
pythreejs Documentation

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PyThreejs Development Team

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Version: 2.0.1

pythreejs is a [Jupyter widgets](#) based [notebook](#) extension that allows Jupyter to leverage the WebGL capabilities of modern browsers by creating bindings to the javascript library [three.js](#).

By being based on top of the jupyter-widgets infrastructure, it allows for eased integration with other interactive tools for notebooks.

CHAPTER 1

Quickstart

To get started with pythreejs, install with pip:

```
pip install pythreejs
```

If you are using a notebook version older than 5.3, or if your kernel is in another environment than the notebook server, you will also need to register the front-end extensions.

For the notebook front-end:

```
jupyter nbextension install [--sys-prefix | --user | --system] --py pythreejs
jupyter nbextension enable [--sys-prefix | --user | --system] --py pythreejs
```

For jupyterlab:

```
jupyter labextension install jupyter-threejs
```

Note: If you are installing an older version of pythreejs, you might have to add a version specifier for the labextension to match the Python package, e.g. *jupyter-threejs@1.0.0*.

2.1 Installation

The simplest way to install pythreejs is via pip:

```
pip install pythreejs
```

or via conda:

```
conda install pythreejs
```

With jupyter notebook version ≥ 5.3 , this should also install and enable the relevant front-end extensions. If for some reason this did not happen (e.g. if the notebook server is in a different environment than the kernel), you can install / configure the front-end extensions manually. If you are using classic notebook (as opposed to Jupyterlab), run:

```
jupyter nbextension install [--sys-prefix / --user / --system] --py pythreejs  
jupyter nbextension enable [--sys-prefix / --user / --system] --py pythreejs
```

with the [appropriate flag](#). If you are using Jupyterlab, install the extension with:

```
jupyter labextension install jupyter-threejs
```

2.2 Upgrading to 1.x

If you are upgrading to version 1.x from a version prior to 1.0, there are certain backwards-incompatible changes that you should note:

- `Plain[Buffer]Geometry` was renamed to `[Buffer]Geometry`. This was done in order to be more consistent with the names used in threejs. The base classes for geometry are now called `Base[Buffer]Geometry`. This also avoids the confusion with `Plane[Buffer]Geometry`.

- `LambertMaterial` -> `MeshLambertMaterial`, and other similar material class renames were done. Again, this was to more closely match the names used in three.js itself.

2.3 Introduction

The pythreejs API attempts to mimic the three.js API as closely as possible, so any resource on its API should also be helpful for understanding pythreejs. See for example the [official three.js documentation](#).

The major difference between the two is the render loop. As we normally do not want to call back to the kernel for every rendered frame, some helper classes have been created to allow for user interaction with the scene with minimal overhead:

2.3.1 Renderer classes

While the `WebGLRenderer` class mimics its three.js counterpart in only rendering frames on demand (one frame per call to its `render()` method), the `Renderer` class sets up an interactive render loop allowing for *Interactive controls* and *Animation views*. Similarly, a *Preview* widget allows for a quick visualization of various threejs objects.

2.3.2 Interactive controls

These are classes for managing user interaction with the WebGL canvas, and translating that into actions. One example is the *OrbitControls* class, which allows the user to control the camera by zooming, panning, and orbital rotation around a target. Another example is the *Picker* widget, which allows for getting the objects and surface coordinates underneath the mouse cursor.

To use controls, pass them to the renderer, e.g.:

```
Renderer(controls=[OrbitControls(...), ...], ...)
```

2.3.3 Animation views

The view widgets for the *AnimationAction* class gives interactive controls to the user for controlling a *threejs animation*.

Other notable deviations from the threejs API are listed below:

- Buffers are based on [numpy arrays](#), with their inbuilt knowledge of shape and dtype. As such, most threejs APIs that take a buffer are slightly modified (fewer options need to be specified explicitly).
- The generative geometry objects (e.g. *SphereGeometry* and *BoxBufferGeometry*) do not sync their vertices or similar data by default. To gain access to the generated data, convert them to either the *Geometry* or *BufferGeometry* type with the *from_geometry()* factory method.
- Methods are often not mirrored to the Python side. However, they can be executed with the *exec_three_obj_method()* method. Consider contributing to make methods directly available. Possibly, these can be auto-generated as well.

2.4 Examples

This section contains several examples generated from Jupyter notebooks. The widgets have been embedded into the page.

2.4.1 Geometry types

```
In [1]: from pythreajs import *
        from IPython.display import display
        from math import pi
```

```
In [2]: # Reduce repo churn for examples with embedded state:
        from pythreajs._example_helper import use_example_model_ids
        use_example_model_ids()
```

```
In [3]: BoxGeometry(
        width=5,
        height=10,
        depth=15,
        widthSegments=5,
        heightSegments=10,
        depthSegments=15)
```

```
Preview(child=BoxGeometry(depth=15.0, depthSegments=15, height=10.0, heightSegments=10, width=5.0, w
```

```
In [4]: BoxBufferGeometry(
        width=5,
        height=10,
        depth=15,
        widthSegments=5,
        heightSegments=10,
        depthSegments=15)
```

```
Preview(child=BoxBufferGeometry(depth=15.0, depthSegments=15, height=10.0, heightSegments=10, width=5
```

```
In [5]: CircleGeometry(
        radius=10,
        segments=10,
        thetaStart=0.25,
        thetaLength=5.0)
```

```
Preview(child=CircleGeometry(radius=10.0, segments=10, thetaLength=5.0, thetaStart=0.25), shadowMap=
```

```
In [6]: CircleBufferGeometry(
        radius=10,
        segments=10,
        thetaStart=0.25,
        thetaLength=5.0)
```

```
Preview(child=CircleBufferGeometry(radius=10.0, segments=10, thetaLength=5.0, thetaStart=0.25), shad
```

```
In [7]: CylinderGeometry(
        radiusTop=5,
        radiusBottom=10,
        height=15,
        radialSegments=6,
        heightSegments=10,
        openEnded=False,
        thetaStart=0,
        thetaLength=2.0*pi)
```

```
Preview(child=CylinderGeometry(height=15.0, heightSegments=10, radiusBottom=10.0, radiusTop=5.0), sha
```

```
In [8]: CylinderBufferGeometry(
        radiusTop=5,
        radiusBottom=10,
        height=15,
        radialSegments=6,
        heightSegments=10,
        openEnded=False,
        thetaStart=0,
        thetaLength=2.0*pi)

Preview(child=CylinderBufferGeometry(height=15.0, heightSegments=10, radiusBottom=10.0, radiusTop=5.0))

In [9]: DodecahedronGeometry(radius=10, detail=0, _flat=True)

Preview(child=DodecahedronGeometry(radius=10.0), shadowMap=WebGLShadowMap())

In [ ]: # TODO:
        # EdgesGeometry(...)

In [ ]: # TODO:
        # ExtrudeGeometry(...)

In [10]: IcosahedronGeometry(radius=10, _flat=True)

Preview(child=IcosahedronGeometry(radius=10.0), shadowMap=WebGLShadowMap())

In [11]: LatheBufferGeometry(
        points=[
            [ 0, -10, 0 ],
            [ 10, -5, 0 ],
            [ 5, 5, 0 ],
            [ 0, 10, 0 ]
        ],
        segments=16,
        phiStart=0.0,
        phiLength=2.0*pi, _flat=True)

Preview(child=LatheBufferGeometry(points=[[0, -10, 0], [10, -5, 0], [5, 5, 0], [0, 10, 0]], segments=16))

In [12]: OctahedronGeometry(radius=10, detail=0, _flat=True)

Preview(child=OctahedronGeometry(radius=10.0), shadowMap=WebGLShadowMap())

In [13]: ParametricGeometry(
        func="""function(u,v,out) {
            var x = 5 * (0.5 - u);
            var y = 5 * (0.5 - v);
            out.set(10 * x, 10 * y, x*x - y*y);
        }""",
        slices=5,
        stacks=10, _flat=True)

Preview(child=ParametricGeometry(func='function(u,v,out) { \n            var x = 5 * (0.5 - u);\n

In [14]: PlaneGeometry(
        width=10,
        height=15,
        widthSegments=5,
        heightSegments=10)

Preview(child=PlaneGeometry(height=15.0, heightSegments=10, width=10.0, widthSegments=5), shadowMap=WebGLShadowMap())

In [15]: PlaneBufferGeometry(
        width=10,
        height=15,
```

```

        widthSegments=5,
        heightSegments=10)

Preview(child=PlaneBufferGeometry(height=15.0, heightSegments=10, width=10.0, widthSegments=5), shadowMap=WebGLShadowMap())

In [ ]: # TODO
        # PolyhedronGeometry(...)

In [16]: # TODO: issues when radius is 0...
        RingGeometry(
            innerRadius=10,
            outerRadius=25,
            thetaSegments=8,
            phiSegments=12,
            thetaStart=0,
            thetaLength=6.283185307179586)

Preview(child=RingGeometry(innerRadius=10.0, outerRadius=25.0, phiSegments=12), shadowMap=WebGLShadowMap())

In [17]: # TODO: issues when radius is 0...
        RingBufferGeometry(
            innerRadius=10,
            outerRadius=25,
            thetaSegments=8,
            phiSegments=12,
            thetaStart=0,
            thetaLength=6.283185307179586)

Preview(child=RingBufferGeometry(innerRadius=10.0, outerRadius=25.0, phiSegments=12), shadowMap=WebGLShadowMap())

In [ ]: # TODO
        # ShapeGeometry(...)

In [18]: SphereGeometry(
        radius=20,
        widthSegments=8,
        heightSegments=6,
        phiStart=0,
        phiLength=1.5*pi,
        thetaStart=0,
        thetaLength=2.0*pi/3.0)

Preview(child=SphereGeometry(phiLength=4.71238898038469, radius=20.0, thetaLength=2.0943951023931953), shadowMap=WebGLShadowMap())

In [19]: SphereBufferGeometry(
        radius=20,
        widthSegments=8,
        heightSegments=6,
        phiStart=0,
        phiLength=1.5*pi,
        thetaStart=0,
        thetaLength=2.0*pi/3.0)

Preview(child=SphereBufferGeometry(phiLength=4.71238898038469, radius=20.0, thetaLength=2.0943951023931953), shadowMap=WebGLShadowMap())

In [20]: TetrahedronGeometry(radius=10, detail=1, _flat=True)

Preview(child=TetrahedronGeometry(detail=1, radius=10.0), shadowMap=WebGLShadowMap())

In [ ]: # TODO: font loading
        # TextGeometry(...)

In [21]: TorusGeometry(
        radius=20,
        tube=5,
        radialSegments=20,
```

```
tubularSegments=6,
arc=1.5*pi)

Preview(child=TorusGeometry(arc=4.71238898038469, radialSegments=20, radius=20.0, tube=5.0), shadowMap=WebGLShadowMap())

In [22]: TorusBufferGeometry(radius=100)

Preview(child=TorusBufferGeometry(radius=100.0), shadowMap=WebGLShadowMap())

In [23]: TorusKnotGeometry(
    radius=20,
    tube=5,
    tubularSegments=64,
    radialSegments=8,
    p=2,
    q=3)

Preview(child=TorusKnotGeometry(radius=20.0, tube=5.0), shadowMap=WebGLShadowMap())

In [24]: TorusKnotBufferGeometry(
    radius=20,
    tube=5,
    tubularSegments=64,
    radialSegments=8,
    p=2,
    q=3)

Preview(child=TorusKnotBufferGeometry(radius=20.0, tube=5.0), shadowMap=WebGLShadowMap())

In [ ]: # TODO: handling THREE.Curve
    TubeGeometry(
        path=None,
        segments=64,
        radius=1,
        radiusSegments=8,
        close=False)

In [25]: WireframeGeometry(geometry=TorusBufferGeometry(
    radius=20,
    tube=5,
    radialSegments=6,
    tubularSegments=20,
    arc=2.0*pi
))

Preview(child=WireframeGeometry(geometry=TorusBufferGeometry(radialSegments=6, radius=20.0, tube=5.0), shadowMap=WebGLShadowMap()))

In [ ]:
```

2.4.2 Animation

```
In [1]: from pythreejs import *
import ipywidgets
from IPython.display import display

In [2]: # Reduce repo churn for examples with embedded state:
from pythreejs._example_helper import use_example_model_ids
use_example_model_ids()

In [3]: view_width = 600
view_height = 400
```

Let's first set up a basic scene with a cube and a sphere,

```
In [4]: sphere = Mesh(
    SphereBufferGeometry(1, 32, 16),
    MeshStandardMaterial(color='red')
)

In [5]: cube = Mesh(
    BoxBufferGeometry(1, 1, 1),
    MeshPhysicalMaterial(color='green'),
    position=[2, 0, 4]
)
```

as well as lighting and camera:

```
In [6]: camera = PerspectiveCamera(position=[10, 6, 10], aspect=view_width/view_height)
    key_light = DirectionalLight(position=[0, 10, 10])
    ambient_light = AmbientLight()
```

Keyframe animation

The three.js animation system is built as a **keyframe** system. We'll demonstrate this by animating the position and rotation of our camera.

First, we set up the keyframes for the position and the rotation separately:

```
In [7]: positon_track = VectorKeyframeTrack(name='.position',
    times=[0, 2, 5],
    values=[10, 6, 10,
            6.3, 3.78, 6.3,
            -2.98, 0.84, 9.2,
            ])
    rotation_track = QuaternionKeyframeTrack(name='.quaternion',
    times=[0, 2, 5],
    values=[-0.184, 0.375, 0.0762, 0.905,
            -0.184, 0.375, 0.0762, 0.905,
            -0.0430, -0.156, -0.00681, 0.987,
            ])
```

Next, we create an animation clip combining the two tracks, and finally an animation action to control the animation. See the three.js docs for more details on the different responsibilities of the different classes.

```
In [8]: camera_clip = AnimationClip(tracks=[positon_track, rotation_track])
    camera_action = AnimationAction(AnimationMixer(camera), camera_clip, camera)
```

Now, let's see it in action:

```
In [9]: scene = Scene(children=[sphere, cube, camera, key_light, ambient_light])
    controller = OrbitControls(controlling=camera)
    renderer = Renderer(camera=camera, scene=scene, controls=[controller],
        width=view_width, height=view_height)
```

```
In [10]: renderer
```

```
Renderer(camera=PerspectiveCamera(aspect=1.5, position=(10.0, 6.0, 10.0), projectionMatrix=(1.429671
```

```
In [11]: camera_action
```

```
AnimationAction(clip=AnimationClip(duration=5.0, tracks=(VectorKeyframeTrack(name='.position', times=
```

Let's add another animation clip, this time animating the color of the sphere's material:

```
In [12]: color_track = ColorKeyframeTrack(name='.material.color',
    times=[0, 1], values=[1, 0, 0, 0, 0, 1]) # red to blue
```

```
color_clip = AnimationClip(tracks=[color_track], duration=1.5)
color_action = AnimationAction(AnimationMixer(sphere), color_clip, sphere)
```

```
In [13]: color_action
```

```
AnimationAction(clip=AnimationClip(duration=1.5, tracks=(ColorKeyframeTrack(name='.material.color', t
```

Note how the two animation clips can freely be combined since they affect different properties. It's also worth noting that the color animation can be combined with manual camera control, while the camera animation cannot. When animating the camera, you might want to consider disabling the manual controls.

Animating rotation

When animating the camera rotation above, we used the camera's quaternion. This is the most robust method for animating free-form rotations. For example, the animation above was created by first moving the camera manually, and then reading out its position and quaternion properties at the wanted views. If you want more intuitive axes control, it is possible to animate the rotation sub-attributes instead, as shown below.

```
In [14]: f = """
function f(origu, origv, out) {
    // scale u and v to the ranges I want: [0, 2*pi]
    var u = 2*Math.PI*origu;
    var v = 2*Math.PI*origv;

    var x = Math.sin(u);
    var y = Math.cos(v);
    var z = Math.cos(u+v);

    out.set(x,y,z)
}
"""
surf_g = ParametricGeometry(func=f, slices=16, stacks=16);

surf1 = Mesh(geometry=surf_g,
              material=MeshLambertMaterial(color='green', side='FrontSide'))
surf2 = Mesh(geometry=surf_g,
              material=MeshLambertMaterial(color='yellow', side='BackSide'))
surf = Group(children=[surf1, surf2])

camera2 = PerspectiveCamera( position=[10, 6, 10], aspect=view_width/view_height)
scene2 = Scene(children=[surf, camera2,
                        DirectionalLight(position=[3, 5, 1], intensity=0.6),
                        AmbientLight(intensity=0.5)])
renderer2 = Renderer(camera=camera2, scene=scene2,
                    controls=[OrbitControls(controlling=camera2)],
                    width=view_width, height=view_height)

display(renderer2)

Renderer(camera=PerspectiveCamera(aspect=1.5, position=(10.0, 6.0, 10.0), quaternion=(0.0, 0.0, 0.0, 1.0)))

In [15]: spin_track = NumberKeyframeTrack(name='.rotation[y]', times=[0, 2], values=[0, 6.28])
spin_clip = AnimationClip(tracks=[spin_track])
spin_action = AnimationAction(AnimationMixer(surf), spin_clip, surf)
spin_action
```

```
AnimationAction(clip=AnimationClip(tracks=(NumberKeyframeTrack(name='.rotation[y]', times=array([0, 2
```

Note that we are spinning the object itself, and that we are therefore free to manipulate the camera at will.

Morph targets

Set up a simple sphere geometry, and add a morph target that is an oblong pill shape:

```
In [16]: # This lets three.js create the geometry, then syncs back vertex positions etc.
# For this reason, you should allow for the sync to complete before executing
# the next cell.
morph = BufferGeometry.from_geometry(SphereBufferGeometry(1, 32, 16))

In [17]: import numpy as np

# Set up morph targets:
vertices = np.array(morph.attributes['position'].array)
for i in range(len(vertices)):
    if vertices[i, 0] > 0:
        vertices[i, 0] += 1
morph.morphAttributes = {'position': [
    BufferAttribute(vertices),
]}

morphMesh = Mesh(morph, MeshPhongMaterial(
    color='#ff3333', shininess=150, morphTargets=True))
```

Set up animation for going back and forth between the sphere and pill shape:

```
In [18]: pill_track = NumberKeyframeTrack(
    name='.morphTargetInfluences[0]', times=[0, 1.5, 3], values=[0, 2.5, 0])
pill_clip = AnimationClip(tracks=[pill_track])
pill_action = AnimationAction(AnimationMixer(morphMesh), pill_clip, morphMesh)

In [19]: camera3 = PerspectiveCamera( position=[5, 3, 5], aspect=view_width/view_height)
scene3 = Scene(children=[morphMesh, camera3,
    DirectionalLight(position=[3, 5, 1], intensity=0.6),
    AmbientLight(intensity=0.5)])
renderer3 = Renderer(camera=camera3, scene=scene3,
    controls=[OrbitControls(controlling=camera3)],
    width=view_width, height=view_height)
display(renderer3, pill_action)

Renderer(camera=PerspectiveCamera(aspect=1.5, position=(5.0, 3.0, 5.0), quaternion=(0.0, 0.0, 0.0, 1.0))
AnimationAction(clip=AnimationClip(duration=3.0, tracks=(NumberKeyframeTrack(name='.morphTargetInfluences[0]', times=[0, 1.5, 3], values=[0, 2.5, 0]))))
```

Skeletal animation

First, set up a skinned mesh with some bones:

```
In [20]: import numpy as np

N_BONES = 3

ref_cylinder = CylinderBufferGeometry(5, 5, 50, 5, N_BONES * 5, True)
cylinder = BufferGeometry.from_geometry(ref_cylinder)

In [21]: skinIndices = []
skinWeights = []
vertices = cylinder.attributes['position'].array
boneHeight = ref_cylinder.height / (N_BONES - 1)
for i in range(vertices.shape[0]):

    y = vertices[i, 1] + 0.5 * ref_cylinder.height
```

```
skinIndex = y // boneHeight
skinWeight = ( y % boneHeight ) / boneHeight

# Ease between each bone
skinIndices.append([skinIndex, skinIndex + 1, 0, 0 ])
skinWeights.append([1 - skinWeight, skinWeight, 0, 0 ])

cylinder.attributes = dict(
    cylinder.attributes,
    skinIndex=BufferAttribute(skinIndices),
    skinWeight=BufferAttribute(skinWeights),
)

shoulder = Bone(position=(0, -25, 0))
elbow = Bone(position=(0, 25, 0))
hand = Bone(position=(0, 25, 0))

shoulder.add(elbow)
elbow.add(hand)
bones = [shoulder, elbow, hand]
skeleton = Skeleton(bones)

mesh = SkinnedMesh(cylinder, MeshPhongMaterial(side='DoubleSide', skinning=True))
mesh.add(bones[0])
mesh.skeleton = skeleton
```

