noobs (bpy.types.DomainFluidSettings attribute), 383  
surface\_smooth (bpy.types.DomainFluidSettings attribute), 383  
surface\_subdivisions (bpy.types.DomainFluidSettings attribute), 383  
SurfaceCurve (class in bpy.types), 896  
SurfaceModifier (class in bpy.types), 898  
suspend() (bge.types.KX\_Scene method), 1205  
suspendDynamics() (bge.types.KX\_GameObject method), 1180  
suspended (bge.types.KX\_Scene attribute), 1204  
svg() (in module bpy.ops.import\_curve), 68  
swap() (bpy.types.Sequence method), 796  
swap() (in module bpy.ops.nla), 89  
swap() (in module bpy.ops.sequencer), 130  
swap\_data() (in module bpy.ops.sequencer), 130  
swap\_inputs() (in module bpy.ops.sequencer), 130  
switch\_direction() (in module bpy.ops.armature), 41

switch\_direction() (in module bpy.ops.curve), 50  
 sync\_mode (bpy.types.Scene attribute), 771  
 syntax\_builtin (bpy.types.ThemeTextEditor attribute), 960  
 syntax\_comment (bpy.types.ThemeTextEditor attribute), 960  
 syntax\_numbers (bpy.types.ThemeTextEditor attribute), 961  
 syntax\_special (bpy.types.ThemeTextEditor attribute), 961  
 syntax\_string (bpy.types.ThemeTextEditor attribute), 961  
 sysinfo() (in module bpy.ops.wm), 170  
 system (bpy.types.ParticleTarget attribute), 707  
 system (bpy.types.UnitSettings attribute), 1013  
 system\_rotation (bpy.types.UnitSettings attribute), 1013

**T**

tab\_width (bpy.types.SpaceTextEditor attribute), 867  
 TABKEY (in module bge.events), 1264  
 tag (bpy.types.ID attribute), 472  
 tag() (bpy.typesBlendDataActions method), 215  
 tag() (bpy.typesBlendDataArmatures method), 216  
 tag() (bpy.typesBlendDataBrushes method), 217  
 tag() (bpy.typesBlendDataCameras method), 218  
 tag() (bpy.typesBlendDataCurves method), 219  
 tag() (bpy.typesBlendDataFonts method), 220  
 tag() (bpy.typesBlendDataGreasePencils method), 221  
 tag() (bpy.typesBlendDataGroups method), 222  
 tag() (bpy.typesBlendDataImages method), 223  
 tag() (bpy.typesBlendDataLamps method), 224  
 tag() (bpy.typesBlendDataLattices method), 225  
 tag() (bpy.typesBlendDataLibraries method), 226  
 tag() (bpy.typesBlendDataMaterials method), 227  
 tag() (bpy.typesBlendDataMeshes method), 228  
 tag() (bpy.typesBlendDataMetaBalls method), 229  
 tag() (bpy.typesBlendDataNodeTrees method), 230  
 tag() (bpy.typesBlendDataObjects method), 231  
 tag() (bpy.typesBlendDataParticles method), 232  
 tag() (bpy.typesBlendDataScreens method), 234  
 tag() (bpy.typesBlendDataSounds method), 235  
 tag() (bpy.typesBlendDataTexts method), 236  
 tag() (bpy.typesBlendDataTextures method), 237  
 tag() (bpy.typesBlendDataWindowManagers method), 238  
 tag() (bpy.typesBlendDataWorlds method), 239  
 tag\_redraw() (bpy.types.Area method), 194  
 tag\_redraw() (bpy.types.Region method), 743  
 tail (bge.types.BL\_ArmatureBone attribute), 1234  
 tail (bpy.types.Bone attribute), 253  
 tail (bpy.types.EditBone attribute), 393  
 tail\_local (bpy.types.Bone attribute), 253  
 tail\_radius (bpy.types.Bone attribute), 253  
 tail\_radius (bpy.types.EditBone attribute), 393  
 tangent\_factor (bpy.types.ParticleSettings attribute), 693

tangent\_phase (bpy.types.ParticleSettings attribute), 693  
 tap (bge.types.SCA\_ISensor attribute), 1164  
 taper\_object (bpy.types.Curve attribute), 368  
 target (bge.types.BL\_ArmatureActuator attribute), 1225  
 target (bge.types.BL\_ArmatureConstraint attribute), 1228  
 target (bpy.types.ActionConstraint attribute), 173  
 target (bpy.types.ArmatureActuator attribute), 201  
 target (bpy.types.ChildOfConstraint attribute), 273  
 target (bpy.types.ClampToConstraint attribute), 276  
 target (bpy.types.ConstraintTarget attribute), 356  
 target (bpy.types.CopyLocationConstraint attribute), 362  
 target (bpy.types.CopyRotationConstraint attribute), 363  
 target (bpy.types.CopyScaleConstraint attribute), 365  
 target (bpy.types.CopyTransformsConstraint attribute), 366  
 target (bpy.types.DampedTrackConstraint attribute), 376  
 target (bpy.types.FloorConstraint attribute), 438  
 target (bpy.types.FollowPathConstraint attribute), 442  
 target (bpy.types.KeyboardSensor attribute), 511  
 target (bpy.types.KinematicConstraint attribute), 521  
 target (bpy.types.LimitDistanceConstraint attribute), 533  
 target (bpy.types.LockedTrackConstraint attribute), 540  
 target (bpy.types.PivotConstraint attribute), 708  
 target (bpy.types.RigidBodyJointConstraint attribute), 766  
 target (bpy.types.ShrinkwrapConstraint attribute), 829  
 target (bpy.types.ShrinkwrapModifier attribute), 830  
 target (bpy.types.SplineIKConstraint attribute), 881  
 target (bpy.types.StretchToConstraint attribute), 888  
 target (bpy.types.TrackToConstraint attribute), 980  
 target (bpy.types.TransformConstraint attribute), 982  
 target\_count (bpy.types.PythonConstraint attribute), 735  
 target\_move\_down() (in module bpy.ops.particle), 114  
 target\_move\_up() (in module bpy.ops.particle), 114  
 target\_remove() (in module bpy.ops.particle), 114  
 target\_space (bpy.types.Constraint attribute), 353  
 targetProperty (bge.types.SCA\_KeyboardSensor attribute), 1216  
 tempdir (in module bpy.app), 1075  
 temperature (bpy.types.SmokeFlowSettings attribute), 836  
 template\_any\_ID() (bpy.typesUILayout method), 1006  
 template\_color\_ramp() (bpy.typesUILayout method), 1007  
 template\_color\_wheel() (bpy.typesUILayout method), 1007  
 template\_constraint() (bpy.typesUILayout method), 1006  
 template\_curve\_mapping() (bpy.typesUILayout method), 1006  
 template\_edit\_mode\_selection() (bpy.typesUILayout method), 1008  
 template\_header() (bpy.typesUILayout method), 1005  
 template\_header\_3D() (bpy.typesUILayout method), 1008

template\_histogram() (bpy.typesUILayout method), 1007  
template\_ID() (bpy.typesUILayout method), 1005  
template\_ID\_preview() (bpy.typesUILayout method), 1005  
template\_image() (bpy.typesUILayout method), 1008  
template\_image\_layers() (bpy.typesUILayout method), 1008  
template\_layers() (bpy.typesUILayout method), 1007  
template\_list() (bpy.typesUILayout method), 1008  
template\_modifier() (bpy.typesUILayout method), 1006  
template\_operator\_search() (bpy.typesUILayout method), 1008  
template\_path\_builder() (bpy.typesUILayout method), 1006  
template\_preview() (bpy.typesUILayout method), 1006  
template\_reports\_banner() (bpy.typesUILayout method), 1008  
template\_running\_jobs() (bpy.typesUILayout method), 1008  
template\_vectorscope() (bpy.typesUILayout method), 1007  
template\_waveform() (bpy.typesUILayout method), 1007  
temporary\_directory (bpy.types.UserPreferencesFilePaths attribute), 1020  
tessellate\_polygon() (in module mathutils.geometry), 1116  
test\_break() (bpy.types.RenderEngine method), 748  
test\_type (bpy.types.ArmatureSensor attribute), 205  
texco\_mesh (bpy.types.Mesh attribute), 577  
TexMapping (class in bpy.types), 899  
texspace\_location (bpy.types.Curve attribute), 368  
texspace\_location (bpy.types.Mesh attribute), 577  
texspace\_location (bpy.types.MetaBall attribute), 600  
texspace\_size (bpy.types.Curve attribute), 368  
texspace\_size (bpy.types.Mesh attribute), 577  
texspace\_size (bpy.types.MetaBall attribute), 601  
text (bpy.types.Panel attribute), 671  
text (bpy.types.PythonConstraint attribute), 735  
text (bpy.types.PythonController attribute), 736  
text (bpy.types.SpaceTextEditor attribute), 867  
text (bpy.types.ThemeAudioWindow attribute), 934  
text (bpy.types.ThemeConsole attribute), 937  
text (bpy.types.ThemeDopeSheet attribute), 939  
text (bpy.types.ThemeFileBrowser attribute), 941  
text (bpy.types.ThemeGraphEditor attribute), 945  
text (bpy.types.ThemeImageEditor attribute), 947  
text (bpy.types.ThemeInfo attribute), 948  
text (bpy.types.ThemeLogicEditor attribute), 949  
text (bpy.types.ThemeNLAEditor attribute), 951  
text (bpy.types.ThemeNodeEditor attribute), 953  
text (bpy.types.ThemeOutliner attribute), 955  
text (bpy.types.ThemeProperties attribute), 956  
text (bpy.types.ThemeSequenceEditor attribute), 958  
text (bpy.types.ThemeTextEditor attribute), 961  
text (bpy.types.ThemeTimeline attribute), 962  
text (bpy.types.ThemeUserPreferences attribute), 965  
text (bpy.types.ThemeView3D attribute), 969  
text (bpy.types.ThemeWidgetColors attribute), 970  
Text (class in bpy.types), 900  
Text.current\_character (in module bpy.types), 900  
Text.current\_line (in module bpy.types), 900  
Text.is\_dirty (in module bpy.types), 900  
Text.is\_in\_memory (in module bpy.types), 900  
Text.is\_modified (in module bpy.types), 900  
Text.lines (in module bpy.types), 900  
Text.markers (in module bpy.types), 900  
Text.select\_end\_character (in module bpy.types), 900  
Text.select\_end\_line (in module bpy.types), 900  
Text.users\_logic (in module bpy.types), 901  
text\_add() (in module bpy.ops.object), 107  
text\_copy() (in module bpy.ops.font), 58  
text\_cut() (in module bpy.ops.font), 59  
text\_hi (bpy.types.ThemeAudioWindow attribute), 934  
text\_hi (bpy.types.ThemeConsole attribute), 937  
text\_hi (bpy.types.ThemeDopeSheet attribute), 939  
text\_hi (bpy.types.ThemeFileBrowser attribute), 941  
text\_hi (bpy.types.ThemeGraphEditor attribute), 945  
text\_hi (bpy.types.ThemeImageEditor attribute), 947  
text\_hi (bpy.types.ThemeInfo attribute), 948  
text\_hi (bpy.types.ThemeLogicEditor attribute), 949  
text\_hi (bpy.types.ThemeNLAEditor attribute), 951  
text\_hi (bpy.types.ThemeNodeEditor attribute), 953  
text\_hi (bpy.types.ThemeOutliner attribute), 955  
text\_hi (bpy.types.ThemeProperties attribute), 956  
text\_hi (bpy.types.ThemeSequenceEditor attribute), 958  
text\_hi (bpy.types.ThemeTextEditor attribute), 961  
text\_hi (bpy.types.ThemeTimeline attribute), 962  
text\_hi (bpy.types.ThemeUserPreferences attribute), 965  
text\_hi (bpy.types.ThemeView3D attribute), 969  
text\_insert() (in module bpy.ops.font), 59  
text\_paste() (in module bpy.ops.font), 59  
text\_sel (bpy.types.ThemeWidgetColors attribute), 970  
TextBox (class in bpy.types), 902  
textbox\_add() (in module bpy.ops.font), 59  
textbox\_remove() (in module bpy.ops.font), 59  
TextCharacterFormat (class in bpy.types), 903  
TextCurve (class in bpy.types), 904  
TextCurve.body\_format (in module bpy.types), 904  
TextCurve.edit\_format (in module bpy.types), 904  
TextCurve.text\_boxes (in module bpy.types), 905  
TextLine (class in bpy.types), 907  
TextMarker (class in bpy.types), 907  
TextMarker.character\_index\_end (in module bpy.types), 907  
TextMarker.character\_index\_start (in module bpy.types), 908

TextMarker.group (in module bpy.types), 908  
 TextMarker.is\_temporary (in module bpy.types), 908  
 TextMarker.line (in module bpy.types), 908  
 TextMarker.use\_edit\_all (in module bpy.types), 908  
 texture (bge.types.KX\_PolygonMaterial attribute), 1197  
 texture (bge.types.KX\_PolyProxy attribute), 1193  
 texture (bpy.types.Brush attribute), 261  
 texture (bpy.types.CompositorNodeTexture attribute), 341  
 texture (bpy.types.DisplaceModifier attribute), 379  
 texture (bpy.types.EffectorWeights attribute), 401  
 texture (bpy.types.FieldSettings attribute), 431  
 texture (bpy.types.ShaderNodeTexture attribute), 818  
 texture (bpy.types.TextureNodeTexture attribute), 925  
 texture (bpy.types.TextureSlot attribute), 931  
 texture (bpy.types.WarpModifier attribute), 1045  
 texture (bpy.types.WaveModifier attribute), 1047  
 Texture (class in bge.texture), 1258  
 Texture (class in bpy.types), 909  
 texture (in module bpy.context), 30  
 Texture.animation\_data (in module bpy.types), 909  
 Texture.color\_ramp (in module bpy.types), 909  
 Texture.node\_tree (in module bpy.types), 909  
 Texture.users\_material (in module bpy.types), 910  
 Texture.users\_object\_modifier (in module bpy.types), 910  
 texture\_angle\_source\_no\_random (bpy.types.Brush attribute), 262  
 texture\_angle\_source\_random (bpy.types.Brush attribute), 262  
 texture\_collection\_rate (bpy.types.UserPreferencesSystem attribute), 1025  
 texture\_context (bpy.types.SpaceProperties attribute), 864  
 texture\_coords (bpy.types.DisplaceModifier attribute), 379  
 texture\_coords (bpy.types.LampTextureSlot attribute), 526  
 texture\_coords (bpy.types.MaterialTextureSlot attribute), 566  
 texture\_coords (bpy.types.ParticleSettingsTextureSlot attribute), 698  
 texture\_coords (bpy.types.WarpModifier attribute), 1045  
 texture\_coords (bpy.types.WaveModifier attribute), 1047  
 texture\_coords (bpy.types.WorldTextureSlot attribute), 1062  
 texture\_coords\_object (bpy.types.DisplaceModifier attribute), 379  
 texture\_coords\_object (bpy.types.WarpModifier attribute), 1045  
 texture\_coords\_object (bpy.types.WaveModifier attribute), 1047  
 texture\_directory (bpy.types.UserPreferencesFilePaths attribute), 1020  
 texture\_factor (bpy.types.MaterialSubsurfaceScattering attribute), 563  
 texture\_mesh (bpy.types.Mesh attribute), 577  
 texture\_mode (bpy.types.FieldSettings attribute), 431  
 texture\_nabla (bpy.types.FieldSettings attribute), 431  
 texture\_overlay\_alpha (bpy.types.Brush attribute), 262  
 texture\_paint\_toggle() (in module bpy.ops.paint), 112  
 texture\_plugin\_directory (bpy.types.UserPreferencesFilePaths attribute), 1020  
 texture\_sample\_bias (bpy.types.Brush attribute), 262  
 texture\_slot (in module bpy.context), 30  
 texture\_time\_out (bpy.types.UserPreferencesSystem attribute), 1025  
 texture\_type (bpy.types.SpaceNodeEditor attribute), 862  
 TextureNode (class in bpy.types), 911  
 TextureNode.type (in module bpy.types), 911  
 TextureNodeBricks (class in bpy.types), 912  
 TextureNodeChecker (class in bpy.types), 913  
 TextureNodeCompose (class in bpy.types), 914  
 TextureNodeCoordinates (class in bpy.types), 914  
 TextureNodeCurveRGB (class in bpy.types), 915  
 TextureNodeCurveRGB.mapping (in module bpy.types), 915  
 TextureNodeCurveTime (class in bpy.types), 916  
 TextureNodeCurveTime.curve (in module bpy.types), 916  
 TextureNodeDecompose (class in bpy.types), 917  
 TextureNodeDistance (class in bpy.types), 917  
 TextureNodeHueSaturation (class in bpy.types), 918  
 TextureNodeImage (class in bpy.types), 919  
 TextureNodeInvert (class in bpy.types), 919  
 TextureNodeMath (class in bpy.types), 920  
 TextureNodeMixRGB (class in bpy.types), 921  
 TextureNodeOutput (class in bpy.types), 922  
 TextureNodeRGBToBW (class in bpy.types), 923  
 TextureNodeRotate (class in bpy.types), 923  
 TextureNodes (class in bpy.types), 929  
 TextureNodeScale (class in bpy.types), 924  
 TextureNodeTexture (class in bpy.types), 925  
 TextureNodeTranslate (class in bpy.types), 925  
 TextureNodeTree (class in bpy.types), 926  
 TextureNodeTree.nodes (in module bpy.types), 926  
 TextureNodeValToNor (class in bpy.types), 927  
 TextureNodeValToRGB (class in bpy.types), 928  
 TextureNodeValToRGB.color\_ramp (in module bpy.types), 928  
 TextureNodeViewer (class in bpy.types), 929  
 TextureSlot (class in bpy.types), 930  
 TextureSlot.name (in module bpy.types), 931  
 tface (bge.types.KX\_PolygonMaterial attribute), 1197  
 Theme (class in bpy.types), 932  
 Theme.bone\_color\_sets (in module bpy.types), 932  
 Theme.console (in module bpy.types), 932  
 Theme.dopesheet\_editor (in module bpy.types), 932  
 Theme.file\_browser (in module bpy.types), 932  
 Theme.graph\_editor (in module bpy.types), 932  
 Theme.image\_editor (in module bpy.types), 932