In [22]: helper = SkeletonHelper(mesh)

Next, set up some simple rotation animations for the bones:

In [23]: # Rotate on x and z axes:

```
bend_tracks = [
    NumberKeyframeTrack(
        name='.bones[1].rotation[x]',
        times=[0, 0.5, 1.5, 2],
        values=[0, 0.3, -0.3, 0]),
    NumberKeyframeTrack(
        name='.bones[1].rotation[z]',
        times=[0, 0.5, 1.5, 2],
        values=[0, 0.3, -0.3, 0]),
    NumberKeyframeTrack(
        name='.bones[2].rotation[x]',
        times=[0, 0.5, 1.5, 2],
        values=[0, -0.3, 0.3, 0]),
    NumberKeyframeTrack(
        name='.bones[2].rotation[z]',
        times=[0, 0.5, 1.5, 2],
        values=[0, -0.3, 0.3, 0]),
]
bend_clip = AnimationClip(tracks=bend_tracks)
bend_action = AnimationAction(AnimationMixer(mesh), bend_clip, mesh)
```

Rotate on y axis:

```
wring_tracks = [
    NumberKeyframeTrack(name='.bones[1].rotation[y]', times=[0, 0.5, 1.5, 2], values=[0, 0.3, -0.3, 0]),
    NumberKeyframeTrack(name='.bones[2].rotation[y]', times=[0, 0.5, 1.5, 2], values=[0, 0.3, -0.3, 0]),
]

wring_clip = AnimationClip(tracks=wring_tracks)
```



```
        color_key = int(x / checker_w) + int(y / checker_h)
        if color_key % 2 == 0:
            array[x, y, :] = [ 0, 0, 0 ]
        else:
            array[x, y, :] = [ 1, 1, 1 ]
    return array

data_tex = DataTexture(
    data=gen_checkers(arr_w, arr_h, 4, 4),
    format="RGBFormat",
    type="FloatType",
)

In [7]: data_tex

Preview(child=DataTexture(data=array([[0., 0., 0.],
    [0., 0., 0.],
    [0., 0., 0.],
    ...,
    ...,
    ...]),

In [8]: data_tex.data = gen_checkers(arr_w, arr_h, 12, 20)

In [ ]:
```

2.4.4 Renderer properties

```
In [1]: from pythreejs import *
        from IPython.display import display
        import ipywidgets

In [2]: # Reduce repo churn for examples with embedded state:
        from pythreejs._example_helper import use_example_model_ids
        use_example_model_ids()
```

Transparent background

To have the render view use a transparent background, there are three steps you need to do: 1. Ensure that the background property of the Scene object is set to None. 2. Ensure that alpha=True is passed to the constructor of the Renderer object. This ensures that an alpha channel is used by the renderer. 3. Ensure that the clearOpacity property of the Renderer object is set to 0. For more details about this, see below.

```
In [3]: ball = Mesh(geometry=SphereGeometry(),
                    material=MeshLambertMaterial(color='red'))
    key_light = DirectionalLight(color='white', position=[3, 5, 1], intensity=0.5)

    c = PerspectiveCamera(position=[0, 5, 5], up=[0, 1, 0], children=[key_light])

    scene = Scene(children=[ball, c, AmbientLight(color='#777777')], background=None)

    renderer = Renderer(camera=c,
                        scene=scene,
                        alpha=True,
                        clearOpacity=0,
                        controls=[OrbitControls(controlling=c)])

    display(renderer)

Renderer(camera=PerspectiveCamera(children=(DirectionalLight(color='white', intensity=0.5, position=
```

The use of clear color/opacity is explained in more detailed in the docs of three.js, but in short: - If `autoClear` is true the renderer output is cleared on each rendered frame. - If `autoClearColor` is true the background color is cleared on each frame. - When the background color is cleared, it is reset to `Renderer.clearColor`, with an opacity of `Renderer.clearOpacity`.

In [4]: *# Let's set up some controls for the clear color/opacity:*

```
opacity = ipywidgets.FloatSlider(min=0., max=1.)
ipywidgets.jslink((opacity, 'value'), (renderer, 'clearOpacity'))

color = ipywidgets.ColorPicker()
ipywidgets.jslink((color, 'value'), (renderer, 'clearColor'))

display(ipywidgets.HBox(children=[
    ipywidgets.Label('Clear color:'), color, ipywidgets.Label('Clear opacity:'), opacity]))
HBox(children=(Label(value='Clear color:'), ColorPicker(value='black'), Label(value='Clear opacity:')))
```

Scene background

If we set the background property of the scene, it will be filled in on top of whatever clear color is there, basically making the clear color ineffective.

```
In [5]: scene_background = ipywidgets.ColorPicker()
        _background_link = None

def toggle_scene_background(change):
    global _background_link
    if change['new']:
        _background_link = ipywidgets.jslink((scene_background, 'value'), (scene, 'background'))
    else:
        _background_link.close()
        _background_link = None
        scene.background = None

scene_background_toggle = ipywidgets.ToggleButton(False, description='Scene Color')
scene_background_toggle.observe(toggle_scene_background, 'value')

display(ipywidgets.HBox(children=[
    ipywidgets.Label('Scene background color:'), scene_background, scene_background_toggle]))
HBox(children=(Label(value='Scene background color:'), ColorPicker(value='black'), ToggleButton(value='Scene Color')))
```

In []:

2.4.5 Thick line geometry

Three.js has some example code for thick lines via an instance-based geometry. Since WebGL does not guarantee support for line thickness greater than 1 for GL lines, pythreejs includes these objects by default.

```
In [1]: from pythreejs import *
        from IPython.display import display
        from ipywidgets import VBox, HBox, Checkbox, jslink
        import numpy as np

In [2]: # Reduce repo churn for examples with embedded state:
        from pythreejs._example_helper import use_example_model_ids
        use_example_model_ids()
```

First, let's set up a normal GL line for comparison. Depending on your OS/browser combination, this might not respect the `linewidth` argument. E.g. most browsers on Windows does not support linewidth greater than 1, due to lack of support in the ANGLE library that most browsers rely on.

```
In [3]: g1 = BufferGeometry(
        attributes={
            'position': BufferAttribute(np.array([
                [0, 0, 0], [1, 1, 1],
                [2, 2, 2], [4, 4, 4]
            ], dtype=np.float32), normalized=False),
            'color': BufferAttribute(np.array([
                [1, 0, 0], [1, 0, 0],
                [0, 1, 0], [0, 0, 1]
            ], dtype=np.float32), normalized=False),
        },
    )
    m1 = LineBasicMaterial(vertexColors='VertexColors', linewidth=10)
    line1 = LineSegments(g1, m1)
    line1
```

```
Preview(child=LineSegments(geometry=BufferGeometry(attributes={'position': BufferAttribute(array=array(
```

Next, we'll set up two variants of the instance geometry based lines. One with a single color, and one with vertex colors.

```
In [4]: g2 = LineSegmentsGeometry(
        positions=[
            [[0, 0, 0], [1, 1, 1]],
            [[2, 2, 2], [4, 4, 4]]
        ],
    )
    m2 = LineMaterial(linewidth=10, color='cyan')
    line2 = LineSegments2(g2, m2)
    line2
```

```
Preview(child=LineSegments2(geometry=LineSegmentsGeometry(positions=array([[0., 0., 0.],
[1., 1., 1.]...
```

```
In [5]: g3 = LineSegmentsGeometry(
        positions=[
            [[0, 0, 0], [1, 1, 1]],
            [[2, 2, 2], [4, 4, 4]]
        ],
        colors=[
            [[1, 0, 0], [1, 0, 0]],
            [[0, 1, 0], [0, 0, 1]]
        ],
    )
    m3 = LineMaterial(linewidth=10, vertexColors='VertexColors')
    line3 = LineSegments2(g3, m3)
    line3
```

```
Preview(child=LineSegments2(geometry=LineSegmentsGeometry(colors=array([[1., 0., 0.],
[1., 0., 0.]],
...

```

Finally, let's set up a simple scene and renderer, and add some checkboxes so we can toggle the visibility of the different lines.

```
In [6]: view_width = 600
        view_height = 400
        camera = PerspectiveCamera(position=[10, 0, 0], aspect=view_width/view_height)
```

```

key_light = DirectionalLight(position=[0, 10, 10])
ambient_light = AmbientLight()

In [7]: scene = Scene(children=[line1, line2, line3, camera, key_light, ambient_light])
        controller = OrbitControls(controlling=camera, screenSpacePanning=False)
        renderer = Renderer(camera=camera, scene=scene, controls=[controller],
                             width=view_width, height=view_height)

In [8]: chks = [
        Checkbox(True, description='GL line'),
        Checkbox(True, description='Fat line (single color)'),
        Checkbox(True, description='Fat line (vertex colors)'),
        ]
        jslink((chks[0], 'value'), (line1, 'visible'))
        jslink((chks[1], 'value'), (line2, 'visible'))
        jslink((chks[2], 'value'), (line3, 'visible'))
        VBox([renderer, HBox(chks)])

VBox(children=(Renderer(camera=PerspectiveCamera(aspect=1.5, position=(10.0, 0.0, 0.0), projectionMat

```

For reference, the code below shows how you would recreate the line geometry and material from the kernel. The only significant difference is that you need to declare the render view resolution on material creation, while the included `LineMaterial` automatically sets this.

```

In [9]: # The line segment points and colors.
        # Each array of six is one instance/segment [x1, y1, z1, x2, y2, z2]
        posInstBuffer = InstancedInterleavedBuffer( np.array([
            [0, 0, 0, 1, 1, 1],
            [2, 2, 2, 4, 4, 4]
        ], dtype=np.float32))
        colInstBuffer = InstancedInterleavedBuffer( np.array([
            [1, 0, 0, 1, 0, 0],
            [0, 1, 0, 0, 0, 1]
        ], dtype=np.float32))

        # This uses InstancedBufferGeometry, so that the geometry is reused for each line segment
        lineGeo = InstancedBufferGeometry(attributes={
            # Helper line geometry (2x4 grid), that is instanced
            'position': BufferAttribute(np.array([
                [ 1,  2,  0], [1,  2,  0],
                [-1,  1,  0], [1,  1,  0],
                [-1,  0,  0], [1,  0,  0],
                [-1, -1,  0], [1, -1,  0]
            ], dtype=np.float32)),
            'uv': BufferAttribute(np.array([
                [-1,  2], [1,  2],
                [-1,  1], [1,  1],
                [-1, -1], [1, -1],
                [-1, -2], [1, -2]
            ], dtype=np.float32)),
            'index': BufferAttribute(np.array([
                0, 2, 1,
                2, 3, 1,
                2, 4, 3,
                4, 5, 3,
                4, 6, 5,
                6, 7, 5
            ], dtype=np.uint8)),
            # The line segments are split into start/end for each instance:
            'instanceStart': InterleavedBufferAttribute(posInstBuffer, 3, 0),
            'instanceEnd': InterleavedBufferAttribute(posInstBuffer, 3, 3),

```

```
        'instanceColorStart': InterleavedBufferAttribute(colInstBuffer, 3, 0),
        'instanceColorEnd': InterleavedBufferAttribute(colInstBuffer, 3, 3),
    })
```

```
In [10]: # The line material shader:
```

```
lineMat = ShaderMaterial(
    vertexShader=''
    #include <common>
    #include <color_pars_vertex>
    #include <fog_pars_vertex>
    #include <logdepthbuf_pars_vertex>
    #include <clipping_planes_pars_vertex>

    uniform float linewidth;
    uniform vec2 resolution;

    attribute vec3 instanceStart;
    attribute vec3 instanceEnd;

    attribute vec3 instanceColorStart;
    attribute vec3 instanceColorEnd;

    varying vec2 vUv;

    void trimSegment( const in vec4 start, inout vec4 end ) {

        // trim end segment so it terminates between the camera plane and the near plane

        // conservative estimate of the near plane
        float a = projectionMatrix[ 2 ][ 2 ]; // 3rd entry in 3th column
        float b = projectionMatrix[ 3 ][ 2 ]; // 3rd entry in 4th column
        float nearEstimate = - 0.5 * b / a;

        float alpha = ( nearEstimate - start.z ) / ( end.z - start.z );

        end.xyz = mix( start.xyz, end.xyz, alpha );

    }

    void main() {

        #ifdef USE_COLOR

            vColor.xyz = ( position.y < 0.5 ) ? instanceColorStart : instanceColorEnd;

        #endif

        float aspect = resolution.x / resolution.y;

        vUv = uv;

        // camera space
        vec4 start = modelViewMatrix * vec4( instanceStart, 1.0 );
        vec4 end = modelViewMatrix * vec4( instanceEnd, 1.0 );

        // special case for perspective projection, and segments that terminate either in, or beyond
        // clearly the gpu firmware has a way of addressing this issue when projecting into ndc
        // but we need to perform ndc-space calculations in the shader, so we must address this
        // perhaps there is a more elegant solution -- WestLangley
```



```
bool perspective = ( projectionMatrix[ 2 ][ 3 ] == - 1.0 ); // 4th entry in the 3rd column

if ( perspective ) {

    if ( start.z < 0.0 && end.z >= 0.0 ) {

        trimSegment( start, end );

    } else if ( end.z < 0.0 && start.z >= 0.0 ) {

        trimSegment( end, start );

    }

}

// clip space
vec4 clipStart = projectionMatrix * start;
vec4 clipEnd = projectionMatrix * end;

// ndc space
vec2 ndcStart = clipStart.xy / clipStart.w;
vec2 ndcEnd = clipEnd.xy / clipEnd.w;

// direction
vec2 dir = ndcEnd - ndcStart;

// account for clip-space aspect ratio
dir.x *= aspect;
dir = normalize( dir );

// perpendicular to dir
vec2 offset = vec2( dir.y, - dir.x );

// undo aspect ratio adjustment
dir.x /= aspect;
offset.x /= aspect;

// sign flip
if ( position.x < 0.0 ) offset *= - 1.0;

// endcaps
if ( position.y < 0.0 ) {

    offset += - dir;

} else if ( position.y > 1.0 ) {

    offset += dir;

}

// adjust for linewidth
offset *= linewidth;

// adjust for clip-space to screen-space conversion // maybe resolution should be based
offset /= resolution.y;
```

```
// select end
vec4 clip = ( position.y < 0.5 ) ? clipStart : clipEnd;

// back to clip space
offset *= clip.w;

clip.xy += offset;

gl_Position = clip;

vec4 mvPosition = ( position.y < 0.5 ) ? start : end; // this is an approximation

#include <logdepthbuf_vertex>
#include <clipping_planes_vertex>
#include <fog_vertex>
}
'''
    fragmentShader='''
uniform vec3 diffuse;
uniform float opacity;

varying float vLineDistance;

#include <common>
#include <color_pars_fragment>
#include <fog_pars_fragment>
#include <logdepthbuf_pars_fragment>
#include <clipping_planes_pars_fragment>

varying vec2 vUv;

void main() {

    #include <clipping_planes_fragment>

    if ( abs( vUv.y ) > 1.0 ) {

        float a = vUv.x;
        float b = ( vUv.y > 0.0 ) ? vUv.y - 1.0 : vUv.y + 1.0;
        float len2 = a * a + b * b;

        if ( len2 > 1.0 ) discard;

    }

    vec4 diffuseColor = vec4( diffuse, opacity );

    #include <logdepthbuf_fragment>
    #include <color_fragment>

    gl_FragColor = vec4( diffuseColor.rgb, diffuseColor.a );

    #include <premultiplied_alpha_fragment>
    #include <tonemapping_fragment>
    #include <encodings_fragment>
    #include <fog_fragment>

}
```

```

'''
    vertexColors='VertexColors',
    uniforms=dict(
        linewidth={'value': 10.0},
        resolution={'value': (100., 100.)},
        **UniformsLib['common']
    )
)

```

```
In [11]: Mesh(lineGeo, lineMat)
```

```
Preview(child=Mesh(geometry=InstancedBufferGeometry(attributes={'position': BufferAttribute(array=ar
```

```
In [ ]:
```

2.5 API Reference

The pythreejs API attempts to mimic [the three.js API](#) as closely as possible. This API reference therefore does not attempt to explain the purpose of any forwarded objects or attributes, but can still be useful for:

- The trait signatures of various properties.
- Classes, properties and methods custom to pythreejs.
- Variations from the three.js API, e.g. for *BufferAttribute*.

2.5.1 `_base`

Preview

```

class pythreejs.Preview(child, **kwargs)
    Bases: pythreejs._base.renderable.RenderableWidget

    child = Instance()
        a ThreeWidget

```

RenderableWidget

```

class pythreejs.RenderableWidget(**kwargs)
    Bases: ipywidgets.widgets.domwidget.DOMWidget

    autoClear = Bool(True)
        A boolean (True, False) trait.

    autoClearColor = Bool(True)
        A boolean (True, False) trait.

    autoClearDepth = Bool(True)
        A boolean (True, False) trait.

    autoClearStencil = Bool(True)
        A boolean (True, False) trait.

    clearColor = Unicode('000000')
        A trait for unicode strings.

    clearOpacity = CFloat(1.0)
        A casting version of the float trait.

```

clippingPlanes = List()
An instance of a Python list.

freeze()

gammaFactor = CFloat(2.0)
A casting version of the float trait.

gammaInput = Bool(False)
A boolean (True, False) trait.

gammaOutput = Bool(False)
A boolean (True, False) trait.

localClippingEnabled = Bool(False)
A boolean (True, False) trait.

log(msg)
A trait whose value must be an instance of a specified class.

The value can also be an instance of a subclass of the specified class.

Subclasses can declare default classes by overriding the klass attribute

maxMorphNormals = CInt(4)
A casting version of the int trait.

maxMorphTargets = CInt(8)
A casting version of the int trait.

physicallyCorrectLights = Bool(False)
A boolean (True, False) trait.

send_msg(message_type, payload=None)

shadowMap = Instance()
A trait whose value must be an instance of a specified class.

The value can also be an instance of a subclass of the specified class.

Subclasses can declare default classes by overriding the klass attribute

sortObject = Bool(True)
A boolean (True, False) trait.

toneMapping = Enum('LinearToneMapping')
An enum whose value must be in a given sequence.

toneMappingExposure = CFloat(1.0)
A casting version of the float trait.

toneMappingWhitePoint = CFloat(1.0)
A casting version of the float trait.

ThreeWidget

```
class pythreejs.ThreeWidget(**kwargs)
    Bases: ipywidgets.widgets.widget.Widget

    Base widget type for all pythreejs widgets

    exec_three_obj_method(method_name, *args, **kwargs)
        Execute a method on the three object.
```

Excute the method specified by *method_name* on the three object, with arguments *args*. *kwargs* is currently ignored.

2.5.2 animation

tracks

BooleanKeyframeTrack

```
class pythreejs.BooleanKeyframeTrack (name="", times=None, values=None, interpolation="InterpolateLinear")
```

BooleanKeyframeTrack

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/animation/tracks/BooleanKeyframeTrack>

Inherits *KeyframeTrack*.

Three.js docs: <https://threejs.org/docs/#api/animation/tracks/BooleanKeyframeTrack>

ColorKeyframeTrack

```
class pythreejs.ColorKeyframeTrack (name="", times=None, values=None, interpolation="InterpolateLinear")
```

ColorKeyframeTrack

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/animation/tracks/ColorKeyframeTrack>

Inherits *KeyframeTrack*.

Three.js docs: <https://threejs.org/docs/#api/animation/tracks/ColorKeyframeTrack>

NumberKeyframeTrack

```
class pythreejs.NumberKeyframeTrack (name="", times=None, values=None, interpolation="InterpolateLinear")
```

NumberKeyframeTrack

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/animation/tracks/NumberKeyframeTrack>

Inherits *KeyframeTrack*.

Three.js docs: <https://threejs.org/docs/#api/animation/tracks/NumberKeyframeTrack>

QuaternionKeyframeTrack

```
class pythreejs.QuaternionKeyframeTrack (name="", times=None, values=None, interpolation="InterpolateLinear")
```

QuaternionKeyframeTrack

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/animation/tracks/QuaternionKeyframeTrack>

Inherits *KeyframeTrack*.

Three.js docs: <https://threejs.org/docs/#api/animation/tracks/QuaternionKeyframeTrack>

StringKeyframeTrack

```
class pythreejs.StringKeyframeTrack (name="", times=None, values=None, interpolation="InterpolateLinear")
```

StringKeyframeTrack

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/animation/tracks/StringKeyframeTrack>

Inherits *KeyframeTrack*.

Three.js docs: <https://threejs.org/docs/#api/animation/tracks/StringKeyframeTrack>

VectorKeyframeTrack

```
class pythreejs.VectorKeyframeTrack (name="", times=None, values=None, interpolation="InterpolateLinear")
```

VectorKeyframeTrack

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/animation/tracks/VectorKeyframeTrack>

Inherits *KeyframeTrack*.

Three.js docs: <https://threejs.org/docs/#api/animation/tracks/VectorKeyframeTrack>

AnimationAction

```
class pythreejs.AnimationAction (mixer=None, clip=None, localRoot=None)
```

AnimationAction is a three widget that also has its own view.

The view offers animation action controls.

This widget has some manual overrides on the Python side.

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/animation/AnimationAction>

mixer

```
Instance(AnimationMixer, allow_none=True).tag(sync=True, **widget_
↪serialization)
```

clip

```
Instance(AnimationClip, allow_none=True).tag(sync=True, **widget_
↪serialization)
```

localRoot

```
Instance(ThreeWidget, allow_none=True).tag(sync=True, **widget_serialization)
```

clampWhenFinished

```
Bool(False, allow_none=False).tag(sync=True)
```

enabled

```
Bool(True, allow_none=False).tag(sync=True)
```

loop

```
Enum(LoopModes, "LoopRepeat", allow_none=False).tag(sync=True)
```

paused

```
Bool(False, allow_none=False).tag(sync=True)
```

repititions

```
CInt(float('inf'), allow_none=False).tag(sync=True)
```

time

```
CFloat(0, allow_none=False).tag(sync=True)
```

timeScale

```
CFloat(1, allow_none=False).tag(sync=True)
```

weigth

```
CFloat(1, allow_none=False).tag(sync=True)
```

zeroSlopeAtEnd

```
Bool(True, allow_none=False).tag(sync=True)
```

zeroSlopeAtStart

```
Bool(True, allow_none=False).tag(sync=True)
```

pause()

play()

repititions = Union(inf)
an int or a float

stop()

AnimationClip

class pythreejs.**AnimationClip** (*name=None, duration=-1, tracks=[]*)
AnimationClip

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/animation/AnimationClip>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/animation/AnimationClip>

name

```
Unicode(None, allow_none=True).tag(sync=True)
```

duration

```
CFloat(-1, allow_none=False).tag(sync=True)
```

tracks

```
Tuple().tag(sync=True, **widget_serialization)
```

duration = CFloat(-1)
a float

name = Unicode(None)
a unicode string

tracks = Tuple()
a tuple of any type

AnimationMixer

class pythreejs.**AnimationMixer** (*rootObject=None, time=0, timeScale=1*)
AnimationMixer

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/animation/AnimationMixer>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/animation/AnimationMixer>

rootObject

```
Instance(ThreeWidget, allow_none=True).tag(sync=True, **widget_serialization)
```

time

```
CFloat(0, allow_none=False).tag(sync=True)
```

timeScale


```
CFloat(1, allow_none=False).tag(sync=True)
```

rootObject = Instance()

a ThreeWidget or None

time = CFloat(0)

a float

timeScale = CFloat(1)

a float

AnimationObjectGroup

class pythreejs.AnimationObjectGroup

AnimationObjectGroup

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/animation/AnimationObjectGroup>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/animation/AnimationObjectGroup>

AnimationUtils

class pythreejs.AnimationUtils

AnimationUtils

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/animation/AnimationUtils>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/animation/AnimationUtils>

KeyframeTrack

class pythreejs.KeyframeTrack(*name=""*, *times=None*, *values=None*, *interpolation="InterpolateLinear"*)

KeyframeTrack

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/animation/KeyframeTrack>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/animation/KeyframeTrack>

name

```
Unicode("", allow_none=False).tag(sync=True)
```

times

```
WebGLDataUnion().tag(sync=True)
```

values

```
WebGLDataUnion().tag(sync=True)
```

interpolation

```
Enum(InterpolationModes, "InterpolateLinear", allow_none=False).tag(sync=True)
```

```
interpolation = Enum('InterpolateLinear')
    any of ['InterpolateDiscrete', 'InterpolateLinear', 'InterpolateSmooth']

name = Unicode('')
    a unicode string

times = WebGLDataUnion()
    a numpy array or a NDArrayBase

values = WebGLDataUnion()
    a numpy array or a NDArrayBase
```

PropertyBinding

```
class pythreejs.PropertyBinding
    PropertyBinding

    Autogenerated by generate-wrappers.js See https://threejs.org/docs/#api/animation/PropertyBinding

    Inherits ThreeWidget.

    Three.js docs: https://threejs.org/docs/#api/animation/PropertyBinding
```

PropertyMixer

```
class pythreejs.PropertyMixer
    PropertyMixer

    Autogenerated by generate-wrappers.js See https://threejs.org/docs/#api/animation/PropertyMixer

    Inherits ThreeWidget.

    Three.js docs: https://threejs.org/docs/#api/animation/PropertyMixer
```

2.5.3 audio

AudioAnalyser

```
class pythreejs.AudioAnalyser
    AudioAnalyser

    Autogenerated by generate-wrappers.js See https://threejs.org/docs/#api/audio/AudioAnalyser

    Inherits ThreeWidget.

    Three.js docs: https://threejs.org/docs/#api/audio/AudioAnalyser
```

AudioListener

class pythreejs.**AudioListener**
AudioListener

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/audio/AudioListener>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/audio/AudioListener>

Audio

class pythreejs.**Audio**
Audio

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/audio/Audio>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/audio/Audio>

PositionalAudio

class pythreejs.**PositionalAudio**
PositionalAudio

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/audio/PositionalAudio>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/audio/PositionalAudio>

2.5.4 cameras

ArrayCamera

class pythreejs.**ArrayCamera** (*fov=50, aspect=1, near=0.1, far=2000*)
ArrayCamera

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/cameras/ArrayCamera>

Inherits *PerspectiveCamera*.

Three.js docs: <https://threejs.org/docs/#api/cameras/ArrayCamera>

type

```
Unicode("ArrayCamera", allow_none=False).tag(sync=True)
```

type = Unicode('ArrayCamera')
a unicode string

Camera

class pythreejs.Camera

Camera

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/cameras/Camera>

Inherits *Object3D*.

Three.js docs: <https://threejs.org/docs/#api/cameras/Camera>

matrixWorldInverse

```
Matrix4(default_value=[1, 0, 0, 0, 0, 1, 0, 0, 0, 0, 1, 0, 0, 0, 0, 1]).  
↪tag(sync=True)
```

projectionMatrix

```
Matrix4(default_value=[1, 0, 0, 0, 0, 1, 0, 0, 0, 0, 1, 0, 0, 0, 0, 1]).  
↪tag(sync=True)
```

type

```
Unicode("Camera", allow_none=False).tag(sync=True)
```

matrixWorldInverse = **Matrix4**((1, 0, 0, 0, 0, 1, 0, 0, 0, 0, 1, 0, 0, 0, 0, 1))
a tuple of any type

projectionMatrix = **Matrix4**((1, 0, 0, 0, 0, 1, 0, 0, 0, 0, 1, 0, 0, 0, 0, 1))
a tuple of any type

type = **Unicode**('Camera')
a unicode string

CombinedCamera

class pythreejs.CombinedCamera(*width=0, height=0, fov=50, near=0.1, far=2000, orthoNear=0.1, orthoFar=2000*)

CombinedCamera

Autogenerated by generate-wrappers.js This class is a custom class for pythreejs, with no direct corresponding class in three.js.

Inherits *Camera*.

Three.js docs: <https://threejs.org/docs/#api/cameras/CombinedCamera>

fov

```
CFloat(50, allow_none=False).tag(sync=True)
```

zoom

```
CFloat(1, allow_none=False).tag(sync=True)
```

near

```
CFloat(0.1, allow_none=False).tag(sync=True)
```

far

```
CFloat(2000, allow_none=False).tag(sync=True)
```

orthoNear

```
CFloat(0.1, allow_none=False).tag(sync=True)
```

orthoFar

```
CFloat(2000, allow_none=False).tag(sync=True)
```

width

```
CFloat(0, allow_none=False).tag(sync=True)
```

height

```
CFloat(0, allow_none=False).tag(sync=True)
```

mode

```
Enum(['perspective', 'orthographic'], "perspective", allow_none=False).  
→tag(sync=True)
```

impersonate

```
Bool(True, allow_none=False).tag(sync=True)
```

type

```
Unicode("CombinedCamera", allow_none=False).tag(sync=True)
```

far = CFloat(2000)

a float

fov = CFloat(50)

a float

height = CFloat(0)

a float

impersonate = Bool(True)

a boolean

```
mode = Enum('perspective')
    any of ['perspective', 'orthographic']

near = CFloat(0.1)
    a float

orthoFar = CFloat(2000)
    a float

orthoNear = CFloat(0.1)
    a float

type = Unicode('CombinedCamera')
    a unicode string

width = CFloat(0)
    a float

zoom = CFloat(1)
    a float
```

CubeCamera

```
class pythreejs.CubeCamera
    CubeCamera
```

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/cameras/CubeCamera>

Inherits *Object3D*.

Three.js docs: <https://threejs.org/docs/#api/cameras/CubeCamera>

type

```
Unicode("CubeCamera", allow_none=False).tag(sync=True)
```

```
type = Unicode('CubeCamera')
    a unicode string
```

OrthographicCamera

```
class pythreejs.OrthographicCamera (left=0, right=0, top=0, bottom=0, near=0.1, far=2000)
    OrthographicCamera
```

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/cameras/OrthographicCamera>

Inherits *Camera*.

Three.js docs: <https://threejs.org/docs/#api/cameras/OrthographicCamera>

zoom

```
CFloat(1, allow_none=False).tag(sync=True)
```

left

```
CFloat(0, allow_none=False).tag(sync=True)
```

right

```
CFloat(0, allow_none=False).tag(sync=True)
```

top

```
CFloat(0, allow_none=False).tag(sync=True)
```

bottom

```
CFloat(0, allow_none=False).tag(sync=True)
```

near

```
CFloat(0.1, allow_none=False).tag(sync=True)
```

far

```
CFloat(2000, allow_none=False).tag(sync=True)
```

type

```
Unicode("OrthographicCamera", allow_none=False).tag(sync=True)
```

bottom = CFloat(0)

a float

far = CFloat(2000)

a float

left = CFloat(0)

a float

near = CFloat(0.1)

a float

right = CFloat(0)

a float

top = CFloat(0)

a float

type = Unicode('OrthographicCamera')

a unicode string

zoom = CFloat(1)

a float

PerspectiveCamera

class pythreejs.**PerspectiveCamera** (*fov=50, aspect=1, near=0.1, far=2000*)
 PerspectiveCamera

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/cameras/PerspectiveCamera>

Inherits *Camera*.

Three.js docs: <https://threejs.org/docs/#api/cameras/PerspectiveCamera>

fov

```
CFloat(50, allow_none=False).tag(sync=True)
```

zoom

```
CFloat(1, allow_none=False).tag(sync=True)
```

near

```
CFloat(0.1, allow_none=False).tag(sync=True)
```

far

```
CFloat(2000, allow_none=False).tag(sync=True)
```

focus

```
CFloat(10, allow_none=False).tag(sync=True)
```

aspect

```
CFloat(1, allow_none=False).tag(sync=True)
```

type

```
Unicode("PerspectiveCamera", allow_none=False).tag(sync=True)
```

aspect = CFloat(1)
 a float

far = CFloat(2000)
 a float

focus = CFloat(10)
 a float

fov = CFloat(50)
 a float

near = CFloat(0.1)
 a float


```

type = Unicode('PerspectiveCamera')
    a unicode string

zoom = CFloat(1)
    a float

```

StereoCamera

```

class pythreejs.StereoCamera
    StereoCamera

```

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/cameras/StereoCamera>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/cameras/StereoCamera>

aspect

```
CFloat(1, allow_none=False).tag(sync=True)
```

eyeSep

```
CFloat(0.064, allow_none=False).tag(sync=True)
```

cameraL

```
Instance(PerspectiveCamera, allow_none=True).tag(sync=True, **widget_
↪serialization)
```

cameraR

```
Instance(PerspectiveCamera, allow_none=True).tag(sync=True, **widget_
↪serialization)
```

```

aspect = CFloat(1)
    a float

```

```

cameraL = Instance()
    a PerspectiveCamera or None

```

```

cameraR = Instance()
    a PerspectiveCamera or None

```

```

eyeSep = CFloat(0.064)
    a float

```

2.5.5 controls

Controls

```

class pythreejs.Controls
    Controls

```

Autogenerated by generate-wrappers.js This class is a custom class for pythreejs, with no direct corresponding class in three.js.

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/controls/Controls>

controlling

```
Instance(Object3D, allow_none=False).tag(sync=True, **widget_serialization)
```

```
controlling = Instance()  
    an Object3D
```

FlyControls

```
class pythreejs.FlyControls(controlling=None)  
    FlyControls
```

Autogenerated by generate-wrappers.js This class is a custom class for pythreejs, with no direct corresponding class in three.js.

Inherits *Controls*.

Three.js docs: <https://threejs.org/docs/#api/controls/FlyControls>

moveVector

```
Vector3(default_value=[0, 0, 0]).tag(sync=True)
```

rotationVector

```
Vector3(default_value=[0, 0, 0]).tag(sync=True)
```

movementSpeed

```
CFloat(1, allow_none=False).tag(sync=True)
```

rollSpeed

```
CFloat(0.05, allow_none=False).tag(sync=True)
```

syncRate

```
CFloat(1, allow_none=False).tag(sync=True)
```

```
moveVector = Vector3((0, 0, 0))  
    a tuple of any type
```

```
movementSpeed = CFloat(1)  
    a float
```

```
rollSpeed = CFloat(0.05)  
    a float
```

```
rotationVector = Vector3((0, 0, 0))
    a tuple of any type

syncRate = CFloat(1)
    a float
```

OrbitControls

class `pythreejs.OrbitControls` (*controlling=None*)
 This widget has some manual overrides on the Python side.

Inherits *Controls*.

Three.js docs: <https://threejs.org/docs/#api/controls/OrbitControls>

autoRotate

```
Bool(False, allow_none=False).tag(sync=True)
```

autoRotateSpeed

```
CFloat(2, allow_none=False).tag(sync=True)
```

dampingFactor

```
CFloat(0.25, allow_none=False).tag(sync=True)
```

enabled

```
Bool(True, allow_none=False).tag(sync=True)
```

enableDamping

```
Bool(False, allow_none=False).tag(sync=True)
```

enableKeys

```
Bool(True, allow_none=False).tag(sync=True)
```

enablePan

```
Bool(True, allow_none=False).tag(sync=True)
```

enableRotate

```
Bool(True, allow_none=False).tag(sync=True)
```

enableZoom

```
Bool(True, allow_none=False).tag(sync=True)
```

keyPanSpeed

```
CFloat(7, allow_none=False).tag(sync=True)
```

maxAzimuthAngle

```
CFloat(float('inf'), allow_none=False).tag(sync=True)
```

maxDistance

```
CFloat(float('inf'), allow_none=False).tag(sync=True)
```

maxPolarAngle

```
CFloat(3.141592653589793, allow_none=False).tag(sync=True)
```

maxZoom

```
CFloat(float('inf'), allow_none=False).tag(sync=True)
```

minAzimuthAngle

```
CFloat(-float('inf'), allow_none=False).tag(sync=True)
```

minDistance

```
CFloat(0, allow_none=False).tag(sync=True)
```

minPolarAngle

```
CFloat(0, allow_none=False).tag(sync=True)
```

minZoom

```
CFloat(0, allow_none=False).tag(sync=True)
```

panSpeed

```
CFloat(1, allow_none=False).tag(sync=True)
```

rotateSpeed

```
CFloat(1, allow_none=False).tag(sync=True)
```

screenSpacePanning

```
Bool(True, allow_none=False).tag(sync=True)
```

zoomSpeed

```
CFloat(1, allow_none=False).tag(sync=True)
```

target

```
Vector3(default_value=[0, 0, 0]).tag(sync=True)
```

reset()

Reset the controlled object to its initial state.

Picker

class pythreejs.**Picker** (*controlling=None*)

Picker

Autogenerated by generate-wrappers.js This class is a custom class for pythreejs, with no direct corresponding class in three.js.

Inherits *Controls*.

Three.js docs: <https://threejs.org/docs/#api/controls/Picker>

event

The DOM MouseEvent type to trigger the pick

```
Unicode("click", allow_none=False).tag(sync=True)
```

all

Wether to send info on all object intersections beneath the picked point, or only the first one. See *picked*.

```
Bool(False, allow_none=False).tag(sync=True)
```

distance

The distance from the camera of the picked point (null if no object picked)

```
CFloat(None, allow_none=True).tag(sync=True)
```

point

The coordinates of the picked point (all zero if no object picked)

```
Vector3(default_value=[0, 0, 0]).tag(sync=True)
```

face

The vertex indices of the picked face (all zero if no face picked)

```
Vector3(default_value=[0, 0, 0]).tag(sync=True)
```

faceNormal

The normal vector of the picked face (all zero if no face picked)

```
Vector3(default_value=[0, 0, 0]).tag(sync=True)
```

faceVertices

The three vertices that make up the picked face, as vectors (empty if no face picked)

```
List(trait=List()).tag(sync=True)
```

faceIndex

The index of the face picked (null if no face picked)

```
CInt(None, allow_none=True).tag(sync=True)
```

modifiers

The keyboard modifiers held at the pick event in the following order: [SHIFT, CTRL, ALT, META]

```
List().tag(sync=True)
```

object

The picked object (null if no object picked)

```
Instance(Object3D, allow_none=True).tag(sync=True, **widget_serialization)
```

picked

The other fields on the picker will always be for the first object intersection. If `all` is set true, this field will be an array containing the same information for all intersections.

```
List().tag(sync=True)
```

uv

The UV coordinate picked (all zero if invalid pick)

```
Vector2(default_value=[0, 0]).tag(sync=True)
```

indices

The vertex indices of the picked face (empty if no face picked)

```
List().tag(sync=True)
```

all = Bool(False)

a boolean

distance = CFloat(None)

a float

event = Unicode('click')

a unicode string

face = Vector3((0, 0, 0))

a tuple of any type

faceIndex = CInt(None)

an int

faceNormal = Vector3((0, 0, 0))

a tuple of any type

```

faceVertices = List()
    a list with values that are: a list

indices = List()
    a list of any type

modifiers = List()
    a list of any type

object = Instance()
    an Object3D or None

picked = List()
    a list of any type

point = Vector3((0, 0, 0))
    a tuple of any type

uv = Vector2((0, 0))
    a tuple of any type

```

TrackballControls

```

class pythreejs.TrackballControls (controlling=None)
    TrackballControls

```

Autogenerated by generate-wrappers.js This class is a custom class for pythreejs, with no direct corresponding class in three.js.

Inherits *Controls*.

Three.js docs: <https://threejs.org/docs/#api/controls/TrackballControls>

enabled

```

Bool(True, allow_none=False).tag(sync=True)

```

minDistance

```

CFloat(0, allow_none=False).tag(sync=True)

```

maxDistance

```

CFloat(float('inf'), allow_none=False).tag(sync=True)

```

rotateSpeed

```

CFloat(1, allow_none=False).tag(sync=True)

```

zoomSpeed

```

CFloat(1.2, allow_none=False).tag(sync=True)

```

panSpeed

```
CFloat(0.3, allow_none=False).tag(sync=True)
```

staticMoving

```
Bool(False, allow_none=False).tag(sync=True)
```

dynamicDampingFactor

```
CFloat(0.2, allow_none=False).tag(sync=True)
```

noRotate

```
Bool(False, allow_none=False).tag(sync=True)
```

noZoom

```
Bool(False, allow_none=False).tag(sync=True)
```

noPan

```
Bool(False, allow_none=False).tag(sync=True)
```

noRoll

```
Bool(False, allow_none=False).tag(sync=True)
```

target

```
Vector3(default_value=[0, 0, 0]).tag(sync=True)
```

dynamicDampingFactor = CFloat(0.2)

a float

enabled = Bool(True)

a boolean

maxDistance = CFloat(inf)

a float

minDistance = CFloat(0)

a float

noPan = Bool(False)

a boolean

noRoll = Bool(False)

a boolean

noRotate = Bool(False)

a boolean


```

noZoom = Bool(False)
    a boolean

panSpeed = CFloat(0.3)
    a float

rotateSpeed = CFloat(1)
    a float

staticMoving = Bool(False)
    a boolean

target = Vector3((0, 0, 0))
    a tuple of any type

zoomSpeed = CFloat(1.2)
    a float

```

2.5.6 core

BaseBufferGeometry

class `pythreejs.BaseBufferGeometry`
 BaseBufferGeometry

Autogenerated by generate-wrappers.js This class is a custom class for pythreejs, with no direct corresponding class in three.js.