Theme.info (in module bpy.types), 932  
Theme.logic\_editor (in module bpy.types), 932  
Theme.nla\_editor (in module bpy.types), 932  
Theme.node\_editor (in module bpy.types), 932  
Theme.outliner (in module bpy.types), 933  
Theme.properties (in module bpy.types), 933  
Theme.sequence\_editor (in module bpy.types), 933  
Theme.text\_editor (in module bpy.types), 933  
Theme.timeline (in module bpy.types), 933  
Theme.user\_interface (in module bpy.types), 933  
Theme.user\_preferences (in module bpy.types), 933  
Theme.view\_3d (in module bpy.types), 933  
theme\_area (bpy.types.Theme attribute), 933  
ThemeAudioWindow (class in bpy.types), 934  
ThemeBoneColorSet (class in bpy.types), 935  
ThemeConsole (class in bpy.types), 936  
ThemeDopeSheet (class in bpy.types), 938  
ThemeFileBrowser (class in bpy.types), 940  
ThemeFontStyle (class in bpy.types), 942  
ThemeGraphEditor (class in bpy.types), 943  
ThemeImageEditor (class in bpy.types), 946  
ThemeInfo (class in bpy.types), 948  
ThemeLogicEditor (class in bpy.types), 949  
ThemeNLAEditor (class in bpy.types), 950  
ThemeNodeEditor (class in bpy.types), 952  
ThemeOutliner (class in bpy.types), 954  
ThemeProperties (class in bpy.types), 955  
ThemeSequenceEditor (class in bpy.types), 957  
ThemeStyle (class in bpy.types), 959  
ThemeStyle.panel\_title (in module bpy.types), 959  
ThemeStyle.widget (in module bpy.types), 959  
ThemeStyle.widget\_label (in module bpy.types), 959  
ThemeTextEditor (class in bpy.types), 960  
ThemeTimeline (class in bpy.types), 962  
ThemeUserInterface (class in bpy.types), 963  
ThemeUserInterface.wcol\_box (in module bpy.types), 963  
ThemeUserInterface.wcol\_list\_item (in module bpy.types), 963  
ThemeUserInterface.wcol\_menu (in module bpy.types), 963  
ThemeUserInterface.wcol\_menu\_back (in module bpy.types), 963  
ThemeUserInterface.wcol\_menu\_item (in module bpy.types), 963  
ThemeUserInterface.wcol\_num (in module bpy.types), 963  
ThemeUserInterface.wcol\_numslider (in module bpy.types), 963  
ThemeUserInterface.wcol\_option (in module bpy.types), 964  
ThemeUserInterface.wcol\_progress (in module bpy.types), 964  
ThemeUserInterface.wcol\_pulldown (in module bpy.types), 964  
ThemeUserInterface.wcol\_radio (in module bpy.types), 964  
ThemeUserInterface.wcol\_regular (in module bpy.types), 964  
ThemeUserInterface.wcol\_scroll (in module bpy.types), 964  
ThemeUserInterface.wcol\_state (in module bpy.types), 964  
ThemeUserInterface.wcol\_text (in module bpy.types), 964  
ThemeUserInterface.wcol\_toggle (in module bpy.types), 964  
ThemeUserInterface.wcol\_tool (in module bpy.types), 964  
ThemeUserPreferences (class in bpy.types), 965  
ThemeView3D (class in bpy.types), 966  
ThemeWidgetColors (class in bpy.types), 970  
ThemeWidgetStateColors (class in bpy.types), 971  
thickness (bpy.types.SolidifyModifier attribute), 844  
thickness\_inner (bpy.types.CollisionSettings attribute), 287  
thickness\_outer (bpy.types.CollisionSettings attribute), 287  
thickness\_vertex\_group (bpy.types.SolidifyModifier attribute), 844  
threads (bpy.types.RenderSettings attribute), 760  
threads\_mode (bpy.types.RenderSettings attribute), 760  
THREEKEY (in module bge.events), 1262  
threshold (bge.types.SCA\_JoystickSensor attribute), 1215  
threshold (bpy.types.CompositorNodeChromaMatte attribute), 299  
threshold (bpy.types.CompositorNodeDefocus attribute), 311  
threshold (bpy.types.CompositorNodeGlare attribute), 318  
threshold (bpy.types.GlowSequence attribute), 460  
threshold (bpy.types.MetaBall attribute), 601  
threshold (bpy.types.WorldLighting attribute), 1059  
tile (bge.types.KX\_PolygonMaterial attribute), 1197  
tile\_set() (in module bpy.ops.uv), 153  
tiles (bpy.types.ThemeFileBrowser attribute), 941  
tiles\_x (bpy.types.Image attribute), 477  
tiles\_y (bpy.types.Image attribute), 477  
tilexrep (bge.types.KX\_PolygonMaterial attribute), 1197  
tileyrep (bge.types.KX\_PolygonMaterial attribute), 1197  
tilt (bpy.types.BezierSplinePoint attribute), 211  
tilt (bpy.types.ShapeKeyCurvePoint attribute), 827  
tilt (bpy.types.SplinePoint attribute), 882  
tilt() (in module bpy.ops.transform), 144  
tilt\_clear() (in module bpy.ops.curve), 50  
tilt\_interpolation (bpy.types.Spline attribute), 878

time (bge.types.KX\_ConstraintActuator attribute), 1173  
 time (bge.types.KX\_SCA\_AddObjectActuator attribute), 1202  
 time (bge.types.KX\_TrackToActuator attribute), 1207  
 time (bpy.types.ConstraintActuator attribute), 355  
 time (bpy.types.EditObjectActuator attribute), 396  
 time (bpy.types.OperatorMousePath attribute), 663  
 time (bpy.types.OperatorStrokeElement attribute), 664  
 time (bpy.types.ParticleHairKey attribute), 680  
 time (bpy.types.ParticleKey attribute), 683  
 time (bpy.types.ParticleTarget attribute), 707  
 time\_factor (bpy.types.ParticleSettingsTextureSlot attribute), 698  
 time\_offset (bpy.types.Object attribute), 643  
 time\_offset (bpy.types.WaveModifier attribute), 1047  
 time\_scale (bpy.types.SmokeDomainSettings attribute), 835  
 time\_toggle() (in module bpy.ops.anim), 38  
 time\_tweak (bpy.types.ParticleSettings attribute), 693  
 timecode\_style (bpy.types.UserPreferencesView attribute), 1029  
 TimelineMarker (class in bpy.types), 972  
 TimelineMarkers (class in bpy.types), 973  
 timeOffset (bge.types.KX\_GameObject attribute), 1176  
 Timer (class in bpy.types), 974  
 Timer.time\_delta (in module bpy.types), 974  
 Timer.time\_duration (in module bpy.types), 974  
 Timer.time\_step (in module bpy.types), 975  
 timestep (bpy.types.ParticleSettings attribute), 694  
 tip\_size (bpy.types.MaterialStrand attribute), 562  
 title (bpy.types.ThemeAudioWindow attribute), 934  
 title (bpy.types.ThemeConsole attribute), 937  
 title (bpy.types.ThemeDopeSheet attribute), 939  
 title (bpy.types.ThemeFileBrowser attribute), 941  
 title (bpy.types.ThemeGraphEditor attribute), 945  
 title (bpy.types.ThemeImageEditor attribute), 947  
 title (bpy.types.ThemeInfo attribute), 948  
 title (bpy.types.ThemeLogicEditor attribute), 950  
 title (bpy.types.ThemeNLAEditor attribute), 951  
 title (bpy.types.ThemeNodeEditor attribute), 953  
 title (bpy.types.ThemeOutliner attribute), 955  
 title (bpy.types.ThemeProperties attribute), 956  
 title (bpy.types.ThemeSequenceEditor attribute), 958  
 title (bpy.types.ThemeTextEditor attribute), 961  
 title (bpy.types.ThemeTimeline attribute), 962  
 title (bpy.types.ThemeUserPreferences attribute), 965  
 title (bpy.types.ThemeView3D attribute), 969  
 TKEY (in module bge.events), 1262  
 to\_2d() (mathutils.Vector method), 1095  
 to\_3d() (mathutils.Vector method), 1095  
 to\_3d\_object() (in module bpy.ops.text), 138  
 to\_3x3() (mathutils.Matrix method), 1088  
 to\_4d() (mathutils.Vector method), 1095  
 to\_4x4() (mathutils.Matrix method), 1088  
 to\_euler() (mathutils.Matrix method), 1088  
 to\_euler() (mathutils.Quaternion method), 1091  
 to\_list() (in module bgl), 1145  
 to\_matrix() (mathutils.Euler method), 1085  
 to\_matrix() (mathutils.Quaternion method), 1091  
 to\_max\_x (bpy.types.TransformConstraint attribute), 982  
 to\_max\_y (bpy.types.TransformConstraint attribute), 982  
 to\_max\_z (bpy.types.TransformConstraint attribute), 983  
 to\_mesh() (bpy.types.Object method), 644  
 to\_min\_x (bpy.types.TransformConstraint attribute), 983  
 to\_min\_y (bpy.types.TransformConstraint attribute), 983  
 to\_min\_z (bpy.types.TransformConstraint attribute), 983  
 to\_property (bpy.types.MessageActuator attribute), 598  
 to\_quaternion() (mathutils.Euler method), 1085  
 to\_quaternion() (mathutils.Matrix method), 1088  
 to\_scale() (mathutils.Matrix method), 1088  
 to\_track\_quat() (mathutils.Vector method), 1095  
 to\_translation() (mathutils.Matrix method), 1088  
 to\_tuple() (mathutils.Vector method), 1095  
 toggleProperty (bge.types.SCA\_KeyboardSensor attribute), 1216  
 tolerance (bpy.types.CompositorNodeChromaMatte attribute), 299  
 tolerance (bpy.types.CompositorNodeDiffMatte attribute), 312  
 tolerance (bpy.types.CompositorNodeDistanceMatte attribute), 314  
 tonemap\_type (bpy.types.CompositorNodeTonemap attribute), 343  
 tool (bpy.types.ParticleEdit attribute), 678  
 toolbox() (in module bpy.ops.buttons), 43  
 ToolSettings (class in bpy.types), 975  
 ToolSettings.image\_paint (in module bpy.types), 976  
 ToolSettings.particle\_edit (in module bpy.types), 976  
 ToolSettings.sculpt (in module bpy.types), 977  
 ToolSettings.vertex\_paint (in module bpy.types), 978  
 ToolSettings.weight\_paint (in module bpy.types), 979  
 toolshelf() (in module bpy.ops.view3d), 158  
 torque (bge.types.KX\_ObjectActuator attribute), 1191  
 torque (bpy.types.ObjectActuator attribute), 650  
 tosphere() (in module bpy.ops.transform), 145  
 TouchSensor (class in bpy.types), 979  
 tracer\_particles (bpy.types.DomainFluidSettings attribute), 383  
 track\_axis (bpy.types.DampedTrackConstraint attribute), 376  
 track\_axis (bpy.types.LockedTrackConstraint attribute), 540  
 track\_axis (bpy.types.Object attribute), 643  
 track\_axis (bpy.types.TrackToConstraint attribute), 980  
 track\_clear() (in module bpy.ops.object), 107  
 track\_object (bpy.types.EditObjectActuator attribute), 396  
 track\_set() (in module bpy.ops.object), 107

trackball() (in module bpy.ops.transform), 145  
tracks\_add() (in module bpy.ops.nla), 89  
TrackToConstraint (class in bpy.types), 980  
trail\_count (bpy.types.ParticleSettings attribute), 694  
transform (bpy.types.ThemeView3D attribute), 969  
transform() (bpy.types.EditBone method), 395  
transform() (bpy.types.Mesh method), 578  
transform() (in module bpy.ops.transform), 146  
transform\_apply() (in module bpy.ops.object), 107  
transform\_channel (bpy.types.ActionConstraint attribute), 174  
transform\_orientation (bpy.types.SpaceView3D attribute), 874  
transform\_type (bpy.types.DriverTarget attribute), 388  
TransformConstraint (class in bpy.types), 981  
TransformOrientation (class in bpy.types), 984  
transforms\_clear() (in module bpy.ops.pose), 118  
TransformSequence (class in bpy.types), 985  
transition\_add() (in module bpy.ops.nla), 89  
transition\_strip (bpy.types.ThemeSequenceEditor attribute), 958  
transition\_type (bpy.types.WipeSequence attribute), 1052  
translate() (bpy.types.Bone method), 255  
translate() (bpy.types.EditBone method), 395  
translate() (bpy.types.PoseBone method), 726  
translate() (in module bpy.ops.transform), 147  
translate\_start\_x (bpy.types.TransformSequence attribute), 985  
translate\_start\_y (bpy.types.TransformSequence attribute), 985  
Translation() (mathutils.Matrix class method), 1086  
translation\_unit (bpy.types.TransformSequence attribute), 985  
translucency (bpy.types.Material attribute), 551  
translucency\_factor (bpy.types.MaterialTextureSlot attribute), 566  
transmission\_color (bpy.types.MaterialVolume attribute), 572  
transmission\_color\_factor (bpy.types.MaterialTextureSlot attribute), 566  
transparency\_method (bpy.types.Material attribute), 551  
transparent (bge.types.KX\_PolygonMaterial attribute), 1198  
transpose() (mathutils.Matrix method), 1088  
transposed() (mathutils.Matrix method), 1088  
tree\_type (bpy.types.SpaceNodeEditor attribute), 862  
triangle (bge.types.KX\_PolygonMaterial attribute), 1198  
triggered (bge.types.SCA\_ISensor attribute), 1165  
tris\_convert\_to\_quads() (in module bpy.ops.mesh), 86  
turbulence (bpy.types.EffectorWeights attribute), 401  
turbulence (bpy.types.MagicTexture attribute), 542  
turbulence (bpy.types.MarbleTexture attribute), 545  
turbulence (bpy.types.StucciTexture attribute), 892

turbulence (bpy.types.WoodTexture attribute), 1054  
turbulence\_depth (bpy.types.PointDensity attribute), 715  
turbulence\_influence (bpy.types.PointDensity attribute), 716  
turbulence\_scale (bpy.types.PointDensity attribute), 716  
turbulence\_strength (bpy.types.PointDensity attribute), 716  
tweakmode\_enter() (in module bpy.ops.nla), 89  
tweakmode\_exit() (in module bpy.ops.nla), 89  
twist\_mode (bpy.types.Curve attribute), 368  
twist\_smooth (bpy.types.Curve attribute), 369  
TWOKEY (in module bge.events), 1262  
type (bge.types.BL\_ArmatureActuator attribute), 1225  
type (bge.types.BL\_ArmatureConstraint attribute), 1227  
type (bge.types.KX\_ArmatureSensor attribute), 1226  
type (bge.types.KX\_LightObject attribute), 1185  
type (bpy.types.Actuator attribute), 179  
type (bpy.types.AnimVizMotionPaths attribute), 191  
type (bpy.types.AnimVizOnionSkinning attribute), 192  
type (bpy.types.Area attribute), 194  
type (bpy.types.Camera attribute), 269  
type (bpy.types.Controller attribute), 360  
type (bpy.types.Driver attribute), 387  
type (bpy.types.DriverVariable attribute), 389  
type (bpy.types.FieldSettings attribute), 431  
type (bpy.types.FluidSettings attribute), 440  
type (bpy.types.GameProperty attribute), 456  
type (bpy.types.Keyframe attribute), 512  
type (bpy.types.KeyMapItem attribute), 501  
type (bpy.types.Lamp attribute), 523  
type (bpy.types.Material attribute), 551  
type (bpy.types.MetaElement attribute), 603  
type (bpy.types.ParticleEdit attribute), 678  
type (bpy.types.ParticleSettings attribute), 694  
type (bpy.types.Sensor attribute), 793  
type (bpy.types.Spline attribute), 878  
type (bpy.types.Texture attribute), 909  
type\_recast() (bpy.types.bpy\_struct method), 1071

## U

u (bge.types.KX\_VertexProxy attribute), 1210  
u2 (bge.types.KX\_VertexProxy attribute), 1210  
UILayout (class in bpy.types), 986  
UKEY (in module bge.events), 1262  
uncomment() (in module bpy.ops.text), 138  
underline\_height (bpy.types.TextCurve attribute), 905  
underline\_position (bpy.types.TextCurve attribute), 905  
undo() (in module bpy.ops.ed), 50  
undo\_history() (in module bpy.ops.ed), 50  
undo\_memory\_limit (bpy.types.UserPreferencesEdit attribute), 1016  
undo\_push() (in module bpy.ops.ed), 50  
undo\_steps (bpy.types.UserPreferencesEdit attribute), 1016

unindent() (in module bpy.ops.text), 138  
unique\_name() (in module bpy\_extras.io\_utils), 1159  
UnitSettings (class in bpy.types), 1012  
UnknownType (class in bpy.types), 1013  
unlink() (bpy.types.Actuator method), 179  
unlink() (bpy.types.Controller method), 361  
unlink() (bpy.types.GroupObjects method), 466  
unlink() (bpy.types.SceneObjects method), 780  
unlink() (bpy.types.Sensor method), 793  
unlink() (in module bpy.ops.font), 59  
unlink() (in module bpy.ops.poselib), 119  
unlink() (in module bpy.ops.text), 138  
unlink\_selected() (in module bpy.ops.uv), 153  
unlock() (in module bpy.ops.sequencer), 130  
unmute() (in module bpy.ops.sequencer), 130  
unpack() (in module bpy.ops.image), 67  
unpack() (in module bpy.ops.sound), 132  
unpack\_all() (in module bpy.ops.file), 56  
unpack\_face\_list() (in module bpy\_extras.io\_utils), 1158  
unpack\_list() (in module bpy\_extras.io\_utils), 1158  
unprojected\_radius (bpy.types.Brush attribute), 262  
unregister\_class() (in module bpy.utils), 1073  
unregister\_module() (in module bpy.utils), 1073  
unspill\_blue (bpy.types.CompositorNodeColorSpill attribute), 302  
unspill\_green (bpy.types.CompositorNodeColorSpill attribute), 302  
unspill\_red (bpy.types.CompositorNodeColorSpill attribute), 302  
unwrap() (in module bpy.ops.uv), 153  
up\_axis (bpy.types.FollowPathConstraint attribute), 442  
up\_axis (bpy.types.Object attribute), 643  
up\_axis (bpy.types.TrackToConstraint attribute), 980  
UPARROWKEY (in module bge.events), 1263  
update() (bge.types.BL\_ArmatureObject method), 1224  
update() (bpy.types.Image method), 478  
update() (bpy.types.Mesh method), 578  
update() (bpy.types.Scene method), 773  
update\_data\_paths() (in module bpy.ops.anim), 38  
update\_method (bpy.types.MetaBall attribute), 601  
update\_result() (bpy.types.RenderEngine method), 747  
update\_stats() (bpy.types.RenderEngine method), 748  
update\_tag() (bpy.types.ID method), 473  
updateTexture() (bge.types.KX\_PolygonMaterial method), 1198  
url\_open() (in module bpy.ops.wm), 170  
use (bpy.types.CollisionSettings attribute), 287  
use (bpy.types.ControlFluidSettings attribute), 359  
use (bpy.types.FluidFluidSettings attribute), 439  
use (bpy.types.InflowFluidSettings attribute), 489  
use (bpy.types.MaterialRaytraceMirror attribute), 558  
use (bpy.types.MaterialSubsurfaceScattering attribute), 564  
use (bpy.types.MaterialTextureSlot attribute), 566  
use (bpy.types.ObstacleFluidSettings attribute), 654  
use (bpy.types.OutflowFluidSettings attribute), 666  
use (bpy.types.SceneRenderLayer attribute), 782  
use (bpy.types.UserSolidLight attribute), 1030  
use3D (bge.types.KX\_TrackToActuator attribute), 1207  
use\_2d\_force (bpy.types.FieldSettings attribute), 431  
use\_3d\_tracking (bpy.types.EditObjectActuator attribute), 396  
use\_absolute (bpy.types.SmokeFlowSettings attribute), 836  
use\_absolute\_path\_time (bpy.types.ParticleSettings attribute), 694  
use\_absorption (bpy.types.FieldSettings attribute), 431  
use\_accumulate (bpy.types.Brush attribute), 262  
use\_activity\_culling (bpy.types.GameObjectSettings attribute), 454  
use\_activity\_culling (bpy.types.SceneGameData attribute), 778  
use\_actor (bpy.types.GameObjectSettings attribute), 454  
use\_adaptive\_space (bpy.types.Brush attribute), 262  
use\_add\_linear\_velocity (bpy.types.ObjectActuator attribute), 650  
use\_additive (bpy.types.FCurveActuator attribute), 414  
use\_additive (bpy.types.FModifierFunctionGenerator attribute), 423  
use\_additive (bpy.types.FModifierGenerator attribute), 424  
use\_advanced\_hair (bpy.types.ParticleSettings attribute), 694  
use\_airbrush (bpy.types.Brush attribute), 262  
use\_all\_events (bpy.types.JoystickSensor attribute), 493  
use\_all\_faces (bpy.types.VertexPaint attribute), 1038  
use\_all\_keys (bpy.types.KeyboardSensor attribute), 511  
use\_all\_states (bpy.types.GameObjectSettings attribute), 454  
use\_all\_z (bpy.types.SceneRenderLayer attribute), 782  
use\_alpha (bpy.types.Brush attribute), 262  
use\_alpha (bpy.types.CompositorNodeMixRGB attribute), 329  
use\_alpha (bpy.types.CompositorNodeZcombine attribute), 349  
use\_alpha (bpy.types.ImageTexture attribute), 485  
use\_alpha (bpy.types.ShaderNodeMixRGB attribute), 812  
use\_alpha (bpy.types.TextureNodeMixRGB attribute), 921  
use\_alpha\_sort (bpy.types.MeshTextureFace attribute), 593  
use\_always\_true (bpy.types.RandomActuator attribute), 740  
use\_ambient\_occlusion (bpy.types.WorldLighting attribute), 1059  
use\_anchor (bpy.types.Brush attribute), 262