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/core/BaseBufferGeometry>

name

```
Unicode("", allow_none=False).tag(sync=True)
```

type

```
Unicode("BaseBufferGeometry", allow_none=False).tag(sync=True)
```

```
name = Unicode('')
    a unicode string
```

```
type = Unicode('BaseBufferGeometry')
    a unicode string
```

BaseGeometry

class `pythreejs.BaseGeometry`
 BaseGeometry

Autogenerated by generate-wrappers.js This class is a custom class for pythreejs, with no direct corresponding class in three.js.

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/core/BaseGeometry>

name

```
Unicode("", allow_none=False).tag(sync=True)
```

type

```
Unicode("BaseGeometry", allow_none=False).tag(sync=True)
```

name = `Unicode('')`

a unicode string

type = `Unicode('BaseGeometry')`

a unicode string

BufferAttribute

class `pythreejs.BufferAttribute` (*array=None, normalized=False*)

This widget has some manual overrides on the Python side.

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/core/BufferAttribute>

array

```
WebGLDataUnion().tag(sync=True)
```

dynamic

```
Bool(False, allow_none=False).tag(sync=True)
```

needsUpdate

```
Bool(False, allow_none=False).tag(sync=True)
```

normalized

```
Bool(False, allow_none=False).tag(sync=True)
```

version

```
CInt(-1, allow_none=False).tag(sync=True)
```

BufferGeometry

class `pythreejs.BufferGeometry`

This widget has some manual overrides on the Python side.

Inherits *BaseBufferGeometry*.

Three.js docs: <https://threejs.org/docs/#api/core/BufferGeometry>

index

```
Union([
    Instance(BufferAttribute, allow_none=True),
    Instance(InterleavedBufferAttribute, allow_none=True)
]).tag(sync=True, **widget_serialization)
```

attributes

```
Dict(Union([
    Instance(BufferAttribute),
    Instance(InterleavedBufferAttribute)
])).tag(sync=True, **widget_serialization)
```

morphAttributes

```
Dict(TypedTuple(Union([
    Instance(BufferAttribute),
    Instance(InterleavedBufferAttribute)
]))).tag(sync=True, **widget_serialization)
```

userData

```
Dict(default_value={}, allow_none=False).tag(sync=True)
```

MaxIndex

```
CInt(65535, allow_none=False).tag(sync=True)
```

_ref_geometry

```
Union([
    Instance(BaseGeometry, allow_none=True),
    Instance(BaseBufferGeometry, allow_none=True)
]).tag(sync=True, **widget_serialization)
```

_store_ref

```
Bool(False, allow_none=False).tag(sync=True)
```

type

```
Unicode("BufferGeometry", allow_none=False).tag(sync=True)
```

classmethod from_geometry(geometry, store_ref=False)

Creates a PlainBufferGeometry of another geometry.

store_ref determines if the reference is stored after initialization. If it is, it will be used for future embedding.

validate

Clock

class pythreejs.Clock
Clock

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/core/Clock>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/core/Clock>

DirectGeometry

class pythreejs.DirectGeometry
DirectGeometry

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/core/DirectGeometry>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/core/DirectGeometry>

EventDispatcher

class pythreejs.EventDispatcher
EventDispatcher

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/core/EventDispatcher>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/core/EventDispatcher>

Geometry

class pythreejs.Geometry
This widget has some manual overrides on the Python side.

Inherits *BaseGeometry*.

Three.js docs: <https://threejs.org/docs/#api/core/Geometry>

vertices

```
List(trait=List()).tag(sync=True)
```

colors

```
List(trait=Unicode(), default_value=["#ffffff"]).tag(sync=True)
```

faces

```
TypedTuple(trait=Face3()).tag(sync=True)
```

faceVertexUvs

```
List().tag(sync=True)
```

lineDistances

```
List().tag(sync=True)
```

morphTargets

```
List().tag(sync=True)
```

morphNormals

```
List().tag(sync=True)
```

skinWeights

```
List(trait=List()).tag(sync=True)
```

skinIndices

```
List(trait=List()).tag(sync=True)
```

_ref_geometry

```
Instance(BaseGeometry, allow_none=True).tag(sync=True, **widget_serialization)
```

_store_ref

```
Bool(False, allow_none=False).tag(sync=True)
```

type

```
Unicode("Geometry", allow_none=False).tag(sync=True)
```

classmethod from_geometry (*geometry*, *store_ref=False*)

Creates a PlainGeometry of another geometry.

store_ref determines if the reference is stored after initialization. If it is, it will be used for future embedding.

NOTE: The PlainGeometry will copy the arrays from the source geometry. To avoid this, use PlainBufferGeometry.

InstancedBufferAttribute

class pythreejs.InstancedBufferAttribute (*array=None, meshPerAttribute=1*)

InstancedBufferAttribute

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/core/InstancedBufferAttribute>

Inherits *BufferAttribute*.

Three.js docs: <https://threejs.org/docs/#api/core/InstancedBufferAttribute>

meshPerAttribute

```
CInt(1, allow_none=False).tag(sync=True)
```

meshPerAttribute = CInt(1)

an int

InstancedBufferGeometry

class pythreejs.InstancedBufferGeometry

InstancedBufferGeometry

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/core/InstancedBufferGeometry>

Inherits *BufferGeometry*.

Three.js docs: <https://threejs.org/docs/#api/core/InstancedBufferGeometry>

maxInstancedCount

```
CInt(None, allow_none=True).tag(sync=True)
```

type

```
Unicode("InstancedBufferGeometry", allow_none=False).tag(sync=True)
```

maxInstancedCount = CInt(None)

an int

type = Unicode('InstancedBufferGeometry')

a unicode string

InstancedInterleavedBuffer

class pythreejs.InstancedInterleavedBuffer (*array=None, meshPerAttribute=1*)

InstancedInterleavedBuffer

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/core/InstancedInterleavedBuffer>

Inherits *InterleavedBuffer*.

Three.js docs: <https://threejs.org/docs/#api/core/InstancedInterleavedBuffer>

meshPerAttribute

```
CInt(1, allow_none=False).tag(sync=True)
```

meshPerAttribute = CInt(1)
an int

InterleavedBufferAttribute

class pythreejs.**InterleavedBufferAttribute** (*data=None, itemSize=0, offset=0, normalized=False*)

InterleavedBufferAttribute

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/core/InterleavedBufferAttribute>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/core/InterleavedBufferAttribute>

data

```
Instance(InterleavedBuffer, allow_none=True).tag(sync=True, **widget_
↪serialization)
```

itemSize

```
CInt(0, allow_none=False).tag(sync=True)
```

offset

```
CInt(0, allow_none=False).tag(sync=True)
```

normalized

```
Bool(False, allow_none=False).tag(sync=True)
```

data = Instance()
an InterleavedBuffer or None

itemSize = CInt(0)
an int

normalized = Bool(False)
a boolean

offset = CInt(0)
an int

InterleavedBuffer

class pythreejs.**InterleavedBuffer** (*array=None*)

InterleavedBuffer

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/core/InterleavedBuffer>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/core/InterleavedBuffer>

array

```
WebGLDataUnion().tag(sync=True)
```

dynamic

```
Bool(False, allow_none=False).tag(sync=True)
```

version

```
CInt(0, allow_none=False).tag(sync=True)
```

needsUpdate

```
Bool(False, allow_none=False).tag(sync=True)
```

array = **WebGLDataUnion()**
a numpy array or a NDArrayBase

dynamic = **Bool(False)**
a boolean

needsUpdate = **Bool(False)**
a boolean

version = **CInt(0)**
an int

Layers

class `pythreejs.Layers`
Layers

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/core/Layers>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/core/Layers>

Object3D

class `pythreejs.Object3D`
This widget has some manual overrides on the Python side.

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/core/Object3D>

name

```
Unicode("", allow_none=False).tag(sync=True)
```


type

```
Unicode("Object3D", allow_none=False).tag(sync=True)
```

children

```
Tuple().tag(sync=True, **widget_serialization)
```

up

```
Vector3(default_value=[0, 1, 0]).tag(sync=True)
```

position

```
Vector3(default_value=[0, 0, 0]).tag(sync=True)
```

rotation

```
Euler(default_value=[0, 0, 0, "XYZ"]).tag(sync=True)
```

quaternion

```
Vector4(default_value=[0, 0, 0, 1]).tag(sync=True)
```

scale

```
Vector3(default_value=[1, 1, 1]).tag(sync=True)
```

modelViewMatrix

```
Matrix4(default_value=[1, 0, 0, 0, 0, 1, 0, 0, 0, 0, 1, 0, 0, 0, 0, 1]).  
↪tag(sync=True)
```

normalMatrix

```
Matrix3(default_value=[1, 0, 0, 0, 1, 0, 0, 0, 1]).tag(sync=True)
```

matrix

```
Matrix4(default_value=[1, 0, 0, 0, 0, 1, 0, 0, 0, 0, 1, 0, 0, 0, 0, 1]).  
↪tag(sync=True)
```

matrixWorld

```
Matrix4(default_value=[1, 0, 0, 0, 0, 1, 0, 0, 0, 0, 1, 0, 0, 0, 0, 1]).  
↪tag(sync=True)
```

matrixAutoUpdate

```
Bool(True, allow_none=False).tag(sync=True)
```

matrixWorldNeedsUpdate

```
Bool(False, allow_none=False).tag(sync=True)
```

visible

```
Bool(True, allow_none=False).tag(sync=True)
```

castShadow

```
Bool(False, allow_none=False).tag(sync=True)
```

receiveShadow

```
Bool(False, allow_none=False).tag(sync=True)
```

frustumCulled

```
Bool(True, allow_none=False).tag(sync=True)
```

renderOrder

```
CInt(0, allow_none=False).tag(sync=True)
```

add (*children*)**lookAt** (*vector*)**remove** (*children*)**rotateX** (*rad*)**rotateY** (*rad*)**rotateZ** (*rad*)**setRotationFromMatrix** (*m*)

m is a 3 by 3 matrix, as a list of rows. The columns of this matrix are the vectors x, y, and z

Raycaster

```
class pythreejs.Raycaster (origin=[0, 0, 0], direction=[0, 0, 0], near=0, far=1000000,   
Raycaster
```

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/core/Raycaster>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/core/Raycaster>

origin

```
Vector3(default_value=[0, 0, 0]).tag(sync=True)
```

direction

```
Vector3(default_value=[0, 0, 0]).tag(sync=True)
```

near

```
CFloat(0, allow_none=False).tag(sync=True)
```

far

```
CFloat(1000000, allow_none=False).tag(sync=True)
```

ray

```
Instance(Ray, allow_none=True).tag(sync=True, **widget_serialization)
```

linePrecision

```
CFloat(1, allow_none=False).tag(sync=True)
```

direction = Vector3((0, 0, 0))

a tuple of any type

far = CFloat(1000000)

a float

linePrecision = CFloat(1)

a float

near = CFloat(0)

a float

origin = Vector3((0, 0, 0))

a tuple of any type

ray = Instance()

a Ray or None

2.5.7 extras

core**CurvePath**

```
class pythreejs.CurvePath
    CurvePath
```

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/extras/core/CurvePath>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/extras/core/CurvePath>

Curve

class pythreejs.**Curve**
Curve

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/extras/core/Curve>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/extras/core/Curve>

Font

class pythreejs.**Font**
Font

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/extras/core/Font>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/extras/core/Font>

Path

class pythreejs.**Path**
Path

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/extras/core/Path>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/extras/core/Path>

ShapePath

class pythreejs.**ShapePath**
ShapePath

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/extras/core/ShapePath>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/extras/core/ShapePath>

Shape

class pythreejs.**Shape**
Shape

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/extras/core/Shape>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/extras/core/Shape>

curves

ArcCurve

class `pythreejs.ArcCurve`
ArcCurve

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/extras/curves/ArcCurve>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/extras/curves/ArcCurve>

CatmullRomCurve3

class `pythreejs.CatmullRomCurve3`
CatmullRomCurve3

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/extras/curves/CatmullRomCurve3>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/extras/curves/CatmullRomCurve3>

CubicBezierCurve3

class `pythreejs.CubicBezierCurve3`
CubicBezierCurve3

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/extras/curves/CubicBezierCurve3>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/extras/curves/CubicBezierCurve3>

CubicBezierCurve

class `pythreejs.CubicBezierCurve`
CubicBezierCurve

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/extras/curves/CubicBezierCurve>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/extras/curves/CubicBezierCurve>

EllipseCurve

class `pythreejs.EllipseCurve`
EllipseCurve

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/extras/curves/EllipseCurve>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/extras/curves/EllipseCurve>

LineCurve3

class pythreejs.**LineCurve3**

LineCurve3

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/extras/curves/LineCurve3>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/extras/curves/LineCurve3>

LineCurve

class pythreejs.**LineCurve**

LineCurve

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/extras/curves/LineCurve>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/extras/curves/LineCurve>

QuadraticBezierCurve3

class pythreejs.**QuadraticBezierCurve3**

QuadraticBezierCurve3

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/extras/curves/QuadraticBezierCurve3>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/extras/curves/QuadraticBezierCurve3>

QuadraticBezierCurve

class pythreejs.**QuadraticBezierCurve**

QuadraticBezierCurve

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/extras/curves/QuadraticBezierCurve>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/extras/curves/QuadraticBezierCurve>

SplineCurve

class pythreejs.**SplineCurve**

SplineCurve

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/extras/curves/SplineCurve>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/extras/curves/SplineCurve>

objects

ImmediateRenderObject

class `pythreejs.ImmediateRenderObject`

`ImmediateRenderObject`

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/extras/objects/ImmediateRenderObject>

Inherits `ThreeWidget`.

Three.js docs: <https://threejs.org/docs/#api/extras/objects/ImmediateRenderObject>

2.5.8 geometries

BoxBufferGeometry

class `pythreejs.BoxBufferGeometry` (*width=1, height=1, depth=1, widthSegments=1, heightSegments=1, depthSegments=1*)

`BoxBufferGeometry`

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/geometries/BoxGeometry>

Inherits `BaseBufferGeometry`.

Three.js docs: <https://threejs.org/docs/#api/geometries/BoxGeometry>

width

```
CFloat(1, allow_none=False).tag(sync=True)
```

height

```
CFloat(1, allow_none=False).tag(sync=True)
```

depth

```
CFloat(1, allow_none=False).tag(sync=True)
```

widthSegments

```
CInt(1, allow_none=False).tag(sync=True)
```

heightSegments

```
CInt(1, allow_none=False).tag(sync=True)
```

depthSegments

```
CInt(1, allow_none=False).tag(sync=True)
```

type

```
Unicode("BoxBufferGeometry", allow_none=False).tag(sync=True)
```

depth = CFloat(1)

a float

depthSegments = CInt(1)

an int

height = CFloat(1)

a float

heightSegments = CInt(1)

an int

type = Unicode('BoxBufferGeometry')

a unicode string

width = CFloat(1)

a float

widthSegments = CInt(1)

an int

BoxGeometry

class pythreejs.BoxGeometry(*width=1, height=1, depth=1, widthSegments=1, heightSegments=1, depthSegments=1*)

BoxGeometry

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/geometries/BoxGeometry>

Inherits *BaseGeometry*.

Three.js docs: <https://threejs.org/docs/#api/geometries/BoxGeometry>

width

```
CFloat(1, allow_none=False).tag(sync=True)
```

height

```
CFloat(1, allow_none=False).tag(sync=True)
```

depth

```
CFloat(1, allow_none=False).tag(sync=True)
```

widthSegments


```
CInt(1, allow_none=False).tag(sync=True)
```

heightSegments

```
CInt(1, allow_none=False).tag(sync=True)
```

depthSegments

```
CInt(1, allow_none=False).tag(sync=True)
```

type

```
Unicode("BoxGeometry", allow_none=False).tag(sync=True)
```

depth = CFloat(1)

a float

depthSegments = CInt(1)

an int

height = CFloat(1)

a float

heightSegments = CInt(1)

an int

type = Unicode('BoxGeometry')

a unicode string

width = CFloat(1)

a float

widthSegments = CInt(1)

an int

BoxLineGeometry

class pythreejs.BoxLineGeometry(*width=1, height=1, depth=1, widthSegments=1, heightSegments=1, depthSegments=1*)

BoxLineGeometry

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/geometries/BoxGeometry>

Inherits *BaseBufferGeometry*.

Three.js docs: <https://threejs.org/docs/#api/geometries/BoxGeometry>

width

```
CFloat(1, allow_none=False).tag(sync=True)
```

height

```
CFloat(1, allow_none=False).tag(sync=True)
```

depth

```
CFloat(1, allow_none=False).tag(sync=True)
```

widthSegments

```
CInt(1, allow_none=False).tag(sync=True)
```

heightSegments

```
CInt(1, allow_none=False).tag(sync=True)
```

depthSegments

```
CInt(1, allow_none=False).tag(sync=True)
```

type

```
Unicode("BoxLineGeometry", allow_none=False).tag(sync=True)
```

depth = CFloat(1)
a float

depthSegments = CInt(1)
an int

height = CFloat(1)
a float

heightSegments = CInt(1)
an int

type = Unicode('BoxLineGeometry')
a unicode string

width = CFloat(1)
a float

widthSegments = CInt(1)
an int

CircleBufferGeometry

```
class pythreejs.CircleBufferGeometry(radius=1, segments=8, thetaStart=0, thetaLength=6.283185307179586)
```

CircleBufferGeometry

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/geometries/CircleGeometry>

Inherits [BaseBufferGeometry](#).

Three.js docs: <https://threejs.org/docs/#api/geometries/CircleGeometry>

radius

```
CFloat(1, allow_none=False).tag(sync=True)
```

segments

```
CInt(8, allow_none=False, min=3).tag(sync=True)
```

thetaStart

```
CFloat(0, allow_none=False).tag(sync=True)
```

thetaLength

```
CFloat(6.283185307179586, allow_none=False).tag(sync=True)
```

type

```
Unicode("CircleBufferGeometry", allow_none=False).tag(sync=True)
```

radius = CFloat(1)

a float

segments = CInt(8)

an int

thetaLength = CFloat(6.283185307179586)

a float

thetaStart = CFloat(0)

a float

type = Unicode('CircleBufferGeometry')

a unicode string

CircleGeometry

class pythreejs.CircleGeometry(*radius=1, segments=8, thetaStart=0, thetaLength=6.283185307179586*)

CircleGeometry

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/geometries/CircleGeometry>

Inherits *BaseGeometry*.

Three.js docs: <https://threejs.org/docs/#api/geometries/CircleGeometry>

radius

```
CFloat(1, allow_none=False).tag(sync=True)
```

segments

```
CInt(8, allow_none=False, min=3).tag(sync=True)
```

thetaStart

```
CFloat(0, allow_none=False).tag(sync=True)
```

thetaLength

```
CFloat(6.283185307179586, allow_none=False).tag(sync=True)
```

type

```
Unicode("CircleGeometry", allow_none=False).tag(sync=True)
```

radius = CFloat(1)

a float

segments = CInt(8)

an int

thetaLength = CFloat(6.283185307179586)

a float

thetaStart = CFloat(0)

a float

type = Unicode('CircleGeometry')

a unicode string

ConeGeometry

```
class pythreejs.ConeGeometry(radius=20, height=100, radialSegments=8, height-  
Segments=1, openEnded=False, thetaStart=0, thetaL-  
ength=6.283185307179586)
```

ConeGeometry

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/geometries/ConeGeometry>

Inherits *BaseGeometry*.