use\_angular\_limit\_x (bpy.types.RigidBodyJointConstraint attribute), 766  
use\_angular\_limit\_y (bpy.types.RigidBodyJointConstraint attribute), 766  
use\_angular\_limit\_z (bpy.types.RigidBodyJointConstraint attribute), 766  
use\_animated\_influence (bpy.types.NlaStrip attribute), 625  
use\_animated\_mesh (bpy.types.FluidFluidSettings attribute), 439  
use\_animated\_mesh (bpy.types.InflowFluidSettings attribute), 489  
use\_animated\_mesh (bpy.types.ObstacleFluidSettings attribute), 655  
use\_animated\_mesh (bpy.types.OutflowFluidSettings attribute), 667  
use\_animated\_time (bpy.types.NlaStrip attribute), 625  
use\_animated\_time\_cyclic (bpy.types.NlaStrip attribute), 625  
use\_animation (bpy.types.Image attribute), 478  
use\_animation\_record (bpy.types.SceneGameData attribute), 778  
use\_anisotropic\_friction (bpy.types.GameObjectSettings attribute), 454  
use\_antialiasing (bpy.types.RenderSettings attribute), 760  
use\_antialiasing (bpy.types.UserPreferencesSystem attribute), 1025  
use\_apply\_on\_spline (bpy.types.Modifier attribute), 609  
use\_as\_speed (bpy.types.SpeedControlSequence attribute), 876  
use\_atmosphere (bpy.types.LampSkySettings attribute), 525  
use\_audio (bpy.types.Scene attribute), 772  
use\_audio\_scrub (bpy.types.Scene attribute), 772  
use\_audio\_sync (bpy.types.Scene attribute), 772  
use\_auto\_blend (bpy.types.NlaStrip attribute), 625  
use\_auto\_clip\_end (bpy.types.SpotLamp attribute), 886  
use\_auto\_clip\_start (bpy.types.SpotLamp attribute), 886  
use\_auto\_handle\_clamp (bpy.types.FCurve attribute), 413  
use\_auto\_ik (bpy.types.Armature attribute), 199  
use\_auto\_keying (bpy.types.UserPreferencesEdit attribute), 1016  
use\_auto\_merge\_keyframes (bpy.types.SpaceDopeSheetEditor attribute), 852  
use\_auto\_merge\_keyframes (bpy.types.SpaceGraphEditor attribute), 855  
use\_auto\_normalize (bpy.types.ToolSettings attribute), 977  
use\_auto\_perspective (bpy.types.UserPreferencesView attribute), 1029  
use\_auto\_refresh (bpy.types.CompositorNodeImage attribute), 322  
use\_auto\_refresh (bpy.types.ImageUser attribute), 488  
use\_auto\_render (bpy.types.SpaceNodeEditor attribute), 862  
use\_auto\_save\_temporary\_files (bpy.types.UserPreferencesFilePaths attribute), 1020  
use\_auto\_smooth (bpy.types.Mesh attribute), 577  
use\_auto\_start (bpy.types.SceneGameData attribute), 778  
use\_auto\_step (bpy.types.Itasc attribute), 492  
use\_auto\_step (bpy.types.SoftBodySettings attribute), 842  
use\_auto\_txspace (bpy.types.Curve attribute), 369  
use\_auto\_txspace (bpy.types.Mesh attribute), 578  
use\_auto\_txspace (bpy.types.MetaBall attribute), 601  
use\_auto\_velocity (bpy.types.ParticleEdit attribute), 678  
use\_avoid (bpy.types.BoidRuleAvoidCollision attribute), 245  
use\_avoid\_collision (bpy.types.BoidRuleAvoidCollision attribute), 245  
use\_backface\_culling (bpy.types.ImagePaint attribute), 480  
use\_bake\_antialiasing (bpy.types.RenderSettings attribute), 760  
use\_bake\_clear (bpy.types.RenderSettings attribute), 760  
use\_bake\_lores\_mesh (bpy.types.RenderSettings attribute), 760  
use\_bake\_multires (bpy.types.RenderSettings attribute), 760  
use\_bake\_normalize (bpy.types.RenderSettings attribute), 760  
use\_bake\_selected\_to\_active (bpy.types.RenderSettings attribute), 760  
use\_bending\_constraints (bpy.types.GameSoftBodySettings attribute), 457  
use\_bezier\_u (bpy.types.Spline attribute), 878  
use\_bezier\_v (bpy.types.Spline attribute), 878  
use\_billboard (bpy.types.MeshTextureFace attribute), 593  
use\_bitmap\_text (bpy.types.MeshTextureFace attribute), 593  
use\_blend\_shared (bpy.types.MeshTextureFace attribute), 593  
use\_blender\_units (bpy.types.MaterialStrand attribute), 562  
use\_bokeh (bpy.types.CompositorNodeBlur attribute), 296  
use\_bold (bpy.types.TextCharacterFormat attribute), 903  
use\_bone\_envelopes (bpy.types.ArmatureModifier attribute), 204  
use\_bone\_sketching (bpy.types.ToolSettings attribute), 977  
use\_border (bpy.types.RenderSettings attribute), 760  
use\_box\_clip (bpy.types.RegionView3D attribute), 744  
use\_cache (bpy.types.WorldLighting attribute), 1059

use\_calculate\_alpha (bpy.types.ImageTexture attribute), 485  
 use\_camera\_lock\_parent (bpy.types.UserPreferencesView attribute), 1029  
 use\_cast\_approximate (bpy.types.Material attribute), 551  
 use\_cast\_buffer\_shadows (bpy.types.Material attribute), 551  
 use\_cast\_shadows\_only (bpy.types.Material attribute), 551  
 use\_chain\_offset (bpy.types.SplineIKConstraint attribute), 881  
 use\_checker\_even (bpy.types.ImageTexture attribute), 485  
 use\_checker\_odd (bpy.types.ImageTexture attribute), 485  
 use\_children (bpy.types.ParticleInstanceModifier attribute), 682  
 use\_cineon\_log (bpy.types.RenderSettings attribute), 761  
 use\_clamp\_x (bpy.types.Image attribute), 478  
 use\_clamp\_y (bpy.types.Image attribute), 478  
 use\_climb (bpy.types.BoidSettings attribute), 250  
 use\_clip (bpy.types.CurveMapping attribute), 373  
 use\_clip (bpy.types.MirrorModifier attribute), 607  
 use\_clone\_layer (bpy.types.ImagePaint attribute), 480  
 use\_cluster\_rigid\_to\_softbody (bpy.types.GameSoftBodySettings attribute), 457  
 use\_cluster\_soft\_to\_softbody (bpy.types.GameSoftBodySettings attribute), 457  
 use\_collision (bpy.types.ClothCollisionSettings attribute), 277  
 use\_collision (bpy.types.MeshTextureFace attribute), 593  
 use\_collision\_bounds (bpy.types.GameObjectSettings attribute), 454  
 use\_collision\_compound (bpy.types.GameObjectSettings attribute), 455  
 use\_color\_balance (bpy.types.AdjustmentSequence attribute), 183  
 use\_color\_balance (bpy.types.EffectSequence attribute), 398  
 use\_color\_balance (bpy.types.ImageSequence attribute), 482  
 use\_color\_balance (bpy.types.MetaSequence attribute), 605  
 use\_color\_balance (bpy.types.MovieSequence attribute), 613  
 use\_color\_balance (bpy.types.MulticamSequence attribute), 616  
 use\_color\_balance (bpy.types.SceneSequence attribute), 785  
 use\_color\_management (bpy.types.RenderSettings attribute), 761  
 use\_color\_ramp (bpy.types.Texture attribute), 909  
 use\_compositing (bpy.types.RenderSettings attribute), 761  
 use\_compound (bpy.types.ParentActuator attribute), 673  
 use\_connect (bpy.types.EditBone attribute), 394  
 use\_constant\_offset (bpy.types.ArrayModifier attribute), 207  
 use\_continue\_last\_frame (bpy.types.ActionActuator attribute), 172  
 use\_continue\_last\_frame (bpy.types.ShapeActionActuator attribute), 824  
 use\_crop (bpy.types.AdjustmentSequence attribute), 183  
 use\_crop (bpy.types.EffectSequence attribute), 398  
 use\_crop (bpy.types.ImageSequence attribute), 482  
 use\_crop (bpy.types.MetaSequence attribute), 605  
 use\_crop (bpy.types.MovieSequence attribute), 613  
 use\_crop (bpy.types.MulticamSequence attribute), 616  
 use\_crop (bpy.types.SceneSequence attribute), 785  
 use\_crop\_size (bpy.types.CompositorNodeCrop attribute), 307  
 use\_crop\_to\_border (bpy.types.RenderSettings attribute), 761  
 use\_cubic (bpy.types.Material attribute), 551  
 use\_curve\_follow (bpy.types.FollowPathConstraint attribute), 443  
 use\_curve\_radius (bpy.types.FollowPathConstraint attribute), 443  
 use\_curve\_radius (bpy.types.SplineIKConstraint attribute), 881  
 use\_curved (bpy.types.CompositorNodeVecBlur attribute), 347  
 use\_custom\_icon (bpy.types.Brush attribute), 262  
 use\_cyclic (bpy.types.ClampToConstraint attribute), 276  
 use\_cyclic (bpy.types.CompositorNodeImage attribute), 322  
 use\_cyclic (bpy.types.ImageUser attribute), 488  
 use\_cyclic (bpy.types.WaveModifier attribute), 1047  
 use\_cyclic\_offset (bpy.types.Bone attribute), 254  
 use\_cyclic\_offset (bpy.types.EditBone attribute), 394  
 use\_cyclic\_u (bpy.types.Spline attribute), 879  
 use\_cyclic\_v (bpy.types.Spline attribute), 879  
 use\_dead (bpy.types.ParticleSettings attribute), 694  
 use\_debug (bpy.types.PythonController attribute), 736  
 use\_default\_fade (bpy.types.Sequence attribute), 796  
 use\_default\_interpolate (bpy.types.ParticleEdit attribute), 678  
 use\_deform (bpy.types.Bone attribute), 254  
 use\_deform (bpy.types.EditBone attribute), 394  
 use\_deform\_bounds (bpy.types.Curve attribute), 369  
 use\_deform\_delay (bpy.types.Armature attribute), 199  
 use\_deform\_envelopes (bpy.types.Armature attribute), 199  
 use\_deform\_only (bpy.types.Sculpt attribute), 791

use\_deform\_preserve\_volume (bpy.types.Armature attribute), 199  
use\_deform\_preserve\_volume (bpy.types.ArmatureModifier attribute), 204  
use\_deform\_vertex\_groups (bpy.types.Armature attribute), 200  
use\_deinterlace (bpy.types.AdjustmentSequence attribute), 183  
use\_deinterlace (bpy.types.EffectSequence attribute), 398  
use\_deinterlace (bpy.types.ImageSequence attribute), 482  
use\_deinterlace (bpy.types.MetaSequence attribute), 605  
use\_deinterlace (bpy.types.MovieSequence attribute), 614  
use\_deinterlace (bpy.types.MulticamSequence attribute), 616  
use\_deinterlace (bpy.types.SceneSequence attribute), 785  
use\_deprecation\_warnings (bpy.types.SceneGameData attribute), 778  
use\_derivative\_map (bpy.types.ImageTexture attribute), 485  
use\_diagnose (bpy.types.SoftBodySettings attribute), 842  
use\_die\_on\_collision (bpy.types.ParticleSettings attribute), 694  
use\_diffuse (bpy.types.Lamp attribute), 523  
use\_diffuse (bpy.types.ShaderNodeExtendedMaterial attribute), 806  
use\_diffuse (bpy.types.ShaderNodeMaterial attribute), 810  
use\_diffuse\_ramp (bpy.types.Material attribute), 551  
use\_directional\_menus (bpy.types.UserPreferencesView attribute), 1029  
use\_disk\_cache (bpy.types.PointCache attribute), 713  
use\_display\_lists (bpy.types.SceneGameData attribute), 778  
use\_dissolve\_smoke (bpy.types.SmokeDomainSettings attribute), 835  
use\_dissolve\_smoke\_log (bpy.types.SmokeDomainSettings attribute), 835  
use\_dither (bpy.types.AreaLamp attribute), 196  
use\_drag\_immediately (bpy.types.UserPreferencesEdit attribute), 1016  
use\_drops (bpy.types.ParticleFluidSettings attribute), 680  
use\_dupli\_faces\_scale (bpy.types.Object attribute), 643  
use\_dupli\_frames\_speed (bpy.types.Object attribute), 644  
use\_dupli\_vertices\_rotation (bpy.types.Object attribute), 644  
use\_duplicate\_action (bpy.types.UserPreferencesEdit attribute), 1016  
use\_duplicate\_armature (bpy.types.UserPreferencesEdit attribute), 1017  
use\_duplicate\_curve (bpy.types.UserPreferencesEdit attribute), 1017  
use\_duplicate\_fcurve (bpy.types.UserPreferencesEdit attribute), 1017  
use\_duplicate\_lamp (bpy.types.UserPreferencesEdit attribute), 1017  
use\_duplicate\_material (bpy.types.UserPreferencesEdit attribute), 1017  
use\_duplicate\_mesh (bpy.types.UserPreferencesEdit attribute), 1017  
use\_duplicate\_metaball (bpy.types.UserPreferencesEdit attribute), 1017  
use\_duplicate\_particle (bpy.types.UserPreferencesEdit attribute), 1017  
use\_duplicate\_surface (bpy.types.UserPreferencesEdit attribute), 1017  
use\_duplicate\_text (bpy.types.UserPreferencesEdit attribute), 1017  
use\_duplicate\_texture (bpy.types.UserPreferencesEdit attribute), 1017  
use\_dynamic\_bind (bpy.types.MeshDeformModifier attribute), 582  
use\_dynamic\_rotation (bpy.types.ParticleSettings attribute), 694  
use\_edge\_angle (bpy.types.EdgeSplitModifier attribute), 391  
use\_edge\_collision (bpy.types.SoftBodySettings attribute), 842  
use\_edge\_cut (bpy.types.ExplodeModifier attribute), 410  
use\_edge\_enhance (bpy.types.RenderSettings attribute), 761  
use\_edge\_enhance (bpy.types.SceneRenderLayer attribute), 782  
use\_edge\_sharp (bpy.types.EdgeSplitModifier attribute), 391  
use\_edge\_sharp (bpy.types.MeshEdge attribute), 583  
use\_edge\_to\_edge (bpy.types.Brush attribute), 262  
use\_edges (bpy.types.SoftBodySettings attribute), 842  
use\_emit\_random (bpy.types.ParticleSettings attribute), 694  
use\_emitter\_deflect (bpy.types.ParticleEdit attribute), 678  
use\_emulate\_numpad (bpy.types.UserPreferencesInput attribute), 1022  
use\_endpoint\_u (bpy.types.Spline attribute), 879  
use\_endpoint\_v (bpy.types.Spline attribute), 879  
use\_enter\_edit\_mode (bpy.types.UserPreferencesEdit attribute), 1017  
use\_entire\_array (bpy.types.KeyingSetPath attribute), 516  
use\_envelope\_multiply (bpy.types.Bone attribute), 254  
use\_envelope\_multiply (bpy.types.EditBone attribute), 394  
use\_environment\_light (bpy.types.WorldLighting attribute), 1059  
use\_envmaps (bpy.types.RenderSettings attribute), 761  
use\_estimate\_matrix (bpy.types.SoftBodySettings attribute), 842

use\_etch\_autoname (bpy.types.ToolSettings attribute), 977  
 use\_etch\_overdraw (bpy.types.ToolSettings attribute), 977  
 use\_etch\_quick (bpy.types.ToolSettings attribute), 977  
 use\_even\_distribution (bpy.types.ParticleSettings attribute), 694  
 use\_even\_divisions (bpy.types.SplineIKConstraint attribute), 881  
 use\_even\_offset (bpy.types.SolidifyModifier attribute), 844  
 use\_exr\_half (bpy.types.CompositorNodeOutputFile attribute), 331  
 use\_external (bpy.types.PointCache attribute), 713  
 use\_external\_shadows (bpy.types.MaterialVolume attribute), 572  
 use\_extreme\_alpha (bpy.types.MaterialHalo attribute), 555  
 use\_face\_collision (bpy.types.SoftBodySettings attribute), 843  
 use\_face\_texture (bpy.types.Material attribute), 551  
 use\_face\_texture\_alpha (bpy.types.Material attribute), 551  
 use\_fade\_time (bpy.types.ParticleEdit attribute), 678  
 use\_fake\_user (bpy.types.ID attribute), 472  
 use\_falloff (bpy.types.WorldLighting attribute), 1059  
 use\_falloff\_curve (bpy.types.PointDensity attribute), 716  
 use\_fancy\_drawing (bpy.types.SpaceGraphEditor attribute), 855  
 use\_fast\_edit (bpy.types.TextCurve attribute), 905  
 use\_fh\_normal (bpy.types.ConstraintActuator attribute), 355  
 use\_fh\_normal (bpy.types.MaterialPhysics attribute), 557  
 use\_fh\_paralel\_axis (bpy.types.ConstraintActuator attribute), 355  
 use\_fields (bpy.types.Image attribute), 478  
 use\_fields (bpy.types.RenderSettings attribute), 761  
 use\_fields\_still (bpy.types.RenderSettings attribute), 761  
 use\_file\_compression (bpy.types.UserPreferencesFilePaths attribute), 1020  
 use\_file\_extension (bpy.types.RenderSettings attribute), 761  
 use\_fill\_back (bpy.types.Curve attribute), 369  
 use\_fill\_deform (bpy.types.Curve attribute), 369  
 use\_fill\_front (bpy.types.Curve attribute), 369  
 use\_filter (bpy.types.FileSelectParams attribute), 433  
 use\_filter\_blender (bpy.types.FileSelectParams attribute), 434  
 use\_filter\_case\_sensitive (bpy.types.SpaceOutliner attribute), 863  
 use\_filter\_complete (bpy.types.SpaceOutliner attribute), 863  
 use\_filter\_files (bpy.types.UserPreferencesFilePaths attribute), 1020  
 use\_filter\_folder (bpy.types.FileSelectParams attribute), 434  
 use\_filter\_font (bpy.types.FileSelectParams attribute), 434  
 use\_filter\_image (bpy.types.FileSelectParams attribute), 434  
 use\_filter\_movie (bpy.types.FileSelectParams attribute), 434  
 use\_filter\_script (bpy.types.FileSelectParams attribute), 434  
 use\_filter\_size\_min (bpy.types.EnvironmentMapTexture attribute), 406  
 use\_filter\_size\_min (bpy.types.ImageTexture attribute), 485  
 use\_filter\_sound (bpy.types.FileSelectParams attribute), 434  
 use\_filter\_text (bpy.types.FileSelectParams attribute), 434  
 use\_find\_all (bpy.types.SpaceTextEditor attribute), 867  
 use\_find\_wrap (bpy.types.SpaceTextEditor attribute), 867  
 use\_fit (bpy.types.CompositorNodeLensdist attribute), 323  
 use\_fixed\_location (bpy.types.FollowPathConstraint attribute), 443  
 use\_fixed\_texture (bpy.types.Brush attribute), 262  
 use\_flare\_mode (bpy.types.MaterialHalo attribute), 555  
 use\_flight (bpy.types.BoidSettings attribute), 250  
 use\_flip\_axis (bpy.types.BlendTexture attribute), 240  
 use\_flip\_axis (bpy.types.ImageTexture attribute), 485  
 use\_flip\_x (bpy.types.AdjustmentSequence attribute), 183  
 use\_flip\_x (bpy.types.EffectSequence attribute), 398  
 use\_flip\_x (bpy.types.ImageSequence attribute), 482  
 use\_flip\_x (bpy.types.MetaSequence attribute), 605  
 use\_flip\_x (bpy.types.MovieSequence attribute), 614  
 use\_flip\_x (bpy.types.MulticamSequence attribute), 616  
 use\_flip\_x (bpy.types.SceneSequence attribute), 785  
 use\_flip\_y (bpy.types.AdjustmentSequence attribute), 183  
 use\_flip\_y (bpy.types.EffectSequence attribute), 398  
 use\_flip\_y (bpy.types.ImageSequence attribute), 482  
 use\_flip\_y (bpy.types.MetaSequence attribute), 605  
 use\_flip\_y (bpy.types.MovieSequence attribute), 614  
 use\_flip\_y (bpy.types.MulticamSequence attribute), 616  
 use\_flip\_y (bpy.types.SceneSequence attribute), 785  
 use\_float (bpy.types.AdjustmentSequence attribute), 183  
 use\_float (bpy.types.EffectSequence attribute), 398  
 use\_float (bpy.types.ImageSequence attribute), 482  
 use\_float (bpy.types.MetaSequence attribute), 605  
 use\_float (bpy.types.MovieSequence attribute), 614  
 use\_float (bpy.types.MulticamSequence attribute), 616  
 use\_float (bpy.types.SceneSequence attribute), 785  
 use\_floats (bpy.types.ParticleFluidSettings attribute), 680  
 use\_force (bpy.types.FCurveActuator attribute), 414

use\_force\_distance (bpy.types.ConstraintActuator attribute), 355  
use\_frame\_blend (bpy.types.SpeedControlSequence attribute), 876  
use\_frame\_drop (bpy.types.Scene attribute), 772  
use\_frame\_end (bpy.types.FModifierStepped attribute), 428  
use\_frame\_rate (bpy.types.SceneGameData attribute), 778  
use\_frame\_start (bpy.types.FModifierStepped attribute), 428  
use\_free\_image\_textures (bpy.types.RenderSettings attribute), 761  
use\_free\_unused\_nodes (bpy.types.RenderSettings attribute), 761  
use\_from\_dupli (bpy.types.MaterialTextureSlot attribute), 567  
use\_from\_original (bpy.types.MaterialTextureSlot attribute), 567  
use\_frontface (bpy.types.Brush attribute), 262  
use\_full\_oversampling (bpy.types.Material attribute), 552  
use\_full\_resolution (bpy.types.Scopes attribute), 787  
use\_full\_sample (bpy.types.RenderSettings attribute), 761  
use\_gamma\_correction (bpy.types.CompositorNodeBlur attribute), 296  
use\_gamma\_correction (bpy.types.CompositorNodeDefocus attribute), 311  
use\_generated\_float (bpy.types.Image attribute), 478  
use\_ghost (bpy.types.GameObjectSettings attribute), 455  
use\_ghost (bpy.types.ParentActuator attribute), 673  
use\_global\_coords (bpy.types.FieldSettings attribute), 431  
use\_global\_dupli (bpy.types.ParticleSettings attribute), 694  
use\_global\_pivot (bpy.types.UserPreferencesView attribute), 1029  
use\_global\_scene (bpy.types.UserPreferencesView attribute), 1029  
use\_global\_undo (bpy.types.UserPreferencesEdit attribute), 1017  
use\_glsl\_color\_management (bpy.types.SceneGameData attribute), 778  
use\_glsl\_extra\_textures (bpy.types.SceneGameData attribute), 778  
use\_glsl\_lights (bpy.types.SceneGameData attribute), 778  
use\_glsl\_nodes (bpy.types.SceneGameData attribute), 778  
use\_glsl\_ramps (bpy.types.SceneGameData attribute), 778  
use\_glsl\_shaders (bpy.types.SceneGameData attribute), 779  
use\_glsl\_shadows (bpy.types.SceneGameData attribute), 779  
use\_goal (bpy.types.SoftBodySettings attribute), 843  
use\_gravity (bpy.types.Scene attribute), 772  
use\_grease\_pencil (bpy.types.SpaceImageEditor attribute), 857  
use\_grease\_pencil (bpy.types.SpaceSequenceEditor attribute), 865  
use\_grease\_pencil\_sessions (bpy.types.ToolSettings attribute), 977  
use\_grease\_pencil\_simplify\_stroke (bpy.types.UserPreferencesEdit attribute), 1018  
use\_grease\_pencil\_smooth\_stroke (bpy.types.UserPreferencesEdit attribute), 1018  
use\_group\_count (bpy.types.ParticleSettings attribute), 694  
use\_group\_pick\_random (bpy.types.ParticleSettings attribute), 694  
use\_guide\_path\_add (bpy.types.FieldSettings attribute), 431  
use\_guide\_path\_weight (bpy.types.FieldSettings attribute), 432  
use\_hair\_bspline (bpy.types.ParticleSettings attribute), 695  
use\_hair\_dynamics (bpy.types.ParticleSystem attribute), 703  
use\_halo (bpy.types.MeshTextureFace attribute), 593  
use\_halo (bpy.types.SceneRenderLayer attribute), 782  
use\_halo (bpy.types.SpotLamp attribute), 886  
use\_high\_resolution (bpy.types.SmokeDomainSettings attribute), 835  
use\_ik\_limit\_x (bpy.types.PoseBone attribute), 725  
use\_ik\_limit\_y (bpy.types.PoseBone attribute), 725  
use\_ik\_limit\_z (bpy.types.PoseBone attribute), 725  
use\_ik\_linear\_control (bpy.types.PoseBone attribute), 725  
use\_ik\_rotation\_control (bpy.types.PoseBone attribute), 725  
use\_image (bpy.types.MeshTextureFace attribute), 594  
use\_image\_override (bpy.types.UVProjectModifier attribute), 1010  
use\_image\_paint (bpy.types.SpaceImageEditor attribute), 857  
use\_image\_pin (bpy.types.SpaceImageEditor attribute), 857  
use\_in\_air (bpy.types.BoidRule attribute), 242  
use\_indirect\_light (bpy.types.WorldLighting attribute), 1059  
use\_inherit\_rotation (bpy.types.Bone attribute), 254  
use\_inherit\_rotation (bpy.types.EditBone attribute), 394  
use\_inherit\_scale (bpy.types.Bone attribute), 254  
use\_inherit\_scale (bpy.types.EditBone attribute), 394

use\_initial\_rest\_length (bpy.types.SPHFluidSettings attribute), [769](#)  
 use\_insertkey\_xyz\_to\_rgb (bpy.types.UserPreferencesEdit attribute), [1018](#)  
 use\_instances (bpy.types.RenderSettings attribute), [762](#)  
 use\_international\_fonts (bpy.types.UserPreferencesSystem attribute), [1025](#)  
 use\_interpolation (bpy.types.ImageTexture attribute), [486](#)  
 use\_inverse\_smooth\_pressure (bpy.types.Brush attribute), [263](#)  
 use\_italic (bpy.types.TextCharacterFormat attribute), [903](#)  
 use\_jitter (bpy.types.AreaLamp attribute), [196](#)  
 use\_jitter (bpy.types.CompositorNodeLensdist attribute), [323](#)  
 use\_keep\_above\_surface (bpy.types.ShrinkwrapModifier attribute), [830](#)  
 use\_keyed\_timing (bpy.types.ParticleSystem attribute), [703](#)  
 use\_keyframe\_insert\_auto (bpy.types.ToolSettings attribute), [977](#)  
 use\_keyframe\_insert\_available (bpy.types.UserPreferencesEdit attribute), [1018](#)  
 use\_keyframe\_insert\_keyingset (bpy.types.ToolSettings attribute), [978](#)  
 use\_keyframe\_insert\_needed (bpy.types.UserPreferencesEdit attribute), [1018](#)  
 use\_land (bpy.types.BoidSettings attribute), [250](#)  
 use\_level (bpy.types.Sensor attribute), [793](#)  
 use\_library\_path (bpy.types.PointCache attribute), [713](#)  
 use\_light (bpy.types.MeshTextureFace attribute), [594](#)  
 use\_light\_cache (bpy.types.MaterialVolume attribute), [572](#)  
 use\_light\_group\_exclusive (bpy.types.Material attribute), [552](#)  
 use\_limit\_x (bpy.types.LimitRotationConstraint attribute), [537](#)  
 use\_limit\_x (bpy.types.RigidBodyJointConstraint attribute), [766](#)  
 use\_limit\_y (bpy.types.LimitRotationConstraint attribute), [537](#)  
 use\_limit\_y (bpy.types.RigidBodyJointConstraint attribute), [766](#)  
 use\_limit\_z (bpy.types.LimitRotationConstraint attribute), [537](#)  
 use\_limit\_z (bpy.types.RigidBodyJointConstraint attribute), [766](#)  
 use\_line (bpy.types.BoidRuleFollowLeader attribute), [246](#)  
 use\_lines (bpy.types.MaterialHalo attribute), [555](#)  
 use\_linked\_collision (bpy.types.RigidBodyJointConstraint attribute), [767](#)  
 use\_live\_edit (bpy.types.SpaceTextEditor attribute), [867](#)  
 use\_live\_unwrap (bpy.types.SpaceUVEditor attribute), [870](#)  
 use\_load\_ui (bpy.types.UserPreferencesFilePaths attribute), [1020](#)  
 use\_local (bpy.types.ConstraintActuator attribute), [355](#)  
 use\_local (bpy.types.FCurveActuator attribute), [415](#)  
 use\_local\_angular\_velocity (bpy.types.EditObjectActuator attribute), [396](#)  
 use\_local\_angular\_velocity (bpy.types.ObjectActuator attribute), [650](#)  
 use\_local\_coords (bpy.types.InflowFluidSettings attribute), [489](#)  
 use\_local\_coords (bpy.types.RenderSettings attribute), [762](#)  
 use\_local\_force (bpy.types.ObjectActuator attribute), [650](#)  
 use\_local\_linear\_velocity (bpy.types.EditObjectActuator attribute), [397](#)  
 use\_local\_linear\_velocity (bpy.types.ObjectActuator attribute), [650](#)  
 use\_local\_location (bpy.types.Bone attribute), [254](#)  
 use\_local\_location (bpy.types.EditBone attribute), [394](#)  
 use\_local\_location (bpy.types.ObjectActuator attribute), [650](#)  
 use\_local\_rotation (bpy.types.ObjectActuator attribute), [650](#)  
 use\_local\_space\_transform (bpy.types.DriverTarget attribute), [388](#)  
 use\_local\_torque (bpy.types.ObjectActuator attribute), [650](#)  
 use\_location (bpy.types.KinematicConstraint attribute), [521](#)  
 use\_location\_x (bpy.types.ChildOfConstraint attribute), [273](#)  
 use\_location\_y (bpy.types.ChildOfConstraint attribute), [274](#)  
 use\_location\_z (bpy.types.ChildOfConstraint attribute), [274](#)  
 use\_locked\_size (bpy.types.Brush attribute), [263](#)  
 use\_manipulator\_rotate (bpy.types.SpaceView3D attribute), [874](#)  
 use\_manipulator\_scale (bpy.types.SpaceView3D attribute), [874](#)  
 use\_manipulator\_translate (bpy.types.SpaceView3D attribute), [874](#)  
 use\_map\_alpha (bpy.types.MaterialTextureSlot attribute), [567](#)  
 use\_map\_ambient (bpy.types.MaterialTextureSlot attribute), [567](#)  
 use\_map\_blend (bpy.types.WorldTextureSlot attribute), [1063](#)  
 use\_map\_clump (bpy.types.ParticleSettingsTextureSlot attribute), [698](#)

use\_map\_color (bpy.types.LampTextureSlot attribute), 527  
use\_map\_color\_diffuse (bpy.types.MaterialTextureSlot attribute), 567  
use\_map\_color\_emission (bpy.types.MaterialTextureSlot attribute), 567  
use\_map\_color\_reflection (bpy.types.MaterialTextureSlot attribute), 567  
use\_map\_color\_spec (bpy.types.MaterialTextureSlot attribute), 567  
use\_map\_color\_transmission (bpy.types.MaterialTextureSlot attribute), 567  
use\_map\_damp (bpy.types.ParticleSettingsTextureSlot attribute), 698  
use\_map\_density (bpy.types.MaterialTextureSlot attribute), 567  
use\_map\_density (bpy.types.ParticleSettingsTextureSlot attribute), 698  
use\_map\_diffuse (bpy.types.MaterialTextureSlot attribute), 567  
use\_map\_displacement (bpy.types.MaterialTextureSlot attribute), 567  
use\_map\_emission (bpy.types.MaterialTextureSlot attribute), 567  
use\_map\_emit (bpy.types.MaterialTextureSlot attribute), 567  
use\_map\_field (bpy.types.ParticleSettingsTextureSlot attribute), 698  
use\_map\_gravity (bpy.types.ParticleSettingsTextureSlot attribute), 698  
use\_map\_hardness (bpy.types.MaterialTextureSlot attribute), 568  
use\_map\_horizon (bpy.types.WorldTextureSlot attribute), 1063  
use\_map\_kink (bpy.types.ParticleSettingsTextureSlot attribute), 698  
use\_map\_length (bpy.types.ParticleSettingsTextureSlot attribute), 698  
use\_map\_life (bpy.types.ParticleSettingsTextureSlot attribute), 698  
use\_map\_mirror (bpy.types.MaterialTextureSlot attribute), 568  
use\_map\_normal (bpy.types.MaterialTextureSlot attribute), 568  
use\_map\_raymir (bpy.types.MaterialTextureSlot attribute), 568  
use\_map\_reflect (bpy.types.MaterialTextureSlot attribute), 568  
use\_map\_rough (bpy.types.ParticleSettingsTextureSlot attribute), 698  
use\_map\_scatter (bpy.types.MaterialTextureSlot attribute), 568  
use\_map\_shadow (bpy.types.LampTextureSlot attribute), 527  
use\_map\_size (bpy.types.ParticleSettingsTextureSlot attribute), 698  
use\_map\_specular (bpy.types.MaterialTextureSlot attribute), 568  
use\_map\_time (bpy.types.ParticleSettingsTextureSlot attribute), 699  
use\_map\_translucency (bpy.types.MaterialTextureSlot attribute), 568  
use\_map\_velocity (bpy.types.ParticleSettingsTextureSlot attribute), 699  
use\_map\_warp (bpy.types.MaterialTextureSlot attribute), 568  
use\_map\_zenith\_down (bpy.types.WorldTextureSlot attribute), 1063  
use\_map\_zenith\_up (bpy.types.WorldTextureSlot attribute), 1063  
use\_marker\_sync (bpy.types.SpaceDopeSheetEditor attribute), 853  
use\_marker\_sync (bpy.types.SpaceSequenceEditor attribute), 866  
use\_match\_case (bpy.types.SpaceTextEditor attribute), 867  
use\_material (bpy.types.CollisionSensor attribute), 285  
use\_material\_detect (bpy.types.ConstraintActuator attribute), 355  
use\_material\_physics\_fh (bpy.types.GameObjectSettings attribute), 455  
use\_max (bpy.types.CompositorNodeMapValue attribute), 327  
use\_max (bpy.types.ShaderNodeMapping attribute), 809  
use\_max (bpy.types.TexMapping attribute), 899  
use\_max\_distance (bpy.types.FieldSettings attribute), 432  
use\_max\_x (bpy.types.FModifierLimits attribute), 425  
use\_max\_x (bpy.types.LimitLocationConstraint attribute), 535  
use\_max\_x (bpy.types.LimitScaleConstraint attribute), 538  
use\_max\_y (bpy.types.FModifierLimits attribute), 425  
use\_max\_y (bpy.types.LimitLocationConstraint attribute), 535  
use\_max\_y (bpy.types.LimitScaleConstraint attribute), 538  
use\_max\_z (bpy.types.LimitLocationConstraint attribute), 535  
use\_max\_z (bpy.types.LimitScaleConstraint attribute), 538  
use\_memory\_cache (bpy.types.Sound attribute), 846  
use\_merge\_vertices (bpy.types.ArrayModifier attribute), 207  
use\_merge\_vertices\_cap (bpy.types.ArrayModifier attribute), 207