Three.js docs: <https://threejs.org/docs/#api/geometries/ConeGeometry>

radius

```
CFloat(20, allow_none=False).tag(sync=True)
```

height

```
CFloat(100, allow_none=False).tag(sync=True)
```

radialSegments

```
CInt(8, allow_none=False).tag(sync=True)
```

heightSegments

```
CInt(1, allow_none=False).tag(sync=True)
```

openEnded

```
Bool(False, allow_none=False).tag(sync=True)
```

thetaStart

```
CFloat(0, allow_none=False).tag(sync=True)
```

thetaLength

```
CFloat(6.283185307179586, allow_none=False).tag(sync=True)
```

type

```
Unicode("ConeGeometry", allow_none=False).tag(sync=True)
```

height = CFloat(100)

a float

heightSegments = CInt(1)

an int

openEnded = Bool(False)

a boolean

radialSegments = CInt(8)

an int

radius = CFloat(20)

a float

thetaLength = CFloat(6.283185307179586)

a float

thetaStart = CFloat(0)

a float

type = Unicode('ConeGeometry')

a unicode string

CylinderBufferGeometry

```
class pythreejs.CylinderBufferGeometry(radiusTop=1, radiusBottom=1, height=1,
radiusSegments=8, heightSegments=1,
openEnded=False, thetaStart=0, thetaLength=6.283185307179586)
```

CylinderBufferGeometry

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/geometries/CylinderGeometry>

Inherits *BaseBufferGeometry*.

Three.js docs: <https://threejs.org/docs/#api/geometries/CylinderGeometry>

radiusTop

```
CFloat(1, allow_none=False).tag(sync=True)
```

radiusBottom

```
CFloat(1, allow_none=False).tag(sync=True)
```

height

```
CFloat(1, allow_none=False).tag(sync=True)
```

radiusSegments

```
CInt(8, allow_none=False).tag(sync=True)
```

heightSegments

```
CInt(1, allow_none=False).tag(sync=True)
```

openEnded

```
Bool(False, allow_none=False).tag(sync=True)
```

thetaStart

```
CFloat(0, allow_none=False).tag(sync=True)
```

thetaLength

```
CFloat(6.283185307179586, allow_none=False).tag(sync=True)
```

type

```
Unicode("CylinderBufferGeometry", allow_none=False).tag(sync=True)
```

height = CFloat(1)
a float

heightSegments = CInt(1)
an int

openEnded = Bool(False)
a boolean

```

radiusBottom = CFloat(1)
    a float
radiusSegments = CInt(8)
    an int
radiusTop = CFloat(1)
    a float
thetaLength = CFloat(6.283185307179586)
    a float
thetaStart = CFloat(0)
    a float
type = Unicode('CylinderBufferGeometry')
    a unicode string

```

CylinderGeometry

```

class pythreejs.CylinderGeometry (radiusTop=1, radiusBottom=1, height=1, radiusSegments=8,
    heightSegments=1, openEnded=False, thetaStart=0, thetaLength=6.283185307179586)

```

CylinderGeometry

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/geometries/CylinderGeometry>

Inherits *BaseGeometry*.

Three.js docs: <https://threejs.org/docs/#api/geometries/CylinderGeometry>

radiusTop

```
CFloat(1, allow_none=False).tag(sync=True)
```

radiusBottom

```
CFloat(1, allow_none=False).tag(sync=True)
```

height

```
CFloat(1, allow_none=False).tag(sync=True)
```

radiusSegments

```
CInt(8, allow_none=False).tag(sync=True)
```

heightSegments

```
CInt(1, allow_none=False).tag(sync=True)
```

openEnded

```
Bool(False, allow_none=False).tag(sync=True)
```

thetaStart

```
CFloat(0, allow_none=False).tag(sync=True)
```

thetaLength

```
CFloat(6.283185307179586, allow_none=False).tag(sync=True)
```

type

```
Unicode("CylinderGeometry", allow_none=False).tag(sync=True)
```

height = CFloat(1)
a float

heightSegments = CInt(1)
an int

openEnded = Bool(False)
a boolean

radiusBottom = CFloat(1)
a float

radiusSegments = CInt(8)
an int

radiusTop = CFloat(1)
a float

thetaLength = CFloat(6.283185307179586)
a float

thetaStart = CFloat(0)
a float

type = Unicode('CylinderGeometry')
a unicode string

DodecahedronGeometry

class pythreejs.DodecahedronGeometry(*radius=1, detail=0*)
DodecahedronGeometry

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/geometries/DodecahedronGeometry>

Inherits *BaseGeometry*.

Three.js docs: <https://threejs.org/docs/#api/geometries/DodecahedronGeometry>

radius

```
CFloat(1, allow_none=False).tag(sync=True)
```


detail

```
CInt(0, allow_none=False).tag(sync=True)
```

type

```
Unicode("DodecahedronGeometry", allow_none=False).tag(sync=True)
```

detail = CInt(0)

an int

radius = CFloat(1)

a float

type = Unicode('DodecahedronGeometry')

a unicode string

EdgesGeometry

class pythreejs.**EdgesGeometry**

EdgesGeometry

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/geometries/EdgesGeometry>

Inherits *BaseGeometry*.

Three.js docs: <https://threejs.org/docs/#api/geometries/EdgesGeometry>

type

```
Unicode("EdgesGeometry", allow_none=False).tag(sync=True)
```

type = Unicode('EdgesGeometry')

a unicode string

ExtrudeGeometry

class pythreejs.**ExtrudeGeometry**

ExtrudeGeometry

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/geometries/ExtrudeGeometry>

Inherits *BaseGeometry*.

Three.js docs: <https://threejs.org/docs/#api/geometries/ExtrudeGeometry>

type

```
Unicode("ExtrudeGeometry", allow_none=False).tag(sync=True)
```

type = Unicode('ExtrudeGeometry')

a unicode string

IcosahedronGeometry

class `pythreejs.IcosahedronGeometry` (*radius=1, detail=0*)
 IcosahedronGeometry

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/geometries/IcosahedronGeometry>

Inherits *BaseGeometry*.

Three.js docs: <https://threejs.org/docs/#api/geometries/IcosahedronGeometry>

radius

```
CFloat(1, allow_none=False).tag(sync=True)
```

detail

```
CInt(0, allow_none=False).tag(sync=True)
```

type

```
Unicode("IcosahedronGeometry", allow_none=False).tag(sync=True)
```

detail = CInt(0)
 an int

radius = CFloat(1)
 a float

type = Unicode('IcosahedronGeometry')
 a unicode string

LatheBufferGeometry

class `pythreejs.LatheBufferGeometry` (*points=[], segments=12, phiStart=0, phiLength=6.283185307179586*)
 LatheBufferGeometry

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/geometries/LatheGeometry>

Inherits *BaseBufferGeometry*.

Three.js docs: <https://threejs.org/docs/#api/geometries/LatheGeometry>

points

```
List(trait=List()).tag(sync=True)
```

segments

```
CInt(12, allow_none=False).tag(sync=True)
```

phiStart

```
CFloat(0, allow_none=False).tag(sync=True)
```

phiLength

```
CFloat(6.283185307179586, allow_none=False).tag(sync=True)
```

type

```
Unicode("LatheBufferGeometry", allow_none=False).tag(sync=True)
```

phiLength = CFloat(6.283185307179586)

a float

phiStart = CFloat(0)

a float

points = List()

a list with values that are: a list

segments = CInt(12)

an int

type = Unicode('LatheBufferGeometry')

a unicode string

LatheGeometry

class pythreejs.LatheGeometry (*points=[]*, *segments=12*, *phiStart=0*,
phiLength=6.283185307179586)

LatheGeometry

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/geometries/LatheGeometry>

Inherits *BaseGeometry*.

Three.js docs: <https://threejs.org/docs/#api/geometries/LatheGeometry>

points

```
List(trait=List()).tag(sync=True)
```

segments

```
CInt(12, allow_none=False).tag(sync=True)
```

phiStart

```
CFloat(0, allow_none=False).tag(sync=True)
```

phiLength

```
CFloat(6.283185307179586, allow_none=False).tag(sync=True)
```

type

```
Unicode("LatheGeometry", allow_none=False).tag(sync=True)
```

phiLength = **CFloat**(6.283185307179586)
a float

phiStart = **CFloat**(0)
a float

points = **List**()
a list with values that are: a list

segments = **CInt**(12)
an int

type = **Unicode**('LatheGeometry')
a unicode string

LineGeometry

class pythreejs.**LineGeometry**
LineGeometry

Autogenerated by generate-wrappers.js This class is a custom class for pythreejs, with no direct corresponding class in three.js.

Inherits *LineSegmentsGeometry*.

Three.js docs: <https://threejs.org/docs/#api/geometries/LineGeometry>

positions

```
WebGLDataUnion(dtype="float32", shape_constraint=shape_constraints(None, 3)).  
↳tag(sync=True)
```

colors

```
WebGLDataUnion(None, dtype="float32", shape_constraint=shape_constraints(None,  
↳ 3), allow_none=True).tag(sync=True)
```

type

```
Unicode("LineGeometry", allow_none=False).tag(sync=True)
```

colors = **WebGLDataUnion**(None)
a numpy array or a NDAarrayBase

positions = **WebGLDataUnion**()
a numpy array or a NDAarrayBase

type = **Unicode**('LineGeometry')
a unicode string

LineSegmentsGeometry

class pythreejs.LineSegmentsGeometry
LineSegmentsGeometry

Autogenerated by generate-wrappers.js This class is a custom class for pythreejs, with no direct corresponding class in three.js.

Inherits *BaseBufferGeometry*.

Three.js docs: <https://threejs.org/docs/#api/geometries/LineSegmentsGeometry>

positions

```
WebGLDataUnion(dtype="float32", shape_constraint=shape_constraints(None, 2, 3)).tag(sync=True)
```

colors

```
WebGLDataUnion(None, dtype="float32", shape_constraint=shape_constraints(None, 2, 3), allow_none=True).tag(sync=True)
```

type

```
Unicode("LineSegmentsGeometry", allow_none=False).tag(sync=True)
```

colors = **WebGLDataUnion**(None)
a numpy array or a NDArrayBase

positions = **WebGLDataUnion**()
a numpy array or a NDArrayBase

type = **Unicode**('LineSegmentsGeometry')
a unicode string

OctahedronGeometry

class pythreejs.OctahedronGeometry(radius=1, detail=0)
OctahedronGeometry

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/geometries/OctahedronGeometry>

Inherits *BaseGeometry*.

Three.js docs: <https://threejs.org/docs/#api/geometries/OctahedronGeometry>

radius

```
CFloat(1, allow_none=False).tag(sync=True)
```

detail

```
CInt(0, allow_none=False).tag(sync=True)
```

type

```
Unicode("OctahedronGeometry", allow_none=False).tag(sync=True)
```

detail = CInt(0)

an int

radius = CFloat(1)

a float

type = Unicode('OctahedronGeometry')

a unicode string

ParametricGeometry

class pythreejs.ParametricGeometry (*func*, *slices*=3, *stacks*=3)

ParametricGeometry

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/geometries/ParametricGeometry>

Inherits *BaseGeometry*.

Three.js docs: <https://threejs.org/docs/#api/geometries/ParametricGeometry>

func

```
Unicode('function(u, v, vec) { }').tag(sync=True)
```

slices

```
CInt(3, allow_none=False).tag(sync=True)
```

stacks

```
CInt(3, allow_none=False).tag(sync=True)
```

type

```
Unicode("ParametricGeometry", allow_none=False).tag(sync=True)
```

func = Unicode('function(u, v, vec) { }')

a unicode string

slices = CInt(3)

an int

stacks = CInt(3)

an int

type = Unicode('ParametricGeometry')

a unicode string

PlaneBufferGeometry

class pythreejs.PlaneBufferGeometry (width=1, height=1, widthSegments=1, heightSegments=1)

PlaneBufferGeometry

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/geometries/PlaneGeometry>

Inherits *BaseBufferGeometry*.

Three.js docs: <https://threejs.org/docs/#api/geometries/PlaneGeometry>

width

```
CFloat(1, allow_none=False).tag(sync=True)
```

height

```
CFloat(1, allow_none=False).tag(sync=True)
```

widthSegments

```
CInt(1, allow_none=False).tag(sync=True)
```

heightSegments

```
CInt(1, allow_none=False).tag(sync=True)
```

type

```
Unicode("PlaneBufferGeometry", allow_none=False).tag(sync=True)
```

height = CFloat(1)
a float

heightSegments = CInt(1)
an int

type = Unicode('PlaneBufferGeometry')
a unicode string

width = CFloat(1)
a float

widthSegments = CInt(1)
an int

PlaneGeometry

class pythreejs.PlaneGeometry (width=1, height=1, widthSegments=1, heightSegments=1)

PlaneGeometry

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/geometries/PlaneGeometry>

Inherits *BaseGeometry*.

Three.js docs: <https://threejs.org/docs/#api/geometries/PlaneGeometry>

width

```
CFloat(1, allow_none=False).tag(sync=True)
```

height

```
CFloat(1, allow_none=False).tag(sync=True)
```

widthSegments

```
CInt(1, allow_none=False).tag(sync=True)
```

heightSegments

```
CInt(1, allow_none=False).tag(sync=True)
```

type

```
Unicode("PlaneGeometry", allow_none=False).tag(sync=True)
```

height = CFloat(1)

a float

heightSegments = CInt(1)

an int

type = Unicode('PlaneGeometry')

a unicode string

width = CFloat(1)

a float

widthSegments = CInt(1)

an int

PolyhedronGeometry

class pythreejs.PolyhedronGeometry(vertices=[], faces=[], radius=1, detail=0)

PolyhedronGeometry

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/geometries/PolyhedronGeometry>

Inherits *BaseGeometry*.

Three.js docs: <https://threejs.org/docs/#api/geometries/PolyhedronGeometry>

vertices

```
List().tag(sync=True)
```

indices


```
List().tag(sync=True)
```

radius

```
CFloat(1, allow_none=False).tag(sync=True)
```

detail

```
CFloat(0, allow_none=False).tag(sync=True)
```

faces

```
List().tag(sync=True)
```

type

```
Unicode("PolyhedronGeometry", allow_none=False).tag(sync=True)
```

detail = **CFloat**(0)
a float

faces = **List**()
a list of any type

indices = **List**()
a list of any type

radius = **CFloat**(1)
a float

type = **Unicode**('PolyhedronGeometry')
a unicode string

vertices = **List**()
a list of any type

RingBufferGeometry

```
class pythreejs.RingBufferGeometry(innerRadius=0.5, outerRadius=1, thetaSegments=8, phiSegments=8, thetaStart=0, thetaLength=6.283185307179586)
```

RingBufferGeometry

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/geometries/RingGeometry>

Inherits *BaseBufferGeometry*.

Three.js docs: <https://threejs.org/docs/#api/geometries/RingGeometry>

innerRadius

```
CFloat(0.5, allow_none=False).tag(sync=True)
```

outerRadius

```
CFloat(1, allow_none=False).tag(sync=True)
```

thetaSegments

```
CInt(8, allow_none=False, min=3).tag(sync=True)
```

phiSegments

```
CInt(8, allow_none=False, min=1).tag(sync=True)
```

thetaStart

```
CFloat(0, allow_none=False).tag(sync=True)
```

thetaLength

```
CFloat(6.283185307179586, allow_none=False).tag(sync=True)
```

type

```
Unicode("RingBufferGeometry", allow_none=False).tag(sync=True)
```

innerRadius = CFloat(0.5)

a float

outerRadius = CFloat(1)

a float

phiSegments = CInt(8)

an int

thetaLength = CFloat(6.283185307179586)

a float

thetaSegments = CInt(8)

an int

thetaStart = CFloat(0)

a float

type = Unicode('RingBufferGeometry')

a unicode string

RingGeometry

```
class pythreejs.RingGeometry(innerRadius=0.5, outerRadius=1, thetaSegments=8, phiSegments=8, thetaStart=0, thetaLength=6.283185307179586)
```

RingGeometry

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/geometries/RingGeometry>

Inherits *BaseGeometry*.

Three.js docs: <https://threejs.org/docs/#api/geometries/RingGeometry>

innerRadius

```
CFloat(0.5, allow_none=False).tag(sync=True)
```

outerRadius

```
CFloat(1, allow_none=False).tag(sync=True)
```

thetaSegments

```
CInt(8, allow_none=False, min=3).tag(sync=True)
```

phiSegments

```
CInt(8, allow_none=False, min=1).tag(sync=True)
```

thetaStart

```
CFloat(0, allow_none=False).tag(sync=True)
```

thetaLength

```
CFloat(6.283185307179586, allow_none=False).tag(sync=True)
```

type

```
Unicode("RingGeometry", allow_none=False).tag(sync=True)
```

innerRadius = CFloat(0.5)
a float

outerRadius = CFloat(1)
a float

phiSegments = CInt(8)
an int

thetaLength = CFloat(6.283185307179586)
a float

thetaSegments = CInt(8)
an int

thetaStart = CFloat(0)
a float

type = Unicode('RingGeometry')
a unicode string

ShapeGeometry

class pythreejs.**ShapeGeometry** (*shapes=[]*)
ShapeGeometry

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/geometries/ShapeGeometry>

Inherits *BaseGeometry*.

Three.js docs: <https://threejs.org/docs/#api/geometries/ShapeGeometry>

shapes

```
Tuple().tag(sync=True, **widget_serialization)
```

curveSegments

```
CInt(12, allow_none=False).tag(sync=True)
```

material

```
CInt(0, allow_none=False).tag(sync=True)
```

type

```
Unicode("ShapeGeometry", allow_none=False).tag(sync=True)
```

curveSegments = CInt(12)
an int

material = CInt(0)
an int

shapes = Tuple()
a tuple of any type

type = Unicode('ShapeGeometry')
a unicode string

SphereBufferGeometry

class pythreejs.**SphereBufferGeometry** (*radius=1, widthSegments=8, heightSegments=6, phiStart=0, phiLength=6.283185307179586, thetaStart=0, thetaLength=3.141592653589793*)

SphereBufferGeometry

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/geometries/SphereGeometry>

Inherits *BaseBufferGeometry*.

Three.js docs: <https://threejs.org/docs/#api/geometries/SphereGeometry>

radius

```
CFloat(1, allow_none=False).tag(sync=True)
```

widthSegments

```
CInt(8, allow_none=False).tag(sync=True)
```

heightSegments

```
CInt(6, allow_none=False).tag(sync=True)
```

phiStart

```
CFloat(0, allow_none=False).tag(sync=True)
```

phiLength

```
CFloat(6.283185307179586, allow_none=False).tag(sync=True)
```

thetaStart

```
CFloat(0, allow_none=False).tag(sync=True)
```

thetaLength

```
CFloat(3.141592653589793, allow_none=False).tag(sync=True)
```

type

```
Unicode("SphereBufferGeometry", allow_none=False).tag(sync=True)
```

heightSegments = CInt(6)

an int

phiLength = CFloat(6.283185307179586)

a float

phiStart = CFloat(0)

a float

radius = CFloat(1)

a float

thetaLength = CFloat(3.141592653589793)

a float

thetaStart = CFloat(0)

a float

type = Unicode('SphereBufferGeometry')

a unicode string

widthSegments = CInt(8)
an int

SphereGeometry

class pythreejs.**SphereGeometry**(radius=1, widthSegments=8, heightSegments=6, phiStart=0, phiLength=6.283185307179586, thetaStart=0, thetaLength=3.141592653589793)

SphereGeometry

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/geometries/SphereGeometry>

Inherits *BaseGeometry*.

Three.js docs: <https://threejs.org/docs/#api/geometries/SphereGeometry>

radius

```
CFloat(1, allow_none=False).tag(sync=True)
```

widthSegments

```
CInt(8, allow_none=False).tag(sync=True)
```

heightSegments

```
CInt(6, allow_none=False).tag(sync=True)
```

phiStart

```
CFloat(0, allow_none=False).tag(sync=True)
```

phiLength

```
CFloat(6.283185307179586, allow_none=False).tag(sync=True)
```

thetaStart

```
CFloat(0, allow_none=False).tag(sync=True)
```

thetaLength

```
CFloat(3.141592653589793, allow_none=False).tag(sync=True)
```

type

```
Unicode("SphereGeometry", allow_none=False).tag(sync=True)
```

heightSegments = CInt(6)
an int

```

phiLength = CFloat(6.283185307179586)
    a float
phiStart = CFloat(0)
    a float
radius = CFloat(1)
    a float
thetaLength = CFloat(3.141592653589793)
    a float
thetaStart = CFloat(0)
    a float
type = Unicode('SphereGeometry')
    a unicode string
widthSegments = CInt(8)
    an int

```

TetrahedronGeometry

class pythreejs.TetrahedronGeometry (radius=1, detail=0)
TetrahedronGeometry

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/geometries/TetrahedronGeometry>

Inherits *BaseGeometry*.