use\_mesh\_automerge (bpy.types.ToolSettings attribute), 978  
use\_min (bpy.types.CompositorNodeMapValue attribute), 327  
use\_min (bpy.types.ShaderNodeMapping attribute), 809  
use\_min (bpy.types.TexMapping attribute), 899  
use\_min\_distance (bpy.types.FieldSettings attribute), 432  
use\_min\_x (bpy.types.FModifierLimits attribute), 425  
use\_min\_x (bpy.types.LimitLocationConstraint attribute), 535  
use\_min\_x (bpy.types.LimitScaleConstraint attribute), 538  
use\_min\_y (bpy.types.FModifierLimits attribute), 425  
use\_min\_y (bpy.types.LimitLocationConstraint attribute), 535  
use\_min\_y (bpy.types.LimitScaleConstraint attribute), 538  
use\_min\_z (bpy.types.LimitLocationConstraint attribute), 535  
use\_min\_z (bpy.types.LimitScaleConstraint attribute), 538  
use\_mipmap (bpy.types.EnvironmentMapTexture attribute), 406  
use\_mipmap (bpy.types.ImageTexture attribute), 486  
use\_mipmap\_gauss (bpy.types.EnvironmentMapTexture attribute), 406  
use\_mipmap\_gauss (bpy.types.ImageTexture attribute), 486  
use\_mipmaps (bpy.types.UserPreferencesSystem attribute), 1025  
use\_mirror\_merge (bpy.types.MirrorModifier attribute), 607  
use\_mirror\_topology (bpy.types.Mesh attribute), 578  
use\_mirror\_u (bpy.types.MirrorModifier attribute), 607  
use\_mirror\_v (bpy.types.MirrorModifier attribute), 607  
use\_mirror\_vertex\_groups (bpy.types.MirrorModifier attribute), 607  
use\_mirror\_x (bpy.types.Armature attribute), 200  
use\_mirror\_x (bpy.types.ImageTexture attribute), 486  
use\_mirror\_x (bpy.types.Mesh attribute), 578  
use\_mirror\_y (bpy.types.ImageTexture attribute), 486  
use\_mist (bpy.types.Material attribute), 552  
use\_mist (bpy.types.WorldMistSettings attribute), 1060  
use\_module (bpy.types.Text attribute), 900  
use\_motion\_blur (bpy.types.Filter2DActuator attribute), 435  
use\_motion\_blur (bpy.types.RenderSettings attribute), 762  
use\_motion\_extrapolate (bpy.types.TransformConstraint attribute), 983  
use\_mouse\_auto\_depth (bpy.types.UserPreferencesView attribute), 1029  
use\_mouse\_continuous (bpy.types.UserPreferencesInput attribute), 1022  
use\_mouse\_emulate\_3\_button (bpy.types.UserPreferencesInput attribute), 1022  
use\_mouse\_mmb\_paste (bpy.types.UserPreferencesInput attribute), 1022  
use\_mouse\_over\_open (bpy.types.UserPreferencesView attribute), 1029  
use\_multi\_modifier (bpy.types.ArmatureModifier attribute), 204  
use\_multiple\_springs (bpy.types.FieldSettings attribute), 432  
use\_multiply\_size\_mass (bpy.types.ParticleSettings attribute), 695  
use\_negative (bpy.types.Lamp attribute), 523  
use\_negative (bpy.types.MetaElement attribute), 603  
use\_negative\_direction (bpy.types.ShrinkwrapModifier attribute), 830  
use\_negative\_frames (bpy.types.UserPreferencesEdit attribute), 1018  
use\_nla (bpy.types.AnimData attribute), 187  
use\_nodes (bpy.types.Material attribute), 552  
use\_nodes (bpy.types.Scene attribute), 772  
use\_nodes (bpy.types.Texture attribute), 910  
use\_normal (bpy.types.ConstraintActuator attribute), 355  
use\_normal (bpy.types.ParticleInstanceModifier attribute), 682  
use\_normal (bpy.types.VertexPaint attribute), 1038  
use\_normal (bpy.types.WaveModifier attribute), 1047  
use\_normal\_calculate (bpy.types.ScrewModifier attribute), 790  
use\_normal\_falloff (bpy.types.ImagePaint attribute), 480  
use\_normal\_flip (bpy.types.ScrewModifier attribute), 790  
use\_normal\_map (bpy.types.ImageTexture attribute), 486  
use\_normal\_x (bpy.types.WaveModifier attribute), 1047  
use\_normal\_y (bpy.types.WaveModifier attribute), 1047  
use\_normal\_z (bpy.types.WaveModifier attribute), 1047  
use\_object\_color (bpy.types.Material attribute), 552  
use\_object\_color (bpy.types.MeshTextureFace attribute), 594  
use\_object\_coords (bpy.types.FieldSettings attribute), 432  
use\_object\_offset (bpy.types.ArrayModifier attribute), 207  
use\_object\_screw\_offset (bpy.types.ScrewModifier attribute), 790  
use\_occlude (bpy.types.ImagePaint attribute), 480  
use\_occlude\_geometry (bpy.types.SpaceView3D attribute), 875  
use\_occlusion (bpy.types.VisibilityActuator attribute), 1039  
use\_occlusion\_culling (bpy.types.SceneGameData attribute), 779  
use\_offset (bpy.types.CopyLocationConstraint attribute), 362

use\_offset (bpy.types.CopyRotationConstraint attribute), 364  
use\_offset (bpy.types.CopyScaleConstraint attribute), 365  
use\_offset\_pressure (bpy.types.Brush attribute), 263  
use\_on\_land (bpy.types.BoidRule attribute), 242  
use\_onion\_skinning (bpy.types.GPencilLayer attribute), 447  
use\_only\_boost (bpy.types.GlowSequence attribute), 460  
use\_only\_selected\_curves\_handles (bpy.types.SpaceGraphEditor attribute), 855  
use\_only\_selected\_keyframe\_handles (bpy.types.SpaceGraphEditor attribute), 855  
use\_only\_shadow (bpy.types.AreaLamp attribute), 196  
use\_only\_shadow (bpy.types.Material attribute), 552  
use\_only\_shadow (bpy.types.PointLamp attribute), 719  
use\_only\_shadow (bpy.types.SpotLamp attribute), 886  
use\_only\_shadow (bpy.types.SunLamp attribute), 895  
use\_only\_vertices (bpy.types.BevelModifier attribute), 209  
use\_original\_normal (bpy.types.Brush attribute), 263  
use\_outflow (bpy.types.SmokeFlowSettings attribute), 836  
use\_outside (bpy.types.Lattice attribute), 529  
use\_overwrite (bpy.types.RenderSettings attribute), 762  
use\_overwrite (bpy.types.SpaceTextEditor attribute), 867  
use\_own\_layer (bpy.types.Lamp attribute), 523  
use\_paint\_image (bpy.types.Brush attribute), 263  
use\_paint\_mask (bpy.types.Mesh attribute), 578  
use\_paint\_sculpt (bpy.types.Brush attribute), 263  
use\_paint\_vertex (bpy.types.Brush attribute), 263  
use\_paint\_weight (bpy.types.Brush attribute), 263  
use\_panorama (bpy.types.Camera attribute), 269  
use\_parent\_particles (bpy.types.ParticleSettings attribute), 695  
use\_particle\_kill (bpy.types.CollisionSettings attribute), 287  
use\_pass\_ambient\_occlusion (bpy.types.SceneRenderLayer attribute), 782  
use\_pass\_color (bpy.types.SceneRenderLayer attribute), 782  
use\_pass\_combined (bpy.types.SceneRenderLayer attribute), 782  
use\_pass\_diffuse (bpy.types.SceneRenderLayer attribute), 782  
use\_pass\_emit (bpy.types.SceneRenderLayer attribute), 782  
use\_pass\_environment (bpy.types.SceneRenderLayer attribute), 782  
use\_pass\_indirect (bpy.types.SceneRenderLayer attribute), 782  
use\_pass\_material\_index (bpy.types.SceneRenderLayer attribute), 782  
use\_pass\_mist (bpy.types.SceneRenderLayer attribute), 782  
use\_pass\_normal (bpy.types.SceneRenderLayer attribute), 782  
use\_pass\_object\_index (bpy.types.SceneRenderLayer attribute), 783  
use\_pass\_reflection (bpy.types.SceneRenderLayer attribute), 783  
use\_pass\_refraction (bpy.types.SceneRenderLayer attribute), 783  
use\_pass\_shadow (bpy.types.SceneRenderLayer attribute), 783  
use\_pass\_specular (bpy.types.SceneRenderLayer attribute), 783  
use\_pass\_uv (bpy.types.SceneRenderLayer attribute), 783  
use\_pass\_vector (bpy.types.SceneRenderLayer attribute), 783  
use\_pass\_z (bpy.types.SceneRenderLayer attribute), 783  
use\_path (bpy.types.Curve attribute), 369  
use\_path (bpy.types.ParticleInstanceModifier attribute), 682  
use\_path\_follow (bpy.types.Curve attribute), 369  
use\_persistent (bpy.types.Brush attribute), 263  
use\_persistent (bpy.types.ConstraintActuator attribute), 356  
use\_pin\_cloth (bpy.types.ClothSettings attribute), 281  
use\_pin\_id (bpy.types.SpaceProperties attribute), 864  
use\_pivot\_point\_align (bpy.types.SpaceView3D attribute), 875  
use\_placeholder (bpy.types.RenderSettings attribute), 762  
use\_plane\_trim (bpy.types.Brush attribute), 263  
use\_play\_3d\_editors (bpy.types.Screen attribute), 788  
use\_play\_animation\_editors (bpy.types.Screen attribute), 788  
use\_play\_image\_editors (bpy.types.Screen attribute), 788  
use\_play\_node\_editors (bpy.types.Screen attribute), 789  
use\_play\_properties\_editors (bpy.types.Screen attribute), 789  
use\_play\_sequence\_editors (bpy.types.Screen attribute), 789  
use\_play\_top\_left\_3d\_editor (bpy.types.Screen attribute), 789  
use\_positive\_direction (bpy.types.ShrinkwrapModifier attribute), 830  
use\_predict (bpy.types.BoidRuleAvoid attribute), 244  
use\_predict (bpy.types.BoidRuleGoal attribute), 247  
use\_premultiply (bpy.types.AdjustmentSequence attribute), 183  
use\_premultiply (bpy.types.CompositorNodeAlphaOver attribute), 294  
use\_premultiply (bpy.types.EffectSequence attribute), 398  
use\_premultiply (bpy.types.Image attribute), 478

use\_premultiply (bpy.types.ImageSequence attribute), 482  
 use\_premultiply (bpy.types.MetaSequence attribute), 605  
 use\_premultiply (bpy.types.MovieSequence attribute), 614  
 use\_premultiply (bpy.types.MulticamSequence attribute), 616  
 use\_premultiply (bpy.types.SceneSequence attribute), 785  
 use\_preserve\_length (bpy.types.ParticleEdit attribute), 678  
 use\_preserve\_root (bpy.types.ParticleEdit attribute), 679  
 use\_preserve\_shape (bpy.types.ParticleInstanceModifier attribute), 682  
 use\_pressure\_jitter (bpy.types.Brush attribute), 263  
 use\_pressure\_size (bpy.types.Brush attribute), 263  
 use\_pressure\_spacing (bpy.types.Brush attribute), 263  
 use\_pressure\_strength (bpy.types.Brush attribute), 264  
 use\_preview (bpy.types.CompositorNodeDefocus attribute), 311  
 use\_preview\_alpha (bpy.types.Texture attribute), 910  
 use\_preview\_images (bpy.types.UserPreferencesSystem attribute), 1025  
 use\_preview\_range (bpy.types.Scene attribute), 772  
 use\_priority (bpy.types.Controller attribute), 360  
 use\_project\_x (bpy.types.ShrinkwrapModifier attribute), 830  
 use\_project\_y (bpy.types.ShrinkwrapModifier attribute), 831  
 use\_project\_z (bpy.types.ShrinkwrapModifier attribute), 831  
 use\_projection (bpy.types.ImagePaint attribute), 480  
 use\_projector (bpy.types.CompositorNodeLensdist attribute), 324  
 use\_proportional\_edit\_objects (bpy.types.ToolSettings attribute), 978  
 use\_proxy (bpy.types.AdjustmentSequence attribute), 183  
 use\_proxy (bpy.types.EffectSequence attribute), 398  
 use\_proxy (bpy.types.ImageSequence attribute), 482  
 use\_proxy (bpy.types.MetaSequence attribute), 605  
 use\_proxy (bpy.types.MovieSequence attribute), 614  
 use\_proxy (bpy.types.MulticamSequence attribute), 617  
 use\_proxy (bpy.types.SceneSequence attribute), 785  
 use\_proxy\_custom\_directory (bpy.types.AdjustmentSequence attribute), 183  
 use\_proxy\_custom\_directory (bpy.types.EffectSequence attribute), 399  
 use\_proxy\_custom\_directory (bpy.types.ImageSequence attribute), 482  
 use\_proxy\_custom\_directory (bpy.types.MetaSequence attribute), 605  
 use\_proxy\_custom\_directory (bpy.types.MovieSequence attribute), 614  
 use\_proxy\_custom\_directory (bpy.types.MulticamSequence attribute), 617  
 use\_proxy\_custom\_directory (bpy.types.SceneSequence attribute), 786  
 use\_proxy\_custom\_file (bpy.types.AdjustmentSequence attribute), 184  
 use\_proxy\_custom\_file (bpy.types.EffectSequence attribute), 399  
 use\_proxy\_custom\_file (bpy.types.ImageSequence attribute), 483  
 use\_proxy\_custom\_file (bpy.types.MetaSequence attribute), 605  
 use\_proxy\_custom\_file (bpy.types.MovieSequence attribute), 614  
 use\_proxy\_custom\_file (bpy.types.MulticamSequence attribute), 617  
 use\_proxy\_custom\_file (bpy.types.SceneSequence attribute), 786  
 use\_puff\_volume (bpy.types.ParticleBrush attribute), 676  
 use\_pulse (bpy.types.CollisionSensor attribute), 285  
 use\_pulse\_false\_level (bpy.types.Sensor attribute), 793  
 use\_pulse\_true\_level (bpy.types.Sensor attribute), 793  
 use\_quality\_normals (bpy.types.SolidifyModifier attribute), 845  
 use\_quick\_cache (bpy.types.PointCache attribute), 713  
 use\_radial\_max (bpy.types.FieldSettings attribute), 432  
 use\_radial\_min (bpy.types.FieldSettings attribute), 432  
 use\_radiosity (bpy.types.RenderSettings attribute), 762  
 use\_radius (bpy.types.Curve attribute), 369  
 use\_radius\_as\_size (bpy.types.CastModifier attribute), 271  
 use\_rake (bpy.types.Brush attribute), 264  
 use\_random\_order (bpy.types.BuildModifier attribute), 266  
 use\_random\_rotation (bpy.types.Brush attribute), 264  
 use\_ray\_shadow\_bias (bpy.types.Material attribute), 552  
 use\_raytrace (bpy.types.Material attribute), 552  
 use\_raytrace (bpy.types.RenderSettings attribute), 762  
 use\_react\_multiple (bpy.types.ParticleSettings attribute), 695  
 use.react\_start\_end (bpy.types.ParticleSettings attribute), 695  
 use\_realtime\_update (bpy.types.SpaceDopeSheetEditor attribute), 853  
 use\_realtime\_update (bpy.types.SpaceGraphEditor attribute), 855  
 use\_realtime\_update (bpy.types.SpaceImageEditor attribute), 857  
 use\_realtime\_update (bpy.types.SpaceNLA attribute), 860

use\_record\_with\_nla (bpy.types.ToolSettings attribute), 978  
use\_relative (bpy.types.CompositorNodeBlur attribute), 296  
use\_relative (bpy.types.Key attribute), 494  
use\_relative (bpy.types.SimpleDeformModifier attribute), 832  
use\_relative\_location (bpy.types.PivotConstraint attribute), 708  
use\_relative\_offset (bpy.types.ArrayModifier attribute), 207  
use\_relative\_paths (bpy.types.UserPreferencesFilePaths attribute), 1020  
use\_render\_adaptive (bpy.types.ParticleSettings attribute), 695  
use\_render\_emitter (bpy.types.ParticleSettings attribute), 695  
use\_repeat (bpy.types.DelaySensor attribute), 378  
use\_replace\_display\_mesh (bpy.types.EditObjectActuator attribute), 397  
use\_replace\_physics\_mesh (bpy.types.EditObjectActuator attribute), 397  
use\_restore\_mesh (bpy.types.Brush attribute), 264  
use\_reverse (bpy.types.NlaStrip attribute), 625  
use\_reverse\_frames (bpy.types.AdjustmentSequence attribute), 184  
use\_reverse\_frames (bpy.types.ControlFluidSettings attribute), 359  
use\_reverse\_frames (bpy.types.DomainFluidSettings attribute), 383  
use\_reverse\_frames (bpy.types.EffectSequence attribute), 399  
use\_reverse\_frames (bpy.types.ImageSequence attribute), 483  
use\_reverse\_frames (bpy.types.MetaSequence attribute), 605  
use\_reverse\_frames (bpy.types.MovieSequence attribute), 614  
use\_reverse\_frames (bpy.types.MulticamSequence attribute), 617  
use\_reverse\_frames (bpy.types.SceneSequence attribute), 786  
use\_rgb\_to\_intensity (bpy.types.TextureSlot attribute), 931  
use\_rim (bpy.types.SolidifyModifier attribute), 845  
use\_ring (bpy.types.MaterialHalo attribute), 555  
use\_root\_coords (bpy.types.FieldSettings attribute), 432  
use\_rotate\_45 (bpy.types.CompositorNodeGlare attribute), 318  
use\_rotate\_around\_active (bpy.types.UserPreferencesView attribute), 1029  
use\_rotate\_from\_normal (bpy.types.GameObjectSettings attribute), 455  
use\_rotation (bpy.types.FloorConstraint attribute), 438  
use\_rotation (bpy.types.KinematicConstraint attribute), 521  
use\_rotation\_x (bpy.types.ChildOfConstraint attribute), 274  
use\_rotation\_y (bpy.types.ChildOfConstraint attribute), 274  
use\_rotation\_z (bpy.types.ChildOfConstraint attribute), 274  
use\_save\_buffers (bpy.types.RenderSettings attribute), 762  
use\_save\_preview\_images (bpy.types.UserPreferencesFilePaths attribute), 1020  
use\_scale\_x (bpy.types.ChildOfConstraint attribute), 274  
use\_scale\_y (bpy.types.ChildOfConstraint attribute), 274  
use\_scale\_z (bpy.types.ChildOfConstraint attribute), 274  
use\_scripts\_auto\_execute (bpy.types.UserPreferencesSystem attribute), 1025  
use\_seam (bpy.types.MeshEdge attribute), 584  
use\_self\_collision (bpy.types.ClothCollisionSettings attribute), 278  
use\_self\_collision (bpy.types.SoftBodySettings attribute), 843  
use\_self\_effect (bpy.types.ParticleSettings attribute), 695  
use\_separate (bpy.types.UnitSettings attribute), 1013  
use\_sequencer (bpy.types.RenderSettings attribute), 762  
use\_sequencer\_gl\_preview (bpy.types.RenderSettings attribute), 762  
use\_sequencer\_gl\_render (bpy.types.RenderSettings attribute), 762  
use\_servo\_limit\_x (bpy.types.ObjectActuator attribute), 650  
use\_servo\_limit\_y (bpy.types.ObjectActuator attribute), 650  
use\_servo\_limit\_z (bpy.types.ObjectActuator attribute), 650  
use\_shaded (bpy.types.MaterialHalo attribute), 555  
use\_shadeless (bpy.types.Material attribute), 552  
use\_shadow\_cast (bpy.types.MeshTextureFace attribute), 594  
use\_shadow\_layer (bpy.types.AreaLamp attribute), 196  
use\_shadow\_layer (bpy.types.PointLamp attribute), 719  
use\_shadow\_layer (bpy.types.SpotLamp attribute), 886  
use\_shadow\_layer (bpy.types.SunLamp attribute), 895  
use\_shadows (bpy.types.Material attribute), 552  
use\_shadows (bpy.types.RenderSettings attribute), 762  
use\_shape\_key\_edit\_mode (bpy.types.Object attribute), 644  
use\_shape\_match (bpy.types.GameSoftBodySettings attribute), 457

use\_simplify (bpy.types.ParticleSettings attribute), 695  
 use\_simplify (bpy.types.RenderSettings attribute), 762  
 use\_simplify\_triangulate (bpy.types.RenderSettings attribute), 763  
 use\_simplify\_viewport (bpy.types.ParticleSettings attribute), 695  
 use\_single\_layer (bpy.types.RenderSettings attribute), 763  
 use\_size (bpy.types.ExplodeModifier attribute), 410  
 use\_size (bpy.types.ParticleInstanceModifier attribute), 682  
 use\_size\_deflect (bpy.types.ParticleSettings attribute), 695  
 use\_sky (bpy.types.LampSkySettings attribute), 526  
 use\_sky (bpy.types.Material attribute), 552  
 use\_sky (bpy.types.SceneRenderLayer attribute), 783  
 use\_sky\_blend (bpy.types.World attribute), 1056  
 use\_sky\_paper (bpy.types.World attribute), 1057  
 use\_sky\_real (bpy.types.World attribute), 1057  
 use\_sleep (bpy.types.GameObjectSettings attribute), 455  
 use\_slow\_parent (bpy.types.Object attribute), 644  
 use\_small\_caps (bpy.types.TextCharacterFormat attribute), 903  
 use\_smooth (bpy.types.MeshFace attribute), 586  
 use\_smooth (bpy.types.Spline attribute), 879  
 use\_smooth\_stroke (bpy.types.Brush attribute), 264  
 use\_snap (bpy.types.ToolSettings attribute), 978  
 use\_snap\_align\_rotation (bpy.types.ToolSettings attribute), 978  
 use\_snap\_peel\_object (bpy.types.ToolSettings attribute), 978  
 use\_snap\_project (bpy.types.ToolSettings attribute), 978  
 use\_snap\_self (bpy.types.ToolSettings attribute), 978  
 use\_snap\_to\_pixels (bpy.types.SpaceUVEditor attribute), 870  
 use\_soft (bpy.types.MaterialHalo attribute), 555  
 use\_solid (bpy.types.SceneRenderLayer attribute), 783  
 use\_sound\_3d (bpy.types.SoundActuator attribute), 847  
 use\_space (bpy.types.Brush attribute), 264  
 use\_space\_atten (bpy.types.Brush attribute), 264  
 use\_specular (bpy.types.Lamp attribute), 523  
 use\_specular (bpy.types.ShaderNodeExtendedMaterial attribute), 806  
 use\_specular (bpy.types.ShaderNodeMaterial attribute), 810  
 use\_specular\_ramp (bpy.types.Material attribute), 552  
 use\_speed\_vectors (bpy.types.DomainFluidSettings attribute), 383  
 use\_sphere (bpy.types.PointLamp attribute), 719  
 use\_sphere (bpy.types.SpotLamp attribute), 886  
 use\_spray (bpy.types.VertexPaint attribute), 1038  
 use\_square (bpy.types.SpotLamp attribute), 886  
 use\_sss (bpy.types.RenderSettings attribute), 763  
 use\_stamp (bpy.types.RenderSettings attribute), 763  
 use\_stamp\_camera (bpy.types.RenderSettings attribute), 763  
 use\_stamp\_date (bpy.types.RenderSettings attribute), 763  
 use\_stamp\_filename (bpy.types.RenderSettings attribute), 763  
 use\_stamp\_frame (bpy.types.RenderSettings attribute), 763  
 use\_stamp\_lens (bpy.types.RenderSettings attribute), 763  
 use\_stamp\_marker (bpy.types.RenderSettings attribute), 763  
 use\_stamp\_note (bpy.types.RenderSettings attribute), 763  
 use\_stamp\_note (bpy.types.Scene attribute), 772  
 use\_stamp\_render\_time (bpy.types.RenderSettings attribute), 763  
 use\_stamp\_scene (bpy.types.RenderSettings attribute), 763  
 use\_stamp\_sequencer\_strip (bpy.types.RenderSettings attribute), 764  
 use\_stamp\_time (bpy.types.RenderSettings attribute), 764  
 use\_star (bpy.types.MaterialHalo attribute), 555  
 use\_stars (bpy.types.WorldStarsSettings attribute), 1061  
 use\_stencil (bpy.types.TextureSlot attribute), 931  
 use\_stencil\_layer (bpy.types.ImagePaint attribute), 480  
 use\_sticky (bpy.types.FloorConstraint attribute), 438  
 use\_stiff\_quads (bpy.types.SoftBodySettings attribute), 843  
 use\_stiffness\_scale (bpy.types.ClothSettings attribute), 281  
 use\_still\_frame (bpy.types.VoxelData attribute), 1042  
 use\_strand (bpy.types.SceneRenderLayer attribute), 783  
 use\_strand\_primitive (bpy.types.ParticleSettings attribute), 695  
 use\_stretch (bpy.types.Curve attribute), 369  
 use\_stretch (bpy.types.KinematicConstraint attribute), 521  
 use\_stroke\_endpoints (bpy.types.GreasePencil attribute), 462  
 use\_subsurf\_uv (bpy.types.MultiresModifier attribute), 619  
 use\_subsurf\_uv (bpy.types.SubsurfModifier attribute), 894  
 use\_symmetry\_feather (bpy.types.Sculpt attribute), 792  
 use\_symmetry\_x (bpy.types.Sculpt attribute), 792  
 use\_symmetry\_y (bpy.types.Sculpt attribute), 792  
 use\_symmetry\_z (bpy.types.Sculpt attribute), 792  
 use\_tabs\_as\_spaces (bpy.types.Text attribute), 900  
 use\_tabs\_as\_spaces (bpy.types.UserPreferencesSystem attribute), 1026  
 use\_tail (bpy.types.KinematicConstraint attribute), 521  
 use\_tangent\_shading (bpy.types.Material attribute), 552  
 use\_tangent\_shading (bpy.types.MaterialStrand attribute), 562  
 use\_tap (bpy.types.Sensor attribute), 793  
 use\_target (bpy.types.KinematicConstraint attribute), 522

use\_target\_z (bpy.types.TrackToConstraint attribute), 981  
use\_targets (bpy.types.PythonConstraint attribute), 735  
use\_text\_antialiasing (bpy.types.UserPreferencesSystem attribute), 1026  
use\_texture (bpy.types.MaterialHalo attribute), 556  
use\_texture\_overlay (bpy.types.Brush attribute), 264  
use\_textured\_fonts (bpy.types.UserPreferencesSystem attribute), 1026  
use\_textures (bpy.types.Material attribute), 553  
use\_textures (bpy.types.RenderSettings attribute), 764  
use\_threaded (bpy.types.Sculpt attribute), 792  
use\_tiff\_16bit (bpy.types.RenderSettings attribute), 764  
use\_tiles (bpy.types.Image attribute), 478  
use\_time\_offset (bpy.types.Curve attribute), 369  
use\_time\_offset\_add\_parent (bpy.types.Object attribute), 644  
use\_time\_offset\_edit (bpy.types.Object attribute), 644  
use\_time\_offset\_parent (bpy.types.Object attribute), 644  
use\_time\_offset\_particle (bpy.types.Object attribute), 644  
use\_time\_override (bpy.types.DomainFluidSettings attribute), 383  
use\_transform (bpy.types.CastModifier attribute), 271  
use\_transform\_limit (bpy.types.LimitLocationConstraint attribute), 535  
use\_transform\_limit (bpy.types.LimitRotationConstraint attribute), 537  
use\_transform\_limit (bpy.types.LimitScaleConstraint attribute), 538  
use\_translate\_buttons (bpy.types.UserPreferencesSystem attribute), 1026  
use\_translate\_toolbox (bpy.types.UserPreferencesSystem attribute), 1026  
use\_translate\_tooltips (bpy.types.UserPreferencesSystem attribute), 1026  
use\_translation (bpy.types.AdjustmentSequence attribute), 184  
use\_translation (bpy.types.EffectSequence attribute), 399  
use\_translation (bpy.types.ImageSequence attribute), 483  
use\_translation (bpy.types.MetaSequence attribute), 606  
use\_translation (bpy.types.MovieSequence attribute), 614  
use\_translation (bpy.types.MulticamSequence attribute), 617  
use\_translation (bpy.types.SceneSequence attribute), 786  
use\_transparency (bpy.types.Material attribute), 553  
use\_transparent\_shadows (bpy.types.Material attribute), 553  
use\_turbulence (bpy.types.PointDensity attribute), 716  
use\_twoside (bpy.types.MeshTextureFace attribute), 594  
use\_umbra (bpy.types.AreaLamp attribute), 196  
use\_underline (bpy.types.TextCharacterFormat attribute), 903  
use\_uniform\_scale (bpy.types.TransformSequence attribute), 985  
use\_unspill (bpy.types.CompositorNodeColorSpill attribute), 302  
use\_uv\_as\_generated (bpy.types.Curve attribute), 369  
use\_uv\_as\_generated (bpy.types.SurfaceCurve attribute), 896  
use\_uv\_as\_generated (bpy.types.TextCurve attribute), 905  
use\_uv\_select\_sync (bpy.types.ToolSettings attribute), 978  
use\_velocity\_length (bpy.types.ParticleSettings attribute), 695  
use\_vertex\_buffer\_objects (bpy.types.UserPreferencesSystem attribute), 1026  
use\_vertex\_color\_light (bpy.types.Material attribute), 553  
use\_vertex\_color\_paint (bpy.types.Material attribute), 553  
use\_vertex\_groups (bpy.types.ArmatureModifier attribute), 204  
use\_vertex\_normal (bpy.types.MaterialHalo attribute), 556  
use\_viscoelastic\_springs (bpy.types.SPHFluidSettings attribute), 769  
use\_visible (bpy.types.VisibilityActuator attribute), 1039  
use\_visual\_keying (bpy.types.UserPreferencesEdit attribute), 1018  
use\_volume\_preserve (bpy.types.WarpModifier attribute), 1045  
use\_weight\_color\_range (bpy.types.UserPreferencesSystem attribute), 1026  
use\_whole\_group (bpy.types.ParticleSettings attribute), 695  
use\_wrap (bpy.types.Brush attribute), 264  
use\_wrap (bpy.types.CompositorNodeDBlur attribute), 310  
use\_x (bpy.types.CastModifier attribute), 271  
use\_x (bpy.types.CopyLocationConstraint attribute), 362  
use\_x (bpy.types.CopyRotationConstraint attribute), 364  
use\_x (bpy.types.CopyScaleConstraint attribute), 365  
use\_x (bpy.types.MirrorModifier attribute), 607  
use\_x (bpy.types.ShrinkwrapConstraint attribute), 829  
use\_x (bpy.types.SmoothModifier attribute), 838  
use\_x (bpy.types.WaveModifier attribute), 1048  
use\_x\_ray (bpy.types.RaySensor attribute), 742  
use\_y (bpy.types.CastModifier attribute), 271  
use\_y (bpy.types.CopyLocationConstraint attribute), 362  
use\_y (bpy.types.CopyRotationConstraint attribute), 364  
use\_y (bpy.types.CopyScaleConstraint attribute), 365  
use\_y (bpy.types.MirrorModifier attribute), 607  
use\_y (bpy.types.ShrinkwrapConstraint attribute), 829  
use\_y (bpy.types.SmoothModifier attribute), 838  
use\_y (bpy.types.WaveModifier attribute), 1048  
use\_y\_stretch (bpy.types.SplineIKConstraint attribute), 881

use\_z (bpy.types.CastModifier attribute), 272  
 use\_z (bpy.types.CopyLocationConstraint attribute), 362  
 use\_z (bpy.types.CopyRotationConstraint attribute), 364  
 use\_z (bpy.types.CopyScaleConstraint attribute), 365  
 use\_z (bpy.types.MirrorModifier attribute), 607  
 use\_z (bpy.types.ShrinkwrapConstraint attribute), 829  
 use\_z (bpy.types.SmoothModifier attribute), 838  
 use\_zbuffer (bpy.types.CompositorNodeDefocus attribute), 311  
 use\_zmask (bpy.types.SceneRenderLayer attribute), 783  
 use\_zoom\_to\_mouse (bpy.types.UserPreferencesView attribute), 1029  
 use\_ztransp (bpy.types.SceneRenderLayer attribute), 783  
 useAllKeys (bge.types.SCA\_KeyboardSensor attribute), 1216  
 useChildren (bge.types.KX\_IpoActuator attribute), 1185  
 useContinue (bge.types.BL\_ActionActuator attribute), 1166  
 useDisplayMesh (bge.types.KX\_SCA\_ReplaceMeshActuator attribute), 1203  
 useHighPriority (bge.types.SCA\_IController attribute), 1165  
 useIpoAdd (bge.types.KX\_IpoActuator attribute), 1185  
 useIpoAsForce (bge.types.KX\_IpoActuator attribute), 1185  
 useIpoLocal (bge.types.KX\_IpoActuator attribute), 1185  
 useLocalAngV (bge.types.KX\_ObjectActuator attribute), 1192  
 useLocalDLoc (bge.types.KX\_ObjectActuator attribute), 1191  
 useLocalDRot (bge.types.KX\_ObjectActuator attribute), 1191  
 useLocalForce (bge.types.KX\_ObjectActuator attribute), 1191  
 useLocalLinV (bge.types.KX\_ObjectActuator attribute), 1191  
 useLocalTorque (bge.types.KX\_ObjectActuator attribute), 1191  
 useMaterial (bge.types.KX\_RaySensor attribute), 1200  
 useMaterial (bge.types.KX\_TouchSensor attribute), 1189  
 useNegPulseMode (bge.types.SCA\_ISensor attribute), 1164  
 useOcclusion (bge.types.KX\_VisibilityActuator attribute), 1212  
 usePhysicsMesh (bge.types.KX\_SCA\_ReplaceMeshActuator attribute), 1203  
 usePosPulseMode (bge.types.SCA\_ISensor attribute), 1164  
 usePropBody (bge.types.KX\_NetworkMessageActuator attribute), 1190  
 usePulseCollision (bge.types.KX\_TouchSensor attribute), 1189  
 usePulseFocus (bge.types.KX\_MouseFocusSensor attribute), 1189  
 user\_clear() (bpy.types.ID method), 473  
 user\_resource() (in module bpy.utils), 1073  
 user\_script\_path() (in module bpy.utils), 1074  
 useRecursion (bge.types.KX\_VisibilityActuator attribute), 1213  
 useRestart (bge.types.KX\_SceneActuator attribute), 1206  
 userjit (bpy.types.ParticleSettings attribute), 696  
 userpref\_show() (in module bpy.ops.screen), 123  
 UserPreferences (class in bpy.types), 1014  
 UserPreferences.addons (in module bpy.types), 1014  
 UserPreferences.edit (in module bpy.types), 1014  
 UserPreferences.filepaths (in module bpy.types), 1014  
 UserPreferences.inputs (in module bpy.types), 1014  
 UserPreferences.system (in module bpy.types), 1015  
 UserPreferences.themes (in module bpy.types), 1015  
 UserPreferences.ui\_styles (in module bpy.types), 1015  
 UserPreferences.view (in module bpy.types), 1015  
 UserPreferencesEdit (class in bpy.types), 1015  
 UserPreferencesFilePaths (class in bpy.types), 1019  
 UserPreferencesInput (class in bpy.types), 1021  
 UserPreferencesSystem (class in bpy.types), 1023  
 UserPreferencesSystem.solid\_lights (in module bpy.types), 1025  
 UserPreferencesSystem.weight\_color\_range (in module bpy.types), 1026  
 UserPreferencesView (class in bpy.types), 1027  
 UserSolidLight (class in bpy.types), 1030  
 useViewport (bge.types.KX\_Camera attribute), 1221  
 useXRay (bge.types.KX\_RaySensor attribute), 1201  
 useXY (bge.types.KX\_CameraActuator attribute), 1172  
 UV (bge.types.KX\_VertexProxy attribute), 1210  
 uv (bpy.types.MeshTextureFace attribute), 594  
 uv1 (bpy.types.MeshTextureFace attribute), 594  
 uv2 (bpy.types.MeshTextureFace attribute), 594  
 uv3 (bpy.types.MeshTextureFace attribute), 594  
 uv4 (bpy.types.MeshTextureFace attribute), 594  
 uv\_layer (bpy.types.DisplaceModifier attribute), 379  
 uv\_layer (bpy.types.MaterialStrand attribute), 562  
 uv\_layer (bpy.types.MaterialTextureSlot attribute), 568  
 uv\_layer (bpy.types.ParticleSettingsTextureSlot attribute), 699  
 uv\_layer (bpy.types.ShaderNodeGeometry attribute), 807  
 uv\_layer (bpy.types.UVProjectModifier attribute), 1010  
 uv\_layer (bpy.types.WarpModifier attribute), 1045  
 uv\_layer (bpy.types.WaveModifier attribute), 1048  
 uv\_raw (bpy.types.MeshTextureFace attribute), 594  
 uv\_select\_mode (bpy.types.ToolSettings attribute), 978  
 uv\_texture\_add() (in module bpy.ops.mesh), 86  
 uv\_texture\_clone (bpy.types.Mesh attribute), 578  
 uv\_texture\_clone\_index (bpy.types.Mesh attribute), 578  
 uv\_texture\_remove() (in module bpy.ops.mesh), 86  
 uv\_texture\_stencil (bpy.types.Mesh attribute), 578  
 uv\_texture\_stencil\_index (bpy.types.Mesh attribute), 578  
 UVProjectModifier (class in bpy.types), 1009

UVProjectModifier.projectors (in module bpy.types), 1010  
UVProjector (class in bpy.types), 1011  
uvs\_mirror() (in module bpy.ops.mesh), 86  
uvs\_rotate() (in module bpy.ops.mesh), 86  
UVTextures (class in bpy.types), 1011