Three.js docs: <https://threejs.org/docs/#api/geometries/TetrahedronGeometry>

radius

```
CFloat(1, allow_none=False).tag(sync=True)
```

detail

```
CInt(0, allow_none=False).tag(sync=True)
```

type

```
Unicode("TetrahedronGeometry", allow_none=False).tag(sync=True)
```

```
detail = CInt(0)
    an int
```

```
radius = CFloat(1)
    a float
```

```
type = Unicode('TetrahedronGeometry')
    a unicode string
```

TextGeometry

class pythreejs.TextGeometry
TextGeometry

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/geometries/TextGeometry>

Inherits *BaseGeometry*.

Three.js docs: <https://threejs.org/docs/#api/geometries/TextGeometry>

type

```
Unicode("TextGeometry", allow_none=False).tag(sync=True)
```

type = **Unicode('TextGeometry')**
a unicode string

TorusBufferGeometry

class pythreejs.**TorusBufferGeometry**(*radius=1, tube=0.4, radialSegments=8, tubularSegments=6, arc=6.283185307179586*)

TorusBufferGeometry

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/geometries/TorusGeometry>

Inherits *BaseBufferGeometry*.

Three.js docs: <https://threejs.org/docs/#api/geometries/TorusGeometry>

radius

```
CFloat(1, allow_none=False).tag(sync=True)
```

tube

```
CFloat(0.4, allow_none=False).tag(sync=True)
```

radialSegments

```
CInt(8, allow_none=False).tag(sync=True)
```

tubularSegments

```
CInt(6, allow_none=False).tag(sync=True)
```

arc

```
CFloat(6.283185307179586, allow_none=False).tag(sync=True)
```

type

```
Unicode("TorusBufferGeometry", allow_none=False).tag(sync=True)
```

arc = **CFloat(6.283185307179586)**
a float


```

radialSegments = CInt(8)
    an int

radius = CFloat(1)
    a float

tube = CFloat(0.4)
    a float

tubularSegments = CInt(6)
    an int

type = Unicode('TorusBufferGeometry')
    a unicode string

```

TorusGeometry

```

class pythreejs.TorusGeometry(radius=1, tube=0.4, radialSegments=8, tubularSegments=6,
                               arc=6.283185307179586)

```

TorusGeometry

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/geometries/TorusGeometry>

Inherits *BaseGeometry*.

Three.js docs: <https://threejs.org/docs/#api/geometries/TorusGeometry>

radius

```
CFloat(1, allow_none=False).tag(sync=True)
```

tube

```
CFloat(0.4, allow_none=False).tag(sync=True)
```

radialSegments

```
CInt(8, allow_none=False).tag(sync=True)
```

tubularSegments

```
CInt(6, allow_none=False).tag(sync=True)
```

arc

```
CFloat(6.283185307179586, allow_none=False).tag(sync=True)
```

type

```
Unicode("TorusGeometry", allow_none=False).tag(sync=True)
```

```

arc = CFloat(6.283185307179586)
    a float

```

```
radialSegments = CInt(8)
    an int

radius = CFloat(1)
    a float

tube = CFloat(0.4)
    a float

tubularSegments = CInt(6)
    an int

type = Unicode('TorusGeometry')
    a unicode string
```

TorusKnotBufferGeometry

```
class pythreejs.TorusKnotBufferGeometry(radius=1, tube=0.4, tubularSegments=64, radialSegments=8, p=2, q=3)
```

TorusKnotBufferGeometry

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/geometries/TorusKnotGeometry>

Inherits *BaseBufferGeometry*.

Three.js docs: <https://threejs.org/docs/#api/geometries/TorusKnotGeometry>

radius

```
CFloat(1, allow_none=False).tag(sync=True)
```

tube

```
CFloat(0.4, allow_none=False).tag(sync=True)
```

tubularSegments

```
CInt(64, allow_none=False).tag(sync=True)
```

radialSegments

```
CInt(8, allow_none=False).tag(sync=True)
```

p

```
CInt(2, allow_none=False).tag(sync=True)
```

q

```
CInt(3, allow_none=False).tag(sync=True)
```

type

```
Unicode("TorusKnotBufferGeometry", allow_none=False).tag(sync=True)
```

```
p = CInt(2)
    an int

q = CInt(3)
    an int

radialSegments = CInt(8)
    an int

radius = CFloat(1)
    a float

tube = CFloat(0.4)
    a float

tubularSegments = CInt(64)
    an int

type = Unicode('TorusKnotBufferGeometry')
    a unicode string
```

TorusKnotGeometry

```
class pythreejs.TorusKnotGeometry(radius=1, tube=0.4, tubularSegments=64, radialSegments=8, p=2, q=3)
```

TorusKnotGeometry

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/geometries/TorusKnotGeometry>

Inherits *BaseGeometry*.

Three.js docs: <https://threejs.org/docs/#api/geometries/TorusKnotGeometry>

radius

```
CFloat(1, allow_none=False).tag(sync=True)
```

tube

```
CFloat(0.4, allow_none=False).tag(sync=True)
```

tubularSegments

```
CInt(64, allow_none=False).tag(sync=True)
```

radialSegments

```
CInt(8, allow_none=False).tag(sync=True)
```

p

```
CInt(2, allow_none=False).tag(sync=True)
```

q

```
CInt(3, allow_none=False).tag(sync=True)
```

type

```
Unicode("TorusKnotGeometry", allow_none=False).tag(sync=True)
```

p = CInt(2)

an int

q = CInt(3)

an int

radialSegments = CInt(8)

an int

radius = CFloat(1)

a float

tube = CFloat(0.4)

a float

tubularSegments = CInt(64)

an int

type = Unicode('TorusKnotGeometry')

a unicode string

TubeGeometry

class pythreejs.**TubeGeometry** (*path=None, segments=64, radius=1, radialSegments=8, close=False*)

TubeGeometry

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/geometries/TubeGeometry>

Inherits [BaseGeometry](#).

Three.js docs: <https://threejs.org/docs/#api/geometries/TubeGeometry>

path

```
Instance(Curve, allow_none=True).tag(sync=True, **widget_serialization)
```

segments

```
CInt(64, allow_none=False).tag(sync=True)
```

radius

```
CFloat(1, allow_none=False).tag(sync=True)
```

radiusSegments

```
CInt(8, allow_none=False).tag(sync=True)
```

close

```
Bool(False, allow_none=False).tag(sync=True)
```

type

```
Unicode("TubeGeometry", allow_none=False).tag(sync=True)
```

close = Bool(False)
a boolean

path = Instance()
a Curve or None

radius = CFloat(1)
a float

radiusSegments = CInt(8)
an int

segments = CInt(64)
an int

type = Unicode('TubeGeometry')
a unicode string

WireframeGeometry

class pythreejs.**WireframeGeometry** (*geometry=None*)
WireframeGeometry

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/geometries/WireframeGeometry>

Inherits *BaseGeometry*.

Three.js docs: <https://threejs.org/docs/#api/geometries/WireframeGeometry>

geometry

```
Union([
    Instance(BaseGeometry, allow_none=True),
    Instance(BaseBufferGeometry, allow_none=True)
]).tag(sync=True, **widget_serialization)
```

type

```
Unicode("WireframeGeometry", allow_none=False).tag(sync=True)
```

```
geometry = Union()
    a BaseGeometry or None or a BaseBufferGeometry or None

type = Unicode('WireframeGeometry')
    a unicode string
```

2.5.9 helpers

ArrowHelper

class pythreejs.ArrowHelper

ArrowHelper

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/helpers/ArrowHelper>

Inherits *Object3D*.

Three.js docs: <https://threejs.org/docs/#api/helpers/ArrowHelper>

dir

```
Vector3(default_value=[1, 0, 0]).tag(sync=True)
```

origin

```
Vector3(default_value=[0, 0, 0]).tag(sync=True)
```

length

```
CFloat(1, allow_none=False).tag(sync=True)
```

hex

```
CInt(0, allow_none=False).tag(sync=True)
```

headLength

```
CFloat(None, allow_none=True).tag(sync=True)
```

headWidth

```
CFloat(None, allow_none=True).tag(sync=True)
```

type

```
Unicode("ArrowHelper", allow_none=False).tag(sync=True)
```

```
dir = Vector3((0, 0, 0))
    a tuple of any type
```

```

headLength = CFloat(None)
    a float
headWidth = CFloat(None)
    a float
hex = CInt(0)
    an int
length = CFloat(1)
    a float
origin = Vector3((0, 0, 0))
    a tuple of any type
type = Unicode('ArrowHelper')
    a unicode string

```

AxesHelper

```

class pythreejs.AxesHelper (size=1)
    AxesHelper

    Autogenerated by generate-wrappers.js See https://threejs.org/docs/#api/helpers/AxesHelper
    Inherits Object3D.
    Three.js docs: https://threejs.org/docs/#api/helpers/AxesHelper

size

```

```
CFloat(1, allow_none=False).tag(sync=True)
```

type

```
Unicode("AxesHelper", allow_none=False).tag(sync=True)
```

```

size = CFloat(1)
    a float
type = Unicode('AxesHelper')
    a unicode string

```

Box3Helper

```

class pythreejs.Box3Helper (box=None, color="yellow")
    Box3Helper

    Autogenerated by generate-wrappers.js See https://threejs.org/docs/#api/helpers/PlaneHelper
    Inherits Object3D.
    Three.js docs: https://threejs.org/docs/#api/helpers/PlaneHelper

box

```

```
Instance(Box3, allow_none=True).tag(sync=True, **widget_serialization)
```

color

```
Color("yellow", allow_none=True).tag(sync=True)
```

type

```
Unicode("Box3Helper", allow_none=False).tag(sync=True)
```

box = Instance()

a Box3 or None

color = Color('yellow')

a valid HTML color

type = Unicode('Box3Helper')

a unicode string

BoxHelper

class pythreejs.BoxHelper(*object=None, color="#ffffff"*)

BoxHelper

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/helpers/BoxHelper>

Inherits *Object3D*.

Three.js docs: <https://threejs.org/docs/#api/helpers/BoxHelper>

object

```
Instance(Object3D, allow_none=True).tag(sync=True, **widget_serialization)
```

color

```
Color("#ffffff", allow_none=True).tag(sync=True)
```

type

```
Unicode("BoxHelper", allow_none=False).tag(sync=True)
```

color = Color('#ffffff')

a valid HTML color

object = Instance()

an Object3D or None

type = Unicode('BoxHelper')

a unicode string

CameraHelper

class pythreejs.CameraHelper (camera=None)
CameraHelper

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/helpers/CameraHelper>

Inherits *Object3D*.

Three.js docs: <https://threejs.org/docs/#api/helpers/CameraHelper>

camera

```
Instance(Camera, allow_none=True).tag(sync=True, **widget_serialization)
```

type

```
Unicode("CameraHelper", allow_none=False).tag(sync=True)
```

camera = Instance()

a Camera or None

type = Unicode('CameraHelper')

a unicode string

DirectionalLightHelper

class pythreejs.DirectionalLightHelper (light=None, size=1, color="#ffffff")
DirectionalLightHelper

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/helpers/DirectionalLightHelper>

Inherits *Object3D*.

Three.js docs: <https://threejs.org/docs/#api/helpers/DirectionalLightHelper>

light

```
Instance(DirectionalLight, allow_none=True).tag(sync=True, **widget_
↪serialization)
```

size

```
CFloat(1, allow_none=False).tag(sync=True)
```

color

```
Color("#ffffff", allow_none=True).tag(sync=True)
```

type

```
Unicode("DirectionalLightHelper", allow_none=False).tag(sync=True)
```

```
color = Color('#ffffff')
    a valid HTML color

light = Instance()
    a DirectionalLight or None

size = CFloat(1)
    a float

type = Unicode('DirectionalLightHelper')
    a unicode string
```

FaceNormalsHelper

class pythreejs.FaceNormalsHelper (*object=None, size=1, color="#ffff00", linewidth=1*)
FaceNormalsHelper

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/helpers/FaceNormalsHelper>

Inherits *Object3D*.

Three.js docs: <https://threejs.org/docs/#api/helpers/FaceNormalsHelper>

object

```
Instance(Object3D, allow_none=True).tag(sync=True, **widget_serialization)
```

size

```
CFloat(1, allow_none=False).tag(sync=True)
```

color

```
Color("#ffff00", allow_none=False).tag(sync=True)
```

linewidth

```
CFloat(1, allow_none=False).tag(sync=True)
```

type

```
Unicode("FaceNormalsHelper", allow_none=False).tag(sync=True)
```

```
color = Color('#ffff00')
    a valid HTML color
```

```
linewidth = CFloat(1)
    a float
```

```
object = Instance()
    an Object3D or None
```

```
size = CFloat(1)
    a float
```

type = `Unicode('FaceNormalsHelper')`
a unicode string

GridHelper

class `pythreejs.GridHelper` (*size=10, divisions=10, colorCenterLine="#444444", colorGrid="#888888"*)

GridHelper

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/helpers/GridHelper>

Inherits *Object3D*.

Three.js docs: <https://threejs.org/docs/#api/helpers/GridHelper>

size

```
CFloat(10, allow_none=False).tag(sync=True)
```

divisions

```
CInt(10, allow_none=False).tag(sync=True)
```

colorCenterLine

```
Color("#444444", allow_none=False).tag(sync=True)
```

colorGrid

```
Color("#888888", allow_none=False).tag(sync=True)
```

type

```
Unicode("GridHelper", allow_none=False).tag(sync=True)
```

colorCenterLine = `Color('#444444')`
a valid HTML color

colorGrid = `Color('#888888')`
a valid HTML color

divisions = `CInt(10)`
an int

size = `CFloat(10)`
a float

type = `Unicode('GridHelper')`
a unicode string

HemisphereLightHelper

class pythreejs.**HemisphereLightHelper** (*light=None, size=1, color="#ffffff"*)
HemisphereLightHelper

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/helpers/HemisphereLightHelper>

Inherits *Object3D*.

Three.js docs: <https://threejs.org/docs/#api/helpers/HemisphereLightHelper>

light

```
Instance(HemisphereLight, allow_none=True).tag(sync=True, **widget_  
↪serialization)
```

size

```
CFloat(1, allow_none=False).tag(sync=True)
```

color

```
Color("#ffffff", allow_none=True).tag(sync=True)
```

type

```
Unicode("HemisphereLightHelper", allow_none=False).tag(sync=True)
```

color = **Color**(' #ffffff ')
a valid HTML color

light = **Instance**()
a HemisphereLight or None

size = **CFloat**(1)
a float

type = **Unicode**(' HemisphereLightHelper ')
a unicode string

PlaneHelper

class pythreejs.**PlaneHelper** (*plane=None, size=1, color="yellow"*)
PlaneHelper

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/helpers/PlaneHelper>

Inherits *Object3D*.

Three.js docs: <https://threejs.org/docs/#api/helpers/PlaneHelper>

plane

```
Instance(Plane, allow_none=True).tag(sync=True, **widget_serialization)
```

size

```
CFloat(1, allow_none=False).tag(sync=True)
```

color

```
Color("yellow", allow_none=True).tag(sync=True)
```

type

```
Unicode("PlaneHelper", allow_none=False).tag(sync=True)
```

color = **Color**('yellow')
a valid HTML color

plane = **Instance**()
a Plane or None

size = **CFloat**(1)
a float

type = **Unicode**('PlaneHelper')
a unicode string

PointLightHelper

class pythreejs.**PointLightHelper** (*light=None, sphereSize=1, color="#ffffff"*)
PointLightHelper

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/helpers/PointLightHelper>

Inherits *Object3D*.

Three.js docs: <https://threejs.org/docs/#api/helpers/PointLightHelper>

light

```
Instance(PointLight, allow_none=True).tag(sync=True, **widget_serialization)
```

sphereSize

```
CFloat(1, allow_none=False).tag(sync=True)
```

color

```
Color("#ffffff", allow_none=True).tag(sync=True)
```

type

```
Unicode("PointLightHelper", allow_none=False).tag(sync=True)
```

```
color = Color('#ffffff')
    a valid HTML color

light = Instance()
    a PointLight or None

sphereSize = CFloat(1)
    a float

type = Unicode('PointLightHelper')
    a unicode string
```

PolarGridHelper

```
class pythreejs.PolarGridHelper(radius=10, radials=16, circles=8, divisions=64,
                                color1="#444444", color2="#888888")
```

PolarGridHelper

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/helpers/PolarGridHelper>

Inherits *Object3D*.

Three.js docs: <https://threejs.org/docs/#api/helpers/PolarGridHelper>

radius

```
CInt(10, allow_none=False).tag(sync=True)
```

radials

```
CInt(16, allow_none=False).tag(sync=True)
```

circles

```
CInt(8, allow_none=False).tag(sync=True)
```

divisions

```
CInt(64, allow_none=False).tag(sync=True)
```

color1

```
Color("#444444", allow_none=False).tag(sync=True)
```

color2

```
Color("#888888", allow_none=False).tag(sync=True)
```

type

```
Unicode("PolarGridHelper", allow_none=False).tag(sync=True)
```

```

circles = CInt(8)
    an int

color1 = Color('#444444')
    a valid HTML color

color2 = Color('#888888')
    a valid HTML color

divisions = CInt(64)
    an int

radials = CInt(16)
    an int

radius = CInt(10)
    an int

type = Unicode('PolarGridHelper')
    a unicode string

```

RectAreaLightHelper

```

class pythreejs.RectAreaLightHelper (light=None, color="#ffffff")
    RectAreaLightHelper

```

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/helpers/RectAreaLightHelper>

Inherits *Object3D*.

Three.js docs: <https://threejs.org/docs/#api/helpers/RectAreaLightHelper>

light

```

Instance(RectAreaLight, allow_none=True).tag(sync=True, **widget_
↪serialization)

```

color

```

Color("#ffffff", allow_none=True).tag(sync=True)

```

type

```

Unicode("RectAreaLightHelper", allow_none=False).tag(sync=True)

```

```

color = Color('#ffffff')
    a valid HTML color

```

```

light = Instance()
    a RectAreaLight or None

```

```

type = Unicode('RectAreaLightHelper')
    a unicode string

```

SkeletonHelper

class pythreejs.SkeletonHelper (*root=None*)
SkeletonHelper

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/helpers/SkeletonHelper>

Inherits *Object3D*.

Three.js docs: <https://threejs.org/docs/#api/helpers/SkeletonHelper>

root

```
Instance(Object3D, allow_none=True).tag(sync=True, **widget_serialization)
```

type

```
Unicode("SkeletonHelper", allow_none=False).tag(sync=True)
```

root = Instance()
an Object3D or None

type = Unicode('SkeletonHelper')
a unicode string

SpotLightHelper

class pythreejs.SpotLightHelper (*light=None, color="#ffffff"*)
SpotLightHelper

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/helpers/SpotLightHelper>

Inherits *Object3D*.

Three.js docs: <https://threejs.org/docs/#api/helpers/SpotLightHelper>

light

```
Instance(SpotLight, allow_none=True).tag(sync=True, **widget_serialization)
```

color

```
Color("#ffffff", allow_none=True).tag(sync=True)
```

type

```
Unicode("SpotLightHelper", allow_none=False).tag(sync=True)
```

color = Color('#ffffff')
a valid HTML color

light = Instance()
a SpotLight or None


```
type = Unicode('SpotLightHelper')
    a unicode string
```

VertexNormalsHelper

```
class pythreejs.VertexNormalsHelper (object=None, size=1, color="#ffff00", linewidth=1)
    VertexNormalsHelper
```

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/helpers/VertexNormalsHelper>

Inherits *Object3D*.

Three.js docs: <https://threejs.org/docs/#api/helpers/VertexNormalsHelper>

object

```
Instance(Object3D, allow_none=True).tag(sync=True, **widget_serialization)
```

size

```
CFloat(1, allow_none=False).tag(sync=True)
```

color

```
Color("#ffff00", allow_none=False).tag(sync=True)
```

linewidth

```
CFloat(1, allow_none=False).tag(sync=True)
```

type

```
Unicode("VertexNormalsHelper", allow_none=False).tag(sync=True)
```

```
color = Color('#ffff00')
    a valid HTML color
```

```
linewidth = CFloat(1)
    a float
```

```
object = Instance()
    an Object3D or None
```

```
size = CFloat(1)
    a float
```

```
type = Unicode('VertexNormalsHelper')
    a unicode string
```

2.5.10 lights

AmbientLight

class pythreejs.AmbientLight (color="#ffffff", intensity=1)
AmbientLight

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/lights/AmbientLight>

Inherits *Light*.

Three.js docs: <https://threejs.org/docs/#api/lights/AmbientLight>

type

```
Unicode("AmbientLight", allow_none=False).tag(sync=True)
```

type = Unicode('AmbientLight')
a unicode string

DirectionalLightShadow

class pythreejs.DirectionalLightShadow
DirectionalLightShadow

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/lights/DirectionalLightShadow>

Inherits *LightShadow*.