**V**

v (bge.types.KX\_VertexProxy attribute), 1210  
v (mathutils.Color attribute), 1084  
v1 (bge.types.KX\_PolyProxy attribute), 1193  
v2 (bge.types.KX\_PolyProxy attribute), 1193  
v2 (bge.types.KX\_VertexProxy attribute), 1211  
v3 (bge.types.KX\_PolyProxy attribute), 1193  
v4 (bge.types.KX\_PolyProxy attribute), 1193  
valid (bge.texture.ImageBuff attribute), 1255  
valid (bge.texture.ImageFFmpeg attribute), 1255  
valid (bge.texture.ImageMirror attribute), 1256  
valid (bge.texture.ImageMix attribute), 1257  
valid (bge.texture.ImageRender attribute), 1257  
valid (bge.texture.ImageViewport attribute), 1258  
valid (bge.texture.VideoFFmpeg attribute), 1254  
validate() (bge.types.BL\_Shader method), 1170  
validate() (bpy.types.Mesh method), 579  
value (bge.types.KX\_ArmatureSensor attribute), 1226  
value (bge.types.SCA\_2DFilterActuator attribute), 1213  
value (bge.types.SCA\_PropertyActuator attribute), 1217  
value (bge.types.SCA\_PropertySensor attribute), 1217  
value (bpy.types.ArmatureSensor attribute), 205  
value (bpy.types.GameBooleanProperty attribute), 450  
value (bpy.types.GameFloatProperty attribute), 451  
value (bpy.types.GameIntProperty attribute), 451  
value (bpy.types.GameStringProperty attribute), 458  
value (bpy.types.GameTimerProperty attribute), 459  
value (bpy.types.KeyMapItem attribute), 502  
value (bpy.types.MeshFloatProperty attribute), 587  
value (bpy.types.MeshIntProperty attribute), 589  
value (bpy.types.MeshStringProperty attribute), 591  
value (bpy.types.PropertyActuator attribute), 730  
value (bpy.types.PropertySensor attribute), 734  
value (bpy.types.ShapeKey attribute), 826  
value\_max (bpy.types.PropertySensor attribute), 734  
value\_min (bpy.types.PropertySensor attribute), 734  
value\_offset (bpy.types.FModifierFunctionGenerator attribute), 423  
value\_sliders (bpy.types.ThemeDopeSheet attribute), 939  
ValueNodeSocket (class in bpy.types), 1031  
values() (bpy.types.bpy\_prop\_collection method), 1067  
values() (bpy.types.bpy\_struct method), 1071  
Vector (class in mathutils), 1092  
Vector.angle() (in module mathutils), 1093  
Vector.copy() (in module mathutils), 1093  
Vector.difference() (in module mathutils), 1095  
Vector.lerp() (in module mathutils), 1093  
Vector.project() (in module mathutils), 1094  
Vector.rotate() (in module mathutils), 1095  
VectorFont (class in bpy.types), 1032  
VectorFont.filepath (in module bpy.types), 1032  
VectorFont.packed\_file (in module bpy.types), 1032  
VectorNodeSocket (class in bpy.types), 1033  
vectoscope\_alpha (bpy.types.Scopes attribute), 787  
VEHICLE\_CONSTRAINT (in module bge.constraints), 1271  
velocity (aud.Handle attribute), 1157  
velocity (bge.types.KX\_SoundActuator attribute), 1207  
velocity (bpy.types.Particle attribute), 674  
velocity (bpy.types.ParticleKey attribute), 683  
velocity\_factor (bpy.types.ParticleSettingsTextureSlot attribute), 699  
velocity\_factor (bpy.types.SmokeFlowSettings attribute), 836  
velocity\_max (bpy.types.GameObjectSettings attribute), 455  
velocity\_max (bpy.types.Itasc attribute), 492  
velocity\_min (bpy.types.GameObjectSettings attribute), 455  
velocity\_radius (bpy.types.ControlFluidSettings attribute), 359  
velocity\_strength (bpy.types.ControlFluidSettings attribute), 360  
version (in module bpy.app), 1075  
version\_char (in module bpy.app), 1075  
version\_cycle (in module bpy.app), 1076  
version\_string (in module bpy.app), 1076  
vertex (bpy.types.ThemeGraphEditor attribute), 945  
vertex (bpy.types.ThemeImageEditor attribute), 947  
vertex (bpy.types.ThemeView3D attribute), 969  
vertex\_add() (in module bpy.ops.curve), 50  
vertex\_cache\_space (bpy.types.PointDensity attribute), 716  
vertex\_color\_add() (in module bpy.ops.mesh), 86  
vertex\_color\_dirt() (in module bpy.ops.paint), 112  
vertex\_color\_remove() (in module bpy.ops.mesh), 86  
vertex\_color\_set() (in module bpy.ops.paint), 112  
vertex\_group (bpy.types.ArmatureModifier attribute), 204  
vertex\_group (bpy.types.CastModifier attribute), 272  
vertex\_group (bpy.types.CurveModifier attribute), 374  
vertex\_group (bpy.types.DisplaceModifier attribute), 379  
vertex\_group (bpy.types.ExplodeModifier attribute), 410  
vertex\_group (bpy.types.HookModifier attribute), 471  
vertex\_group (bpy.types.Lattice attribute), 529  
vertex\_group (bpy.types.LatticeModifier attribute), 530  
vertex\_group (bpy.types.MaskModifier attribute), 546  
vertex\_group (bpy.types.MeshDeformModifier attribute), 582  
vertex\_group (bpy.types.ShapeKey attribute), 826  
vertex\_group (bpy.types.ShrinkwrapModifier attribute), 831

**vertex\_group** (bpy.types.SimpleDeformModifier attribute), 832  
**vertex\_group** (bpy.types.SmoothModifier attribute), 838  
**vertex\_group** (bpy.types.SolidifyModifier attribute), 845  
**vertex\_group** (bpy.types.WarpModifier attribute), 1045  
**vertex\_group** (bpy.types.WaveModifier attribute), 1048  
**vertex\_group\_add()** (in module bpy.ops.object), 108  
**vertex\_group\_assign()** (in module bpy.ops.object), 108  
**vertex\_group\_bending** (bpy.types.ClothSettings attribute), 281  
**vertex\_group\_blend()** (in module bpy.ops.object), 108  
**vertex\_group\_clean()** (in module bpy.ops.object), 108  
**vertex\_group\_clump** (bpy.types.ParticleSystem attribute), 703  
**vertex\_group\_copy()** (in module bpy.ops.object), 108  
**vertex\_group\_copy\_to\_linked()** (in module bpy.ops.object), 108  
**vertex\_group\_copy\_to\_selected()** (in module bpy.ops.object), 108  
**vertex\_group\_density** (bpy.types.ParticleSystem attribute), 703  
**vertex\_group\_deselect()** (in module bpy.ops.object), 108  
**vertex\_group\_field** (bpy.types.ParticleSystem attribute), 703  
**vertex\_group\_goal** (bpy.types.SoftBodySettings attribute), 843  
**vertex\_group\_invert()** (in module bpy.ops.object), 108  
**vertex\_group\_kink** (bpy.types.ParticleSystem attribute), 703  
**vertex\_group\_length** (bpy.types.ParticleSystem attribute), 704  
**vertex\_group\_levels()** (in module bpy.ops.object), 108  
**vertex\_group\_mass** (bpy.types.ClothSettings attribute), 281  
**vertex\_group\_mass** (bpy.types.SoftBodySettings attribute), 843  
**vertex\_group\_mirror()** (in module bpy.ops.object), 108  
**vertex\_group\_move()** (in module bpy.ops.object), 108  
**vertex\_group\_normalize()** (in module bpy.ops.object), 109  
**vertex\_group\_normalize\_all()** (in module bpy.ops.object), 109  
**vertex\_group\_remove()** (in module bpy.ops.object), 109  
**vertex\_group\_remove\_from()** (in module bpy.ops.object), 109  
**vertex\_group\_rotation** (bpy.types.ParticleSystem attribute), 704  
**vertex\_group\_roughness\_1** (bpy.types.ParticleSystem attribute), 704  
**vertex\_group\_roughness\_2** (bpy.types.ParticleSystem attribute), 704  
**vertex\_group\_roughness\_end** (bpy.types.ParticleSystem attribute), 704  
**vertex\_group\_select()** (in module bpy.ops.object), 109  
**vertex\_group\_set\_active()** (in module bpy.ops.object), 109  
**vertex\_group\_size** (bpy.types.ParticleSystem attribute), 704  
**vertex\_group\_sort()** (in module bpy.ops.object), 109  
**vertex\_group\_spring** (bpy.types.SoftBodySettings attribute), 843  
**vertex\_group\_structural\_stiffness** (bpy.types.ClothSettings attribute), 281  
**vertex\_group\_tangent** (bpy.types.ParticleSystem attribute), 704  
**vertex\_group\_velocity** (bpy.types.ParticleSystem attribute), 704  
**vertex\_group\_weight** (bpy.types.ToolSettings attribute), 978  
**vertex\_normal** (bpy.types.ThemeView3D attribute), 969  
**vertex\_paint()** (in module bpy.ops.paint), 112  
**vertex\_paint\_object** (in module bpy.context), 28  
**vertex\_paint\_toggle()** (in module bpy.ops.paint), 112  
**vertex\_parent\_set()** (in module bpy.ops.object), 109  
**vertex\_select** (bpy.types.ThemeGraphEditor attribute), 945  
**vertex\_select** (bpy.types.ThemeImageEditor attribute), 947  
**vertex\_select** (bpy.types.ThemeView3D attribute), 969  
**vertex\_size** (bpy.types.ThemeGraphEditor attribute), 945  
**vertex\_size** (bpy.types.ThemeImageEditor attribute), 947  
**vertex\_size** (bpy.types.ThemeView3D attribute), 969  
**vertex\_tool** (bpy.types.Brush attribute), 264  
**vertex\_tool\_set()** (in module bpy.ops.brush), 42  
**VertexColors** (class in bpy.types), 1034  
**VertexGroup** (class in bpy.types), 1035  
**VertexGroup.index** (in module bpy.types), 1035  
**VertexGroupElement** (class in bpy.types), 1036  
**VertexGroupElement.group** (in module bpy.types), 1036  
**VertexGroups** (class in bpy.types), 1037  
**VertexPaint** (class in bpy.types), 1038  
**vertices** (bpy.types.MeshEdge attribute), 584  
**vertices** (bpy.types.MeshFace attribute), 586  
**vertices\_randomize()** (in module bpy.ops.mesh), 86  
**vertices\_raw** (bpy.types.MeshFace attribute), 586  
**vertices\_smooth()** (in module bpy.ops.mesh), 86  
**vertices\_sort()** (in module bpy.ops.mesh), 87  
**VideoFFmpeg** (class in bge.texture), 1254  
**view2d\_grid\_spacing\_min** (bpy.types.UserPreferencesView attribute), 1029  
**view\_all()** (in module bpy.ops.action), 35  
**view\_all()** (in module bpy.ops.graph), 63  
**view\_all()** (in module bpy.ops.image), 67  
**view\_all()** (in module bpy.ops.node), 93  
**view\_all()** (in module bpy.ops.sequencer), 130  
**view\_all()** (in module bpy.ops.time), 139

view\_all() (in module bpy.ops.view3d), 158  
view\_all\_preview() (in module bpy.ops.sequencer), 130  
view\_axis (bpy.types.BackgroundImage attribute), 208  
view\_cancel() (in module bpy.ops.render), 120  
view\_center\_camera() (in module bpy.ops.view3d), 158  
view\_center\_cursor() (in module bpy.ops.view3d), 158  
view\_distance (bpy.types.RegionView3D attribute), 745  
view\_ghost\_border() (in module bpy.ops.sequencer), 131  
view\_location (bpy.types.RegionView3D attribute), 745  
view\_matrix (bpy.types.RegionView3D attribute), 745  
view\_ndof() (in module bpy.ops.image), 67  
view\_orbit() (in module bpy.ops.view3d), 158  
view\_pan() (in module bpy.ops.image), 68  
view\_pan() (in module bpy.ops.view3d), 158  
view\_perspective (bpy.types.RegionView3D attribute), 745  
view\_persportho() (in module bpy.ops.view3d), 158  
view\_rotate\_method (bpy.types.UserPreferencesInput attribute), 1022  
view\_rotation (bpy.types.RegionView3D attribute), 745  
view\_selected() (in module bpy.ops.action), 35  
view\_selected() (in module bpy.ops.graph), 63  
view\_selected() (in module bpy.ops.image), 68  
view\_selected() (in module bpy.ops.sequencer), 131  
view\_selected() (in module bpy.ops.view3d), 158  
view\_show() (in module bpy.ops.render), 120  
view\_sliders (bpy.types.ThemeDopeSheet attribute), 939  
view\_sliders (bpy.types.ThemeNLAEditor attribute), 951  
view\_toggle() (in module bpy.ops.sequencer), 131  
view\_type (bpy.types.SpaceSequenceEditor attribute), 866  
view\_zoom() (in module bpy.ops.image), 68  
view\_zoom\_axis (bpy.types.UserPreferencesInput attribute), 1022  
view\_zoom\_in() (in module bpy.ops.image), 68  
view\_zoom\_method (bpy.types.UserPreferencesInput attribute), 1023  
view\_zoom\_out() (in module bpy.ops.image), 68  
view\_zoom\_ratio() (in module bpy.ops.image), 68  
view\_zoom\_ratio() (in module bpy.ops.sequencer), 131  
VIEWMATRIX (in module bge.logic), 1248  
VIEWMATRIX\_INVERSE (in module bge.logic), 1248  
VIEWMATRIX\_INVERSETRANSPOSE (in module bge.logic), 1248  
VIEWMATRIX\_TRANSPOSE (in module bge.logic), 1248  
viewnumpad() (in module bpy.ops.view3d), 158  
viewpoint\_object (bpy.types.EnvironmentMap attribute), 405  
viewport\_display\_mode (bpy.types.DomainFluidSettings attribute), 383  
viewport\_shade (bpy.types.SpaceView3D attribute), 875  
virtual\_parents (bpy.types.ParticleSettings attribute), 696  
viscosity\_base (bpy.types.DomainFluidSettings attribute), 383  
viscosity\_exponent (bpy.types.DomainFluidSettings attribute), 383  
viscosity\_preset (bpy.types.DomainFluidSettings attribute), 383  
visibility (bge.types.KX\_VisibilityActuator attribute), 1212  
visibility\_toggle() (in module bpy.ops.node), 93  
visibility\_toggle() (in module bpy.ops.outliner), 111  
VisibilityActuator (class in bpy.types), 1039  
visible (bge.types.KX\_GameObject attribute), 1175  
visible (bge.types.KX\_PolyProxy attribute), 1194  
visible (bge.types.SCA\_PythonMouse attribute), 1164  
visible\_bases (in module bpy.context), 27, 29  
visible\_bones (in module bpy.context), 27  
visible\_objects (in module bpy.context), 27, 29  
visible\_pose\_bones (in module bpy.context), 28  
visual\_transform\_apply() (in module bpy.ops.object), 109  
visual\_transform\_apply() (in module bpy.ops.pose), 118  
VKEY (in module bge.events), 1262  
volume (aud.Device attribute), 1151  
volume (aud.Handle attribute), 1157  
volume (bge.types.KX\_SoundActuator attribute), 1206  
volume (bpy.types.BoidState attribute), 251  
volume (bpy.types.MaintainVolumeConstraint attribute), 543  
volume (bpy.types.SoundActuator attribute), 847  
volume (bpy.types.SoundSequence attribute), 849  
volume (bpy.types.StretchToConstraint attribute), 889  
volume\_initialization (bpy.types.FluidFluidSettings attribute), 439  
volume\_initialization (bpy.types.InflowFluidSettings attribute), 489  
volume\_initialization (bpy.types.ObstacleFluidSettings attribute), 655  
volume\_initialization (bpy.types.OutflowFluidSettings attribute), 667  
volume\_maximum (aud.Handle attribute), 1157  
volume\_minimum (aud.Handle attribute), 1157  
VoronoiTexture (class in bpy.types), 1040  
VoronoiTexture.users\_material (in module bpy.types), 1041  
VoronoiTexture.users\_object\_modifier (in module bpy.types), 1041  
vortex (bpy.types.EffectorWeights attribute), 401  
vorticity (bpy.types.SmokeDomainSettings attribute), 835  
VoxelData (class in bpy.types), 1042  
VoxelDataTexture (class in bpy.types), 1043  
VoxelDataTexture.image\_user (in module bpy.types), 1043  
VoxelDataTexture.users\_material (in module bpy.types), 1043

VoxelDataTexture.users\_object\_modifier (in module bpy.types), 1043  
VoxelDataTexture.voxel\_data (in module bpy.types), 1043

## W

w (mathutils.Quaternion attribute), 1091  
w (mathutils.Vector attribute), 1096  
wander (bpy.types.BoidRuleAverageSpeed attribute), 243  
warp() (in module bpy.ops.transform), 147  
warp\_factor (bpy.types.MaterialTextureSlot attribute), 568  
WarpModifier (class in bpy.types), 1045  
WarpModifier.falloff\_curve (in module bpy.types), 1045  
waveform\_alpha (bpy.types.Scopes attribute), 787  
waveform\_mode (bpy.types.Scopes attribute), 787  
WaveModifier (class in bpy.types), 1046  
weight (bge.types.BL\_ArmatureActuator attribute), 1225  
weight (bpy.types.ArmatureActuator attribute), 201  
weight (bpy.types.BezierSplinePoint attribute), 211  
weight (bpy.types.KinematicConstraint attribute), 522  
weight (bpy.types.ParticleHairKey attribute), 681  
weight (bpy.types.SplinePoint attribute), 882  
weight (bpy.types.VertexGroupElement attribute), 1036  
weight() (bpy.types.VertexGroup method), 1035  
weight\_1 (bpy.types.VoronoiTexture attribute), 1040  
weight\_2 (bpy.types.VoronoiTexture attribute), 1040  
weight\_3 (bpy.types.VoronoiTexture attribute), 1040  
weight\_4 (bpy.types.VoronoiTexture attribute), 1040  
weight\_from\_bones() (in module bpy.ops.paint), 112  
weight\_paint() (in module bpy.ops.paint), 112  
weight\_paint\_object (in module bpy.context), 28  
weight\_paint\_toggle() (in module bpy.ops.paint), 112  
weight\_sample() (in module bpy.ops.paint), 112  
weight\_sample\_group() (in module bpy.ops.paint), 112  
weight\_set() (in module bpy.ops.paint), 112  
weight\_set() (in module bpy.ops.particle), 114  
weight\_softbody (bpy.types.SplinePoint attribute), 882  
weight\_tool\_set() (in module bpy.ops.brush), 42  
weld() (in module bpy.ops.uv), 153  
weld\_threshold (bpy.types.GameSoftBodySettings attribute), 458  
wheel\_scroll\_lines (bpy.types.UserPreferencesInput attribute), 1023  
WHEELDOWNMOUSE (in module bge.events), 1261  
WHEELUPMOUSE (in module bge.events), 1261  
white\_level (bpy.types.CurveMapping attribute), 373  
whole (bge.texture.ImageMirror attribute), 1256  
whole (bge.texture.ImageRender attribute), 1257  
whole (bge.texture.ImageViewport attribute), 1258  
width (bpy.types.BevelModifier attribute), 209  
width (bpy.types.TextBox attribute), 902  
width (bpy.types.WaveModifier attribute), 1048  
width\_fade (bpy.types.MaterialStrand attribute), 562  
wind (bpy.types.EffectorWeights attribute), 401  
Window (class in bpy.types), 1049  
window\_draw\_method (bpy.types.UserPreferencesSystem attribute), 1026  
window\_duplicate() (in module bpy.ops.wm), 170  
window\_fullscreen\_toggle() (in module bpy.ops.wm), 170  
window\_sliders (bpy.types.ThemeAudioWindow attribute), 935  
window\_sliders (bpy.types.ThemeGraphEditor attribute), 945  
window\_sliders (bpy.types.ThemeSequenceEditor attribute), 958  
 WindowManager (class in bpy.types), 1049  
 WindowManager.keyconfigs (in module bpy.types), 1050  
 WindowManager.operators (in module bpy.types), 1050  
 WindowManager.windows (in module bpy.types), 1050  
 WipeSequence (class in bpy.types), 1052  
wire (bpy.types.ThemeNodeEditor attribute), 953  
wire (bpy.types.ThemeView3D attribute), 969  
wire\_select (bpy.types.ThemeNodeEditor attribute), 953  
WKEY (in module bge.events), 1262  
wood\_type (bpy.types.WoodTexture attribute), 1054  
WoodTexture (class in bpy.types), 1054  
WoodTexture.users\_material (in module bpy.types), 1054  
WoodTexture.users\_object\_modifier (in module bpy.types), 1054  
world (bpy.types.Scene attribute), 772  
World (class in bpy.types), 1056  
world (in module bpy.context), 29  
World.animation\_data (in module bpy.types), 1056  
World.light\_settings (in module bpy.types), 1056  
World.mist\_settings (in module bpy.types), 1056  
World.star\_settings (in module bpy.types), 1056  
World.texture\_slots (in module bpy.types), 1056  
world\_to\_camera (bge.types.KX\_Camera attribute), 1221  
worldAngularVelocity (bge.types.KX\_GameObject attribute), 1176  
WorldLighting (class in bpy.types), 1058  
worldLinearVelocity (bge.types.KX\_GameObject attribute), 1176  
WorldMistSettings (class in bpy.types), 1060  
worldOrientation (bge.types.KX\_GameObject attribute), 1175  
worldPosition (bge.types.KX\_GameObject attribute), 1176  
worldScale (bge.types.KX\_GameObject attribute), 1176  
WorldStarsSettings (class in bpy.types), 1061  
WorldTextureSlot (class in bpy.types), 1062  
WorldTextureSlots (class in bpy.types), 1064  
wrap\_method (bpy.types.ShrinkwrapModifier attribute), 831  
write() (bpy.types.Text method), 901  
ww (mathutils.Vector attribute), 1096