Three.js docs: <https://threejs.org/docs/#api/lights/DirectionalLightShadow>

DirectionalLight

class pythreejs.DirectionalLight (color="#ffffff", intensity=1)
DirectionalLight

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/lights/DirectionalLight>

Inherits *Light*.

Three.js docs: <https://threejs.org/docs/#api/lights/DirectionalLight>

target

```
Union([
    Instance(Uninitialized),
    Instance(Object3D),
], default_value=UninitializedSentinel, allow_none=False).tag(sync=True,
↳ **uninitialized_serialization)
```

shadow

```
Union([
    Instance(Uninitialized),
    Instance(LightShadow),
], default_value=UninitializedSentinel, allow_none=False).tag(sync=True,
↳ **uninitialized_serialization)
```

(continues on next page)

(continued from previous page)

type

```
Unicode("DirectionalLight", allow_none=False).tag(sync=True)
```

shadow = Union(<pythreejs.traits.Uninitialized object at 0x7f1534098eb8>
an Uninitialized or a LightShadow

target = Union(<pythreejs.traits.Uninitialized object at 0x7f1534098eb8>
an Uninitialized or an Object3D

type = Unicode('DirectionalLight')
a unicode string

HemisphereLight

class pythreejs.HemisphereLight (color="#ffffff", groundColor="#000000", intensity=1)
HemisphereLight

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/lights/HemisphereLight>

Inherits *Light*.

Three.js docs: <https://threejs.org/docs/#api/lights/HemisphereLight>

groundColor

```
Color("#000000", allow_none=False).tag(sync=True)
```

type

```
Unicode("HemisphereLight", allow_none=False).tag(sync=True)
```

groundColor = Color('#000000')
a valid HTML color

type = Unicode('HemisphereLight')
a unicode string

LightShadow

class pythreejs.LightShadow (camera=UninitializedSentinel)
LightShadow

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/lights/LightShadow>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/lights/LightShadow>

camera

```
Union([
    Instance(Uninitialized),
    Instance(Camera),
], default_value=UninitializedSentinel, allow_none=False).tag(sync=True,
↳**uninitialized_serialization)
```

bias

```
CFloat(0, allow_none=False).tag(sync=True)
```

mapSize

```
Vector2(default_value=[512, 512]).tag(sync=True)
```

radius

```
CFloat(1, allow_none=False).tag(sync=True)
```

bias = CFloat(0)

a float

camera = Union(<pythreejs.traits.Uninitialized object at 0x7f1534098eb8>)

an Uninitialized or a Camera

mapSize = Vector2((0, 0))

a tuple of any type

radius = CFloat(1)

a float

Light

class pythreejs.**Light** (*color="#ffffff", intensity=1*)

Light

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/lights/Light>

Inherits *Object3D*.

Three.js docs: <https://threejs.org/docs/#api/lights/Light>

color

```
Color("#ffffff", allow_none=False).tag(sync=True)
```

intensity

```
CFloat(1, allow_none=False).tag(sync=True)
```

type

```
Unicode("Light", allow_none=False).tag(sync=True)
```

color = **Color**('#ffffff')

a valid HTML color

intensity = **CFloat**(1)

a float

type = **Unicode**('Light')

a unicode string

PointLight

class pythreejs.**PointLight** (color="#ffffff", intensity=1, distance=0, decay=1)

PointLight

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/lights/PointLight>

Inherits *Light*.

Three.js docs: <https://threejs.org/docs/#api/lights/PointLight>

power

```
CFloat(12.566370614359172, allow_none=False).tag(sync=True)
```

distance

```
CFloat(0, allow_none=False).tag(sync=True)
```

decay

```
CFloat(1, allow_none=False).tag(sync=True)
```

shadow

```
Union([
    Instance(Uninitialized),
    Instance(LightShadow),
], default_value=UninitializedSentinel, allow_none=False).tag(sync=True,
↳ **uninitialized_serialization)
```

type

```
Unicode("PointLight", allow_none=False).tag(sync=True)
```

decay = **CFloat**(1)

a float

distance = **CFloat**(0)

a float

power = **CFloat**(12.566370614359172)

a float

```
shadow = Union(<pythreejs.traits.Uninitialized object at 0x7f1534098eb8>
               an Uninitialized or a LightShadow
type = Unicode('PointLight')
           a unicode string
```

RectAreaLight

```
class pythreejs.RectAreaLight (color="#ffffff", intensity=1, width=10, height=10)
    RectAreaLight
```

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/lights/RectAreaLight>

Inherits *Light*.

Three.js docs: <https://threejs.org/docs/#api/lights/RectAreaLight>

width

```
CFloat(10, allow_none=False).tag(sync=True)
```

height

```
CFloat(10, allow_none=False).tag(sync=True)
```

type

```
Unicode("RectAreaLight", allow_none=False).tag(sync=True)
```

```
height = CFloat(10)
           a float
```

```
type = Unicode('RectAreaLight')
           a unicode string
```

```
width = CFloat(10)
           a float
```

SpotLightShadow

```
class pythreejs.SpotLightShadow
    SpotLightShadow
```

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/lights/SpotLightShadow>

Inherits *LightShadow*.

Three.js docs: <https://threejs.org/docs/#api/lights/SpotLightShadow>

SpotLight

```
class pythreejs.SpotLight (color="#ffffff", intensity=1, distance=0, angle=1.0471975511965976,
                           penumbra=0, decay=1)
    SpotLight
```

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/lights/SpotLight>

Inherits *Light*.

Three.js docs: <https://threejs.org/docs/#api/lights/SpotLight>

target

```
Union([
  Instance(Uninitialized),
  Instance(Object3D),
], default_value=UninitializedSentinel, allow_none=False).tag(sync=True,
↳ **uninitialized_serialization)
```

distance

```
CFloat(0, allow_none=False).tag(sync=True)
```

angle

```
CFloat(1.0471975511965976, allow_none=False).tag(sync=True)
```

penumbra

```
CFloat(0, allow_none=False).tag(sync=True)
```

decay

```
CFloat(1, allow_none=False).tag(sync=True)
```

shadow

```
Union([
  Instance(Uninitialized),
  Instance(LightShadow),
], default_value=UninitializedSentinel, allow_none=False).tag(sync=True,
↳ **uninitialized_serialization)
```

type

```
Unicode("SpotLight", allow_none=False).tag(sync=True)
```

angle = **CFloat(1.0471975511965976)**
a float

decay = **CFloat(1)**
a float

distance = **CFloat(0)**
a float

penumbra = **CFloat(0)**
a float

```
shadow = Union(<pythreejs.traits.Uninitialized object at 0x7f1534098eb8>
               an Uninitialized or a LightShadow
target = Union(<pythreejs.traits.Uninitialized object at 0x7f1534098eb8>
               an Uninitialized or an Object3D
type = Unicode('SpotLight')
        a unicode string
```

2.5.11 loaders

AnimationLoader

```
class pythreejs.AnimationLoader
    AnimationLoader

    Autogenerated by generate-wrappers.js See https://threejs.org/docs/#api/loaders/AnimationLoader
    Inherits ThreeWidget.
    Three.js docs: https://threejs.org/docs/#api/loaders/AnimationLoader
```

AudioLoader

```
class pythreejs.AudioLoader
    AudioLoader

    Autogenerated by generate-wrappers.js See https://threejs.org/docs/#api/loaders/AudioLoader
    Inherits ThreeWidget.
    Three.js docs: https://threejs.org/docs/#api/loaders/AudioLoader
```

BufferGeometryLoader

```
class pythreejs.BufferGeometryLoader
    BufferGeometryLoader

    Autogenerated by generate-wrappers.js See https://threejs.org/docs/#api/loaders/BufferGeometryLoader
    Inherits ThreeWidget.
    Three.js docs: https://threejs.org/docs/#api/loaders/BufferGeometryLoader
```

Cache

```
class pythreejs.Cache
    Cache

    Autogenerated by generate-wrappers.js See https://threejs.org/docs/#api/loaders/Cache
    Inherits ThreeWidget.
    Three.js docs: https://threejs.org/docs/#api/loaders/Cache
```


CompressedTextureLoader

class pythreejs.**CompressedTextureLoader**
CompressedTextureLoader

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/loaders/CompressedTextureLoader>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/loaders/CompressedTextureLoader>

CubeTextureLoader

class pythreejs.**CubeTextureLoader**
CubeTextureLoader

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/loaders/CubeTextureLoader>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/loaders/CubeTextureLoader>

DataTextureLoader

class pythreejs.**DataTextureLoader**
DataTextureLoader

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/loaders/DataTextureLoader>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/loaders/DataTextureLoader>

FileLoader

class pythreejs.**FileLoader**
FileLoader

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/loaders/FileLoader>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/loaders/FileLoader>

FontLoader

class pythreejs.**FontLoader**
FontLoader

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/loaders/FontLoader>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/loaders/FontLoader>

ImageBitmapLoader

class pythreejs.**ImageBitmapLoader**
ImageBitmapLoader

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/loaders/ImageBitmapLoader>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/loaders/ImageBitmapLoader>

ImageLoader

class pythreejs.**ImageLoader**
ImageLoader

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/loaders/ImageLoader>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/loaders/ImageLoader>

JSONLoader

class pythreejs.**JSONLoader**
JSONLoader

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/loaders/JSONLoader>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/loaders/JSONLoader>

Loader

class pythreejs.**Loader**
Loader

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/loaders/Loader>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/loaders/Loader>

LoadingManager

class pythreejs.**LoadingManager**
LoadingManager

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/loaders>LoadingManager>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/loaders>LoadingManager>

MaterialLoader

class pythreejs.**MaterialLoader**
MaterialLoader

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/loaders/MaterialLoader>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/loaders/MaterialLoader>

ObjectLoader

class pythreejs.**ObjectLoader**
ObjectLoader

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/loaders/ObjectLoader>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/loaders/ObjectLoader>

TextureLoader

class pythreejs.**TextureLoader**
TextureLoader

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/loaders/TextureLoader>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/loaders/TextureLoader>

2.5.12 materials

LineBasicMaterial

class pythreejs.**LineBasicMaterial**
LineBasicMaterial

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/materials/LineBasicMaterial>

Inherits *Material*.

Three.js docs: <https://threejs.org/docs/#api/materials/LineBasicMaterial>

color

```
Color("#ffffff", allow_none=False).tag(sync=True)
```

lights

```
Bool(False, allow_none=False).tag(sync=True)
```

linewidth

```
CFloat(1, allow_none=False).tag(sync=True)
```

linecap

```
Unicode("round", allow_none=False).tag(sync=True)
```

linejoin

```
Unicode("round", allow_none=False).tag(sync=True)
```

type

```
Unicode("LineBasicMaterial", allow_none=False).tag(sync=True)
```

color = **Color**('#ffffff')
a valid HTML color

lights = **Bool**(False)
a boolean

linecap = **Unicode**('round')
a unicode string

linejoin = **Unicode**('round')
a unicode string

linewidth = **CFloat**(1)
a float

type = **Unicode**('LineBasicMaterial')
a unicode string

LineDashedMaterial

class pythreejs.**LineDashedMaterial**
LineDashedMaterial

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/materials/LineDashedMaterial>

Inherits *Material*.

Three.js docs: <https://threejs.org/docs/#api/materials/LineDashedMaterial>

color

```
Color("#ffffff", allow_none=False).tag(sync=True)
```

lights

```
Bool(False, allow_none=False).tag(sync=True)
```

linewidth

```
CFloat(1, allow_none=False).tag(sync=True)
```

scale

```
CFloat(1, allow_none=False).tag(sync=True)
```

dashSize

```
CFloat(3, allow_none=False).tag(sync=True)
```

gapSize

```
CFloat(1, allow_none=False).tag(sync=True)
```

type

```
Unicode("LineDashedMaterial", allow_none=False).tag(sync=True)
```

color = **Color**('ffffff')
a valid HTML color

dashSize = **CFloat**(3)
a float

gapSize = **CFloat**(1)
a float

lights = **Bool**(False)
a boolean

linewidth = **CFloat**(1)
a float

scale = **CFloat**(1)
a float

type = **Unicode**('LineDashedMaterial')
a unicode string

LineMaterial

class pythreejs.**LineMaterial**
LineMaterial

Autogenerated by generate-wrappers.js This class is a custom class for pythreejs, with no direct corresponding class in three.js.

Inherits *Material*.

Three.js docs: <https://threejs.org/docs/#api/materials/LineMaterial>

color

```
Color("#ffffff", allow_none=False).tag(sync=True)
```

fog

```
Bool(False, allow_none=False).tag(sync=True)
```

lights

```
Bool(False, allow_none=False).tag(sync=True)
```

linewidth

```
CFloat(1, allow_none=False).tag(sync=True)
```

dashScale

```
CFloat(1, allow_none=False).tag(sync=True)
```

dashSize

```
CFloat(1, allow_none=False).tag(sync=True)
```

gapSize

```
CFloat(1, allow_none=False).tag(sync=True)
```

type

```
Unicode("LineMaterial", allow_none=False).tag(sync=True)
```

color = **Color**(' #ffffff')
a valid HTML color

dashScale = **CFloat**(1)
a float

dashSize = **CFloat**(1)
a float

fog = **Bool**(False)
a boolean

gapSize = **CFloat**(1)
a float

lights = **Bool**(False)
a boolean

linewidth = **CFloat**(1)
a float

```
type = Unicode('LineMaterial')
a unicode string
```

Material

class pythreejs.**Material**

This widget has some manual overrides on the Python side.

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/materials/Material>

alphaTest

```
CFloat(0, allow_none=False).tag(sync=True)
```

blendDst

```
Enum(BlendFactors, "OneMinusSrcAlphaFactor", allow_none=False).tag(sync=True)
```

blendDstAlpha

```
CFloat(0, allow_none=False).tag(sync=True)
```

blending

```
Enum(BlendingMode, "NormalBlending", allow_none=False).tag(sync=True)
```

blendSrc

```
Enum(BlendFactors, "SrcAlphaFactor", allow_none=False).tag(sync=True)
```

blendSrcAlpha

```
CFloat(0, allow_none=False).tag(sync=True)
```

blendEquation

```
Enum(Equations, "AddEquation", allow_none=False).tag(sync=True)
```

blendEquationAlpha

```
CFloat(0, allow_none=False).tag(sync=True)
```

clipIntersection

```
Bool(False, allow_none=False).tag(sync=True)
```

clippingPlanes

```
Tuple().tag(sync=True, **widget_serialization)
```

clipShadows

```
Bool(False, allow_none=False).tag(sync=True)
```

colorWrite

```
Bool(True, allow_none=False).tag(sync=True)
```

defines

```
Dict(default_value=None, allow_none=True).tag(sync=True)
```

depthFunc

```
Enum(DepthMode, "LessEqualDepth", allow_none=False).tag(sync=True)
```

depthTest

```
Bool(True, allow_none=False).tag(sync=True)
```

depthWrite

```
Bool(True, allow_none=False).tag(sync=True)
```

dithering

```
Bool(False, allow_none=False).tag(sync=True)
```

flatShading

```
Bool(False, allow_none=False).tag(sync=True)
```

fog

```
Bool(True, allow_none=False).tag(sync=True)
```

lights

```
Bool(True, allow_none=False).tag(sync=True)
```

name


```
Unicode("", allow_none=False).tag(sync=True)
```

opacity

```
CFloat(1, allow_none=False).tag(sync=True)
```

overdraw

```
CFloat(0, allow_none=False).tag(sync=True)
```

polygonOffset

```
Bool(False, allow_none=False).tag(sync=True)
```

polygonOffsetFactor

```
CFloat(0, allow_none=False).tag(sync=True)
```

polygonOffsetUnits

```
CFloat(0, allow_none=False).tag(sync=True)
```

precision

```
Unicode(None, allow_none=True).tag(sync=True)
```

premultipliedAlpha

```
Bool(False, allow_none=False).tag(sync=True)
```

shadowSide

```
Enum(Side, None, allow_none=True).tag(sync=True)
```

side

```
Enum(Side, "FrontSide", allow_none=False).tag(sync=True)
```

transparent

```
Bool(False, allow_none=False).tag(sync=True)
```

type

```
Unicode("Material", allow_none=False).tag(sync=True)
```

vertexColors

```
Enum(Colors, "NoColors", allow_none=False).tag(sync=True)
```

visible

```
Bool(True, allow_none=False).tag(sync=True)
```

needsUpdate = **Bool(False)**

a boolean

onNeedsUpdate**MeshBasicMaterial**

class pythreejs.**MeshBasicMaterial**

MeshBasicMaterial

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/materials/MeshBasicMaterial>

Inherits *Material*.

Three.js docs: <https://threejs.org/docs/#api/materials/MeshBasicMaterial>

alphaMap

```
Instance(Texture, allow_none=True).tag(sync=True, **widget_serialization)
```

aoMap

```
Instance(Texture, allow_none=True).tag(sync=True, **widget_serialization)
```

aoMapIntensity

```
CFloat(1, allow_none=False).tag(sync=True)
```

color

```
Color("#ffffff", allow_none=False).tag(sync=True)
```

combine

```
Enum(Operations, "MultiplyOperation", allow_none=False).tag(sync=True)
```

envMap

```
Instance(CubeTexture, allow_none=True).tag(sync=True, **widget_serialization)
```

lightMap

```
Instance(Texture, allow_none=True).tag(sync=True, **widget_serialization)
```

lightMapIntensity

```
CFloat(1, allow_none=False).tag(sync=True)
```

lights

```
Bool(False, allow_none=False).tag(sync=True)
```

map

```
Instance(Texture, allow_none=True).tag(sync=True, **widget_serialization)
```

morphTargets

```
Bool(False, allow_none=False).tag(sync=True)
```

reflectivity

```
CFloat(1, allow_none=False).tag(sync=True)
```

refractionRatio

```
CFloat(0.98, allow_none=False).tag(sync=True)
```

skinning

```
Bool(False, allow_none=False).tag(sync=True)
```

specularMap

```
Instance(Texture, allow_none=True).tag(sync=True, **widget_serialization)
```

wireframe

```
Bool(False, allow_none=False).tag(sync=True)
```

wireframeLinewidth

```
CFloat(1, allow_none=False).tag(sync=True)
```

wireframeLinecap

```
Unicode("round", allow_none=False).tag(sync=True)
```

wireframeLinejoin

```
Unicode("round", allow_none=False).tag(sync=True)
```

type

```
Unicode("MeshBasicMaterial", allow_none=False).tag(sync=True)
```

alphaMap = Instance()

a Texture or None

aoMap = Instance()

a Texture or None

aoMapIntensity = CFloat(1)

a float

color = Color('#ffffff')

a valid HTML color

combine = Enum('MultiplyOperation')

any of ['AddOperation', 'MixOperation', 'MultiplyOperation']

envMap = Instance()

a CubeTexture or None

lightMap = Instance()

a Texture or None

lightMapIntensity = CFloat(1)

a float

lights = Bool(False)

a boolean

map = Instance()

a Texture or None

morphTargets = Bool(False)

a boolean

reflectivity = CFloat(1)

a float

refractionRatio = CFloat(0.98)

a float

skinning = Bool(False)

a boolean

specularMap = Instance()

a Texture or None

```

type = Unicode('MeshBasicMaterial')
    a unicode string

wireframe = Bool(False)
    a boolean

wireframeLinecap = Unicode('round')
    a unicode string

wireframeLinejoin = Unicode('round')
    a unicode string

wireframeLinewidth = CFloat(1)
    a float

```

MeshDepthMaterial

class pythreejs.MeshDepthMaterial

MeshDepthMaterial

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/materials/MeshDepthMaterial>

Inherits *Material*.