www (mathutils.Vector attribute), 1096  
wwwwww (mathutils.Vector attribute), 1096  
wwwx (mathutils.Vector attribute), 1096  
wwwy (mathutils.Vector attribute), 1096  
wwwz (mathutils.Vector attribute), 1096  
wwx (mathutils.Vector attribute), 1096  
wwxw (mathutils.Vector attribute), 1096  
wwxx (mathutils.Vector attribute), 1096  
wwxy (mathutils.Vector attribute), 1096  
wwxz (mathutils.Vector attribute), 1096  
wwy (mathutils.Vector attribute), 1096  
wwyw (mathutils.Vector attribute), 1097  
wwyx (mathutils.Vector attribute), 1097  
wwyy (mathutils.Vector attribute), 1097  
wwyz (mathutils.Vector attribute), 1097  
wwz (mathutils.Vector attribute), 1097  
wwzw (mathutils.Vector attribute), 1097  
wwzx (mathutils.Vector attribute), 1097  
wwzy (mathutils.Vector attribute), 1097  
wwzz (mathutils.Vector attribute), 1097  
wx (mathutils.Vector attribute), 1097  
wxw (mathutils.Vector attribute), 1097  
wxww (mathutils.Vector attribute), 1097  
wxwx (mathutils.Vector attribute), 1097  
wxwy (mathutils.Vector attribute), 1097  
wxwz (mathutils.Vector attribute), 1097  
wxz (mathutils.Vector attribute), 1098  
wxzw (mathutils.Vector attribute), 1098  
wxzx (mathutils.Vector attribute), 1098  
wxzy (mathutils.Vector attribute), 1098  
wxzz (mathutils.Vector attribute), 1098  
wxxy (mathutils.Vector attribute), 1097  
wxxz (mathutils.Vector attribute), 1097  
wxy (mathutils.Vector attribute), 1097  
wxwy (mathutils.Vector attribute), 1098  
wxxy (mathutils.Vector attribute), 1098  
wxyy (mathutils.Vector attribute), 1098  
wxxyz (mathutils.Vector attribute), 1098  
wxz (mathutils.Vector attribute), 1098  
wxzw (mathutils.Vector attribute), 1098  
wxzx (mathutils.Vector attribute), 1098  
wxzy (mathutils.Vector attribute), 1098  
wxzz (mathutils.Vector attribute), 1098  
wy (mathutils.Vector attribute), 1098  
wyw (mathutils.Vector attribute), 1098  
wyww (mathutils.Vector attribute), 1098  
wywx (mathutils.Vector attribute), 1098  
wywy (mathutils.Vector attribute), 1098  
wywz (mathutils.Vector attribute), 1098  
wyx (mathutils.Vector attribute), 1098  
wyxw (mathutils.Vector attribute), 1098  
wyxx (mathutils.Vector attribute), 1098  
wyxy (mathutils.Vector attribute), 1098  
wyxz (mathutils.Vector attribute), 1098  
wy (mathutils.Vector attribute), 1098  
wyw (mathutils.Vector attribute), 1099

wyyx (mathutils.Vector attribute), 1099  
wyyy (mathutils.Vector attribute), 1099  
wyyz (mathutils.Vector attribute), 1099  
wyz (mathutils.Vector attribute), 1099  
wyzw (mathutils.Vector attribute), 1099  
wyzx (mathutils.Vector attribute), 1099  
wyzy (mathutils.Vector attribute), 1099  
wyzz (mathutils.Vector attribute), 1099  
wz (mathutils.Vector attribute), 1099  
wzw (mathutils.Vector attribute), 1099  
wzww (mathutils.Vector attribute), 1099  
wzwx (mathutils.Vector attribute), 1099  
wzwy (mathutils.Vector attribute), 1099  
wz wz (mathutils.Vector attribute), 1099  
wzx (mathutils.Vector attribute), 1099  
wzxw (mathutils.Vector attribute), 1099  
wzxx (mathutils.Vector attribute), 1099  
wzxy (mathutils.Vector attribute), 1099  
wzxz (mathutils.Vector attribute), 1099  
wzy (mathutils.Vector attribute), 1099  
wzyw (mathutils.Vector attribute), 1100  
wzyx (mathutils.Vector attribute), 1100  
wzyy (mathutils.Vector attribute), 1100  
wzyz (mathutils.Vector attribute), 1100  
wzz (mathutils.Vector attribute), 1100  
wzzw (mathutils.Vector attribute), 1100  
wzzx (mathutils.Vector attribute), 1100  
wzzy (mathutils.Vector attribute), 1100  
wzzz (mathutils.Vector attribute), 1100

## X

x (bge.types.KX\_VertexProxy attribute), 1210  
x (bpy.types.TextBox attribute), 902  
x (mathutils.Euler attribute), 1085  
x (mathutils.Quaternion attribute), 1092  
x (mathutils.Vector attribute), 1100  
x3d() (in module bpy.ops.export\_scene), 54  
x3d() (in module bpy.ops.import\_scene), 70  
XKEY (in module bge.events), 1262  
XnorController (class in bpy.types), 1065  
XorController (class in bpy.types), 1066  
xw (mathutils.Vector attribute), 1100  
xww (mathutils.Vector attribute), 1100  
xwww (mathutils.Vector attribute), 1100  
xwx (mathutils.Vector attribute), 1100  
xwxw (mathutils.Vector attribute), 1100  
xwxx (mathutils.Vector attribute), 1100  
xwy (mathutils.Vector attribute), 1100  
xwyw (mathutils.Vector attribute), 1101  
xwyw (mathutils.Vector attribute), 1101

xwyx (mathutils.Vector attribute), 1101  
xwyx (mathutils.Vector attribute), 1101  
xwyz (mathutils.Vector attribute), 1101  
xwz (mathutils.Vector attribute), 1101  
xwzw (mathutils.Vector attribute), 1101  
xwzx (mathutils.Vector attribute), 1101  
xwzy (mathutils.Vector attribute), 1101  
xwzz (mathutils.Vector attribute), 1101  
xx (mathutils.Vector attribute), 1101  
xxw (mathutils.Vector attribute), 1101  
xxww (mathutils.Vector attribute), 1101  
xxwx (mathutils.Vector attribute), 1101  
xxwy (mathutils.Vector attribute), 1101  
xxwz (mathutils.Vector attribute), 1101  
xxx (mathutils.Vector attribute), 1101  
xxxw (mathutils.Vector attribute), 1101  
xxxx (mathutils.Vector attribute), 1101  
xxxxy (mathutils.Vector attribute), 1101  
xxxz (mathutils.Vector attribute), 1101  
xyy (mathutils.Vector attribute), 1102  
xyyw (mathutils.Vector attribute), 1102  
xyyx (mathutils.Vector attribute), 1102  
xyyy (mathutils.Vector attribute), 1102  
xyyz (mathutils.Vector attribute), 1102  
xy (mathutils.Vector attribute), 1102  
xyw (mathutils.Vector attribute), 1102  
xyww (mathutils.Vector attribute), 1102  
xywx (mathutils.Vector attribute), 1102  
xywy (mathutils.Vector attribute), 1102  
xywz (mathutils.Vector attribute), 1102  
xyx (mathutils.Vector attribute), 1102  
xyxw (mathutils.Vector attribute), 1102  
xyxx (mathutils.Vector attribute), 1102  
xyxy (mathutils.Vector attribute), 1102  
xyxz (mathutils.Vector attribute), 1102  
xyy (mathutils.Vector attribute), 1103  
xyyw (mathutils.Vector attribute), 1103  
xyyx (mathutils.Vector attribute), 1103  
xyyy (mathutils.Vector attribute), 1103  
xyyz (mathutils.Vector attribute), 1103  
XYZ (bge.types.KX\_VertexProxy attribute), 1210  
xyz (mathutils.Vector attribute), 1103  
xyzw (mathutils.Vector attribute), 1103  
xyzx (mathutils.Vector attribute), 1103  
xyzy (mathutils.Vector attribute), 1103  
xyzz (mathutils.Vector attribute), 1103  
xz (mathutils.Vector attribute), 1103  
xz\_scale\_mode (bpy.types.SplineIKConstraint attribute), 1103  
xzw (mathutils.Vector attribute), 1103  
xzww (mathutils.Vector attribute), 1103  
xzwx (mathutils.Vector attribute), 1103  
xzwy (mathutils.Vector attribute), 1103  
xzwz (mathutils.Vector attribute), 1103  
xzx (mathutils.Vector attribute), 1103  
xzxw (mathutils.Vector attribute), 1103  
xzxx (mathutils.Vector attribute), 1103  
xzxy (mathutils.Vector attribute), 1103  
xzxz (mathutils.Vector attribute), 1103  
xzy (mathutils.Vector attribute), 1104  
xzyw (mathutils.Vector attribute), 1104  
xzyx (mathutils.Vector attribute), 1104  
xzyy (mathutils.Vector attribute), 1104  
xzyz (mathutils.Vector attribute), 1104  
xzz (mathutils.Vector attribute), 1104  
xzzw (mathutils.Vector attribute), 1104  
xzzx (mathutils.Vector attribute), 1104  
xzzy (mathutils.Vector attribute), 1104  
xzzz (mathutils.Vector attribute), 1104  
  
**Y**  
y (bge.types.KX\_VertexProxy attribute), 1210  
y (bpy.types.TextBox attribute), 902  
y (mathutils.Euler attribute), 1085  
y (mathutils.Quaternion attribute), 1092  
y (mathutils.Vector attribute), 1104  
yield\_ratio (bpy.types.SPHFluidSettings attribute), 769  
YKEY (in module bge.events), 1262  
yw (mathutils.Vector attribute), 1104  
yww (mathutils.Vector attribute), 1104  
ywww (mathutils.Vector attribute), 1104  
ywwx (mathutils.Vector attribute), 1104  
ywwy (mathutils.Vector attribute), 1104  
ywwz (mathutils.Vector attribute), 1104  
ywx (mathutils.Vector attribute), 1104  
ywxw (mathutils.Vector attribute), 1104  
ywxx (mathutils.Vector attribute), 1104  
ywxy (mathutils.Vector attribute), 1104  
ywzx (mathutils.Vector attribute), 1105  
ywy (mathutils.Vector attribute), 1105  
ywyy (mathutils.Vector attribute), 1105  
ywyz (mathutils.Vector attribute), 1105  
ywz (mathutils.Vector attribute), 1105  
ywzw (mathutils.Vector attribute), 1105  
ywzx (mathutils.Vector attribute), 1105  
ywzy (mathutils.Vector attribute), 1105  
ywzz (mathutils.Vector attribute), 1105  
yx (mathutils.Vector attribute), 1105  
yxw (mathutils.Vector attribute), 1105  
yxww (mathutils.Vector attribute), 1105  
yxwx (mathutils.Vector attribute), 1105

yxwy (mathutils.Vector attribute), 1105  
yxwz (mathutils.Vector attribute), 1105  
yxx (mathutils.Vector attribute), 1105  
yxxw (mathutils.Vector attribute), 1105  
yxxx (mathutils.Vector attribute), 1105  
yxyx (mathutils.Vector attribute), 1105  
yxxx (mathutils.Vector attribute), 1106  
yxy (mathutils.Vector attribute), 1106  
yxyw (mathutils.Vector attribute), 1106  
yxyx (mathutils.Vector attribute), 1106  
yxyy (mathutils.Vector attribute), 1106  
yxyz (mathutils.Vector attribute), 1106  
yxz (mathutils.Vector attribute), 1106  
yxzw (mathutils.Vector attribute), 1106  
yxzx (mathutils.Vector attribute), 1106  
yxzy (mathutils.Vector attribute), 1106  
yxzz (mathutils.Vector attribute), 1106  
yy (mathutils.Vector attribute), 1106  
yyw (mathutils.Vector attribute), 1106  
yyww (mathutils.Vector attribute), 1106  
yywx (mathutils.Vector attribute), 1106  
yywy (mathutils.Vector attribute), 1106  
yywz (mathutils.Vector attribute), 1106  
yyx (mathutils.Vector attribute), 1106  
yyxw (mathutils.Vector attribute), 1106  
yyxx (mathutils.Vector attribute), 1106  
yyxy (mathutils.Vector attribute), 1106  
yyxz (mathutils.Vector attribute), 1107  
yyy (mathutils.Vector attribute), 1107  
yyyw (mathutils.Vector attribute), 1107  
yyyx (mathutils.Vector attribute), 1107  
yyyy (mathutils.Vector attribute), 1107  
yyyz (mathutils.Vector attribute), 1107  
yyz (mathutils.Vector attribute), 1107  
yyzw (mathutils.Vector attribute), 1107  
yyzx (mathutils.Vector attribute), 1107  
yyzy (mathutils.Vector attribute), 1107  
yyzz (mathutils.Vector attribute), 1107  
yz (mathutils.Vector attribute), 1107  
yzw (mathutils.Vector attribute), 1107  
yzww (mathutils.Vector attribute), 1107  
yzwx (mathutils.Vector attribute), 1107  
yzwy (mathutils.Vector attribute), 1107  
yzwz (mathutils.Vector attribute), 1107  
yzx (mathutils.Vector attribute), 1107  
yzxw (mathutils.Vector attribute), 1107  
yzxx (mathutils.Vector attribute), 1107  
yzxy (mathutils.Vector attribute), 1107  
yzxz (mathutils.Vector attribute), 1108  
zy (mathutils.Vector attribute), 1108  
zyw (mathutils.Vector attribute), 1108  
zyyx (mathutils.Vector attribute), 1108  
zyyy (mathutils.Vector attribute), 1108  
zyyz (mathutils.Vector attribute), 1108

yzz (mathutils.Vector attribute), 1108  
yzzw (mathutils.Vector attribute), 1108  
yzzx (mathutils.Vector attribute), 1108  
yzzy (mathutils.Vector attribute), 1108  
yzzz (mathutils.Vector attribute), 1108

## Z

z (bge.types.KX\_VertexProxy attribute), 1210  
z (mathutils.Euler attribute), 1085  
z (mathutils.Quaternion attribute), 1092  
z (mathutils.Vector attribute), 1108  
z\_direction ( bpy.types.FieldSettings attribute), 432  
z\_scale ( bpy.types.CompositorNodeDefocus attribute), 311  
zenith\_color ( bpy.types.World attribute), 1057  
zenith\_down\_factor ( bpy.types.WorldTextureSlot attribute), 1063  
zenith\_up\_factor ( bpy.types.WorldTextureSlot attribute), 1063  
zero() (mathutils.Euler method), 1085  
zero() (mathutils.Matrix method), 1089  
zero() (mathutils.Vector method), 1096  
ZEROKEY (in module bge.events), 1262  
ZKEY (in module bge.events), 1262  
zoom ( bpy.types.CompositorNodeDBlur attribute), 310  
zoom ( bpy.types.EnvironmentMap attribute), 405  
zoom ( bpy.types.SpaceSequenceEditor attribute), 866  
zoom() (in module bpy.ops.view2d), 154  
zoom() (in module bpy.ops.view3d), 159  
zoom\_border() (in module bpy.ops.view2d), 154  
zoom\_border() (in module bpy.ops.view3d), 159  
zoom\_camera\_1\_to\_1() (in module bpy.ops.view3d), 159  
zoom\_in() (in module bpy.ops.view2d), 155  
zoom\_out() (in module bpy.ops.view2d), 155  
zsort (bge.types.KX\_PolygonMaterial attribute), 1198  
zw (mathutils.Vector attribute), 1108  
zww (mathutils.Vector attribute), 1108  
zwww (mathutils.Vector attribute), 1108  
zwwx (mathutils.Vector attribute), 1108  
zwwy (mathutils.Vector attribute), 1108  
zwwz (mathutils.Vector attribute), 1108  
zwx (mathutils.Vector attribute), 1108  
zwxw (mathutils.Vector attribute), 1108  
zwxx (mathutils.Vector attribute), 1108  
zwxy (mathutils.Vector attribute), 1109  
zwxz (mathutils.Vector attribute), 1109  
zwy (mathutils.Vector attribute), 1109  
zwyw (mathutils.Vector attribute), 1109  
zwyx (mathutils.Vector attribute), 1109  
zwyy (mathutils.Vector attribute), 1109  
zwyz (mathutils.Vector attribute), 1109  
zwz (mathutils.Vector attribute), 1109  
zwzw (mathutils.Vector attribute), 1109  
zwzx (mathutils.Vector attribute), 1109

zwzy (mathutils.Vector attribute), 1109  
zwzz (mathutils.Vector attribute), 1109  
zx (mathutils.Vector attribute), 1109  
zxw (mathutils.Vector attribute), 1109  
zxww (mathutils.Vector attribute), 1109  
zxwx (mathutils.Vector attribute), 1109  
zxwy (mathutils.Vector attribute), 1109  
zxwz (mathutils.Vector attribute), 1109  
zxx (mathutils.Vector attribute), 1109  
zxxw (mathutils.Vector attribute), 1109  
zxxx (mathutils.Vector attribute), 1109  
zxy (mathutils.Vector attribute), 1110  
zxyw (mathutils.Vector attribute), 1110  
zxyx (mathutils.Vector attribute), 1110  
zxyy (mathutils.Vector attribute), 1110  
zxyz (mathutils.Vector attribute), 1110  
zxz (mathutils.Vector attribute), 1110  
zxzw (mathutils.Vector attribute), 1110  
zxzx (mathutils.Vector attribute), 1110  
zxzy (mathutils.Vector attribute), 1110  
zxzz (mathutils.Vector attribute), 1110  
zy (mathutils.Vector attribute), 1110  
zyw (mathutils.Vector attribute), 1110  
zyww (mathutils.Vector attribute), 1110  
zywx (mathutils.Vector attribute), 1110  
zywy (mathutils.Vector attribute), 1110  
zywz (mathutils.Vector attribute), 1110  
zyx (mathutils.Vector attribute), 1110  
zyxw (mathutils.Vector attribute), 1110  
zyxx (mathutils.Vector attribute), 1110  
zyxy (mathutils.Vector attribute), 1111  
zyxz (mathutils.Vector attribute), 1111  
zyy (mathutils.Vector attribute), 1111  
zyyw (mathutils.Vector attribute), 1111  
zyyx (mathutils.Vector attribute), 1111  
zyyy (mathutils.Vector attribute), 1111  
zyyz (mathutils.Vector attribute), 1111  
zyz (mathutils.Vector attribute), 1111  
zyzw (mathutils.Vector attribute), 1111  
zyzx (mathutils.Vector attribute), 1111  
zyzy (mathutils.Vector attribute), 1111  
zyzz (mathutils.Vector attribute), 1111  
zz (mathutils.Vector attribute), 1111  
zzw (mathutils.Vector attribute), 1111  
zzww (mathutils.Vector attribute), 1111  
zzwx (mathutils.Vector attribute), 1111  
zzwy (mathutils.Vector attribute), 1111  
zzwz (mathutils.Vector attribute), 1111  
zzx (mathutils.Vector attribute), 1111  
zzxw (mathutils.Vector attribute), 1111  
zzxx (mathutils.Vector attribute), 1111  
zzxy (mathutils.Vector attribute), 1112