Three.js docs: <https://threejs.org/docs/#api/materials/MeshDepthMaterial>

alphaMap

```
Instance(Texture, allow_none=True).tag(sync=True, **widget_serialization)
```

displacementMap

```
Instance(Texture, allow_none=True).tag(sync=True, **widget_serialization)
```

displacementScale

```
CFloat(1, allow_none=False).tag(sync=True)
```

displacementBias

```
CFloat(0, allow_none=False).tag(sync=True)
```

fog

```
Bool(False, allow_none=False).tag(sync=True)
```

lights

```
Bool(False, allow_none=False).tag(sync=True)
```

map

```
Instance(Texture, allow_none=True).tag(sync=True, **widget_serialization)
```

morphTargets

```
Bool(False, allow_none=False).tag(sync=True)
```

skinning

```
Bool(False, allow_none=False).tag(sync=True)
```

wireframe

```
Bool(False, allow_none=False).tag(sync=True)
```

wireframeLinewidth

```
CFloat(1, allow_none=False).tag(sync=True)
```

type

```
Unicode("MeshDepthMaterial", allow_none=False).tag(sync=True)
```

alphaMap = Instance()
a Texture or None

displacementBias = CFloat(0)
a float

displacementMap = Instance()
a Texture or None

displacementScale = CFloat(1)
a float

fog = Bool(False)
a boolean

lights = Bool(False)
a boolean

map = Instance()
a Texture or None

morphTargets = Bool(False)
a boolean

skinning = Bool(False)
a boolean

type = Unicode('MeshDepthMaterial')
a unicode string

wireframe = Bool(False)
a boolean

wireframeLinewidth = CFloat(1)
a float

MeshLambertMaterial

class pythreejs.MeshLambertMaterial
MeshLambertMaterial

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/materials/MeshLambertMaterial>

Inherits *Material*.

Three.js docs: <https://threejs.org/docs/#api/materials/MeshLambertMaterial>

alphaMap

```
Instance(Texture, allow_none=True).tag(sync=True, **widget_serialization)
```

aoMap

```
Instance(Texture, allow_none=True).tag(sync=True, **widget_serialization)
```

aoMapIntensity

```
CFloat(1, allow_none=False).tag(sync=True)
```

color

```
Color("#ffffff", allow_none=False).tag(sync=True)
```

combine

```
Enum(Operations, "MultiplyOperation", allow_none=False).tag(sync=True)
```

emissive

```
Color("#000000", allow_none=False).tag(sync=True)
```

emissiveMap

```
Instance(Texture, allow_none=True).tag(sync=True, **widget_serialization)
```

emissiveIntensity

```
CFloat(1, allow_none=False).tag(sync=True)
```

envMap

```
Instance(CubeTexture, allow_none=True).tag(sync=True, **widget_serialization)
```

lightMap

```
Instance(Texture, allow_none=True).tag(sync=True, **widget_serialization)
```

lightMapIntensity

```
CFloat(1, allow_none=False).tag(sync=True)
```

map

```
Instance(Texture, allow_none=True).tag(sync=True, **widget_serialization)
```

morphNormals

```
Bool(False, allow_none=False).tag(sync=True)
```

morphTargets

```
Bool(False, allow_none=False).tag(sync=True)
```

reflectivity

```
CFloat(1, allow_none=False).tag(sync=True)
```

refractionRatio

```
CFloat(0.98, allow_none=False).tag(sync=True)
```

skinning

```
Bool(False, allow_none=False).tag(sync=True)
```

specularMap

```
Instance(Texture, allow_none=True).tag(sync=True, **widget_serialization)
```

wireframe

```
Bool(False, allow_none=False).tag(sync=True)
```

wireframeLinecap


```
Unicode("round", allow_none=False).tag(sync=True)
```

wireframeLinejoin

```
Unicode("round", allow_none=False).tag(sync=True)
```

wireframeLinewidth

```
CFloat(1, allow_none=False).tag(sync=True)
```

type

```
Unicode("MeshLambertMaterial", allow_none=False).tag(sync=True)
```

alphaMap = Instance()

a Texture or None

aoMap = Instance()

a Texture or None

aoMapIntensity = CFloat(1)

a float

color = Color('#ffffff')

a valid HTML color

combine = Enum('MultiplyOperation')

any of ['AddOperation', 'MixOperation', 'MultiplyOperation']

emissive = Color('#000000')

a valid HTML color

emissiveIntensity = CFloat(1)

a float

emissiveMap = Instance()

a Texture or None

envMap = Instance()

a CubeTexture or None

lightMap = Instance()

a Texture or None

lightMapIntensity = CFloat(1)

a float

map = Instance()

a Texture or None

morphNormals = Bool(False)

a boolean

morphTargets = Bool(False)

a boolean

reflectivity = CFloat(1)

a float

```
refractionRatio = CFloat(0.98)
    a float

skinning = Bool(False)
    a boolean

specularMap = Instance()
    a Texture or None

type = Unicode('MeshLambertMaterial')
    a unicode string

wireframe = Bool(False)
    a boolean

wireframeLinecap = Unicode('round')
    a unicode string

wireframeLinejoin = Unicode('round')
    a unicode string

wireframeLinewidth = CFloat(1)
    a float
```

MeshMatcapMaterial

```
class pythreejs.MeshMatcapMaterial
    MeshMatcapMaterial
```

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/materials/MeshMatcapMaterial>

Inherits *Material*.

Three.js docs: <https://threejs.org/docs/#api/materials/MeshMatcapMaterial>

alphaMap

```
Instance(Texture, allow_none=True).tag(sync=True, **widget_serialization)
```

bumpMap

```
Instance(Texture, allow_none=True).tag(sync=True, **widget_serialization)
```

bumpScale

```
CFloat(1, allow_none=False).tag(sync=True)
```

color

```
Color("#ffffff", allow_none=False).tag(sync=True)
```

displacementMap

```
Instance(Texture, allow_none=True).tag(sync=True, **widget_serialization)
```

displacementScale

```
CFloat(1, allow_none=False).tag(sync=True)
```

displacementBias

```
CFloat(0, allow_none=False).tag(sync=True)
```

lights

```
Bool(False, allow_none=False).tag(sync=True)
```

map

```
Instance(Texture, allow_none=True).tag(sync=True, **widget_serialization)
```

matcap

```
Instance(Texture, allow_none=True).tag(sync=True, **widget_serialization)
```

morphNormals

```
Bool(False, allow_none=False).tag(sync=True)
```

morphTargets

```
Bool(False, allow_none=False).tag(sync=True)
```

normalMap

```
Instance(Texture, allow_none=True).tag(sync=True, **widget_serialization)
```

normalScale

```
Vector2(default_value=[1, 1]).tag(sync=True)
```

skinning

```
Bool(False, allow_none=False).tag(sync=True)
```

type

```
Unicode("MeshMatcapMaterial", allow_none=False).tag(sync=True)
```

alphaMap = Instance()
a Texture or None

```
bumpMap = Instance()  
    a Texture or None  
bumpScale = CFloat(1)  
    a float  
color = Color('#ffffff')  
    a valid HTML color  
displacementBias = CFloat(0)  
    a float  
displacementMap = Instance()  
    a Texture or None  
displacementScale = CFloat(1)  
    a float  
lights = Bool(False)  
    a boolean  
map = Instance()  
    a Texture or None  
matcap = Instance()  
    a Texture or None  
morphNormals = Bool(False)  
    a boolean  
morphTargets = Bool(False)  
    a boolean  
normalMap = Instance()  
    a Texture or None  
normalScale = Vector2((0, 0))  
    a tuple of any type  
skinning = Bool(False)  
    a boolean  
type = Unicode('MeshMatcapMaterial')  
    a unicode string
```

MeshNormalMaterial

```
class pythreejs.MeshNormalMaterial  
    MeshNormalMaterial
```

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/materials/MeshNormalMaterial>

Inherits *Material*.

Three.js docs: <https://threejs.org/docs/#api/materials/MeshNormalMaterial>

fog

```
Bool(False, allow_none=False).tag(sync=True)
```

lights

```
Bool(False, allow_none=False).tag(sync=True)
```

morphTargets

```
Bool(False, allow_none=False).tag(sync=True)
```

wireframe

```
Bool(False, allow_none=False).tag(sync=True)
```

wireframeLinewidth

```
CFloat(1, allow_none=False).tag(sync=True)
```

type

```
Unicode("MeshNormalMaterial", allow_none=False).tag(sync=True)
```

fog = Bool(False)
a boolean

lights = Bool(False)
a boolean

morphTargets = Bool(False)
a boolean

type = Unicode('MeshNormalMaterial')
a unicode string

wireframe = Bool(False)
a boolean

wireframeLinewidth = CFloat(1)
a float

MeshPhongMaterial

class pythreejs.**MeshPhongMaterial**
MeshPhongMaterial

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/materials/MeshPhongMaterial>

Inherits *Material*.

Three.js docs: <https://threejs.org/docs/#api/materials/MeshPhongMaterial>

alphaMap

```
Instance(Texture, allow_none=True).tag(sync=True, **widget_serialization)
```

aoMap

```
Instance(Texture, allow_none=True).tag(sync=True, **widget_serialization)
```

aoMapIntensity

```
CFloat(1, allow_none=False).tag(sync=True)
```

bumpMap

```
Instance(Texture, allow_none=True).tag(sync=True, **widget_serialization)
```

bumpScale

```
CFloat(1, allow_none=False).tag(sync=True)
```

color

```
Color("#ffffff", allow_none=False).tag(sync=True)
```

combine

```
Enum(Operations, "MultiplyOperation", allow_none=False).tag(sync=True)
```

displacementMap

```
Instance(Texture, allow_none=True).tag(sync=True, **widget_serialization)
```

displacementScale

```
CFloat(1, allow_none=False).tag(sync=True)
```

displacementBias

```
CFloat(0, allow_none=False).tag(sync=True)
```

emissive

```
Color("#000000", allow_none=False).tag(sync=True)
```

emissiveMap

```
Instance(Texture, allow_none=True).tag(sync=True, **widget_serialization)
```

emissiveIntensity

```
CFloat(1, allow_none=False).tag(sync=True)
```

envMap

```
Instance(CubeTexture, allow_none=True).tag(sync=True, **widget_serialization)
```

lightMap

```
Instance(Texture, allow_none=True).tag(sync=True, **widget_serialization)
```

lightMapIntensity

```
CFloat(1, allow_none=False).tag(sync=True)
```

map

```
Instance(Texture, allow_none=True).tag(sync=True, **widget_serialization)
```

morphNormals

```
Bool(False, allow_none=False).tag(sync=True)
```

morphTargets

```
Bool(False, allow_none=False).tag(sync=True)
```

normalMap

```
Instance(Texture, allow_none=True).tag(sync=True, **widget_serialization)
```

normalScale

```
Vector2(default_value=[1, 1]).tag(sync=True)
```

reflectivity

```
CFloat(1, allow_none=False).tag(sync=True)
```

refractionRatio

```
CFloat(0.98, allow_none=False).tag(sync=True)
```

shininess

```
CFloat(30, allow_none=False).tag(sync=True)
```

skinning

```
Bool(False, allow_none=False).tag(sync=True)
```

specular

```
Color("#111111", allow_none=False).tag(sync=True)
```

specularMap

```
Instance(Texture, allow_none=True).tag(sync=True, **widget_serialization)
```

wireframe

```
Bool(False, allow_none=False).tag(sync=True)
```

wireframeLinewidth

```
CFloat(1, allow_none=False).tag(sync=True)
```

wireframeLinecap

```
Unicode("round", allow_none=False).tag(sync=True)
```

wireframeLinejoin

```
Unicode("round", allow_none=False).tag(sync=True)
```

type

```
Unicode("MeshPhongMaterial", allow_none=False).tag(sync=True)
```

alphaMap = Instance()

a Texture or None

aoMap = Instance()

a Texture or None

aoMapIntensity = CFloat(1)

a float

bumpMap = Instance()

a Texture or None

bumpScale = CFloat(1)

a float


```
color = Color('#ffffff')
    a valid HTML color

combine = Enum('MultiplyOperation')
    any of ['AddOperation', 'MixOperation', 'MultiplyOperation']

displacementBias = CFloat(0)
    a float

displacementMap = Instance()
    a Texture or None

displacementScale = CFloat(1)
    a float

emissive = Color('#000000')
    a valid HTML color

emissiveIntensity = CFloat(1)
    a float

emissiveMap = Instance()
    a Texture or None

envMap = Instance()
    a CubeTexture or None

lightMap = Instance()
    a Texture or None

lightMapIntensity = CFloat(1)
    a float

map = Instance()
    a Texture or None

morphNormals = Bool(False)
    a boolean

morphTargets = Bool(False)
    a boolean

normalMap = Instance()
    a Texture or None

normalScale = Vector2((0, 0))
    a tuple of any type

reflectivity = CFloat(1)
    a float

refractionRatio = CFloat(0.98)
    a float

shininess = CFloat(30)
    a float

skinning = Bool(False)
    a boolean

specular = Color('#111111')
    a valid HTML color
```

```
specularMap = Instance()  
    a Texture or None  
  
type = Unicode('MeshPhongMaterial')  
    a unicode string  
  
wireframe = Bool(False)  
    a boolean  
  
wireframeLinecap = Unicode('round')  
    a unicode string  
  
wireframeLinejoin = Unicode('round')  
    a unicode string  
  
wireframeLinewidth = CFloat(1)  
    a float
```

MeshPhysicalMaterial

```
class pythreejs.MeshPhysicalMaterial  
    MeshPhysicalMaterial
```

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/materials/MeshPhysicalMaterial>

Inherits *MeshStandardMaterial*.

Three.js docs: <https://threejs.org/docs/#api/materials/MeshPhysicalMaterial>

clearCoat

```
CFloat(0, allow_none=False).tag(sync=True)
```

clearCoatRoughness

```
CFloat(0, allow_none=False).tag(sync=True)
```

defines

```
Dict(default_value={"PHYSICAL":""}, allow_none=True).tag(sync=True)
```

reflectivity

```
CFloat(0.5, allow_none=False).tag(sync=True)
```

type

```
Unicode("MeshPhysicalMaterial", allow_none=False).tag(sync=True)
```

```
clearCoat = CFloat(0)  
    a float
```

```
clearCoatRoughness = CFloat(0)  
    a float
```

defines = Dict()
 a dict or None with elements of any type

reflectivity = CFloat(0.5)
 a float

type = Unicode('MeshPhysicalMaterial')
 a unicode string

MeshStandardMaterial

class pythreejs.MeshStandardMaterial
 MeshStandardMaterial

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/materials/MeshStandardMaterial>

Inherits *Material*.

Three.js docs: <https://threejs.org/docs/#api/materials/MeshStandardMaterial>

alphaMap

```
Instance(Texture, allow_none=True).tag(sync=True, **widget_serialization)
```

aoMap

```
Instance(Texture, allow_none=True).tag(sync=True, **widget_serialization)
```

aoMapIntensity

```
CFloat(1, allow_none=False).tag(sync=True)
```

bumpMap

```
Instance(Texture, allow_none=True).tag(sync=True, **widget_serialization)
```

bumpScale

```
CFloat(1, allow_none=False).tag(sync=True)
```

color

```
Color("#ffffff", allow_none=False).tag(sync=True)
```

defines

```
Dict(default_value={"STANDARD":""}, allow_none=True).tag(sync=True)
```

displacementMap

```
Instance(Texture, allow_none=True).tag(sync=True, **widget_serialization)
```

displacementScale

```
CFloat(1, allow_none=False).tag(sync=True)
```

displacementBias

```
CFloat(0, allow_none=False).tag(sync=True)
```

emissive

```
Color("#000000", allow_none=False).tag(sync=True)
```

emissiveMap

```
Instance(Texture, allow_none=True).tag(sync=True, **widget_serialization)
```

emissiveIntensity

```
CFloat(1, allow_none=False).tag(sync=True)
```

envMap

```
Instance(CubeTexture, allow_none=True).tag(sync=True, **widget_serialization)
```

envMapIntensity

```
CFloat(1, allow_none=False).tag(sync=True)
```

lightMap

```
Instance(Texture, allow_none=True).tag(sync=True, **widget_serialization)
```

lightMapIntensity

```
CFloat(1, allow_none=False).tag(sync=True)
```

map

```
Instance(Texture, allow_none=True).tag(sync=True, **widget_serialization)
```

metalness

```
CFloat(0.5, allow_none=False).tag(sync=True)
```

metalnessMap

```
Instance(Texture, allow_none=True).tag(sync=True, **widget_serialization)
```

morphTargets

```
Bool(False, allow_none=False).tag(sync=True)
```

morphNormals

```
Bool(False, allow_none=False).tag(sync=True)
```

normalMap

```
Instance(Texture, allow_none=True).tag(sync=True, **widget_serialization)
```

normalScale

```
Vector2(default_value=[1, 1]).tag(sync=True)
```

refractionRatio

```
CFloat(0.98, allow_none=False).tag(sync=True)
```

roughness

```
CFloat(0.5, allow_none=False).tag(sync=True)
```

roughnessMap

```
Instance(Texture, allow_none=True).tag(sync=True, **widget_serialization)
```

skinning

```
Bool(False, allow_none=False).tag(sync=True)
```

wireframe

```
Bool(False, allow_none=False).tag(sync=True)
```

wireframeLinecap

```
Unicode("round", allow_none=False).tag(sync=True)
```

wireframeLinejoin

```
Unicode("round", allow_none=False).tag(sync=True)
```

wireframeLinewidth

```
CFloat(1, allow_none=False).tag(sync=True)
```

type

```
Unicode("MeshStandardMaterial", allow_none=False).tag(sync=True)
```

alphaMap = Instance()

a Texture or None

aoMap = Instance()

a Texture or None

aoMapIntensity = CFloat(1)

a float

bumpMap = Instance()

a Texture or None

bumpScale = CFloat(1)

a float

color = Color('#ffffff')

a valid HTML color

defines = Dict()

a dict or None with elements of any type

displacementBias = CFloat(0)

a float

displacementMap = Instance()

a Texture or None

displacementScale = CFloat(1)

a float

emissive = Color('#000000')

a valid HTML color

emissiveIntensity = CFloat(1)

a float

emissiveMap = Instance()

a Texture or None

envMap = Instance()

a CubeTexture or None

envMapIntensity = CFloat(1)

a float

```

lightMap = Instance()
    a Texture or None

lightMapIntensity = CFloat(1)
    a float

map = Instance()
    a Texture or None

metalness = CFloat(0.5)
    a float

metalnessMap = Instance()
    a Texture or None

morphNormals = Bool(False)
    a boolean

morphTargets = Bool(False)
    a boolean

normalMap = Instance()
    a Texture or None

normalScale = Vector2((0, 0))
    a tuple of any type

refractionRatio = CFloat(0.98)
    a float

roughness = CFloat(0.5)
    a float

roughnessMap = Instance()
    a Texture or None

skinning = Bool(False)
    a boolean

type = Unicode('MeshStandardMaterial')
    a unicode string

wireframe = Bool(False)
    a boolean

wireframeLinecap = Unicode('round')
    a unicode string

wireframeLinejoin = Unicode('round')
    a unicode string

wireframeLinewidth = CFloat(1)
    a float

```

MeshToonMaterial

```

class pythreejs.MeshToonMaterial
    MeshToonMaterial

```

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/materials/MeshToonMaterial>

Inherits *MeshPhongMaterial*.

Three.js docs: <https://threejs.org/docs/#api/materials/MeshToonMaterial>

gradientMap

```
Instance(Texture, allow_none=True).tag(sync=True, **widget_serialization)
```

type

```
Unicode("MeshToonMaterial", allow_none=False).tag(sync=True)
```

gradientMap = Instance()

a Texture or None

type = Unicode('MeshToonMaterial')

a unicode string

PointsMaterial

class pythreejs.PointsMaterial

PointsMaterial

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/materials/PointsMaterial>

Inherits *Material*.

Three.js docs: <https://threejs.org/docs/#api/materials/PointsMaterial>

color

```
Color("#ffffff", allow_none=False).tag(sync=True)
```

lights

```
Bool(False, allow_none=False).tag(sync=True)
```

map

```
Instance(Texture, allow_none=True).tag(sync=True, **widget_serialization)
```

morphTargets

```
Bool(False, allow_none=False).tag(sync=True)
```

size

```
CFloat(1, allow_none=False).tag(sync=True)
```

sizeAttenuation


```
Bool(True, allow_none=False).tag(sync=True)
```

type

```
Unicode("PointsMaterial", allow_none=False).tag(sync=True)
```

color = Color('#ffffff')
a valid HTML color

lights = Bool(False)
a boolean

map = Instance()
a Texture or None

morphTargets = Bool(False)
a boolean

size = CFloat(1)
a float

sizeAttenuation = Bool(True)
a boolean

type = Unicode('PointsMaterial')
a unicode string

RawShaderMaterial

class pythreejs.RawShaderMaterial
RawShaderMaterial

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/materials/RawShaderMaterial>

Inherits *ShaderMaterial*.

Three.js docs: <https://threejs.org/docs/#api/materials/RawShaderMaterial>

type

```
Unicode("RawShaderMaterial", allow_none=False).tag(sync=True)
```

type = Unicode('RawShaderMaterial')
a unicode string

ShaderMaterial

class pythreejs.ShaderMaterial
ShaderMaterial

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/materials/ShaderMaterial>

Inherits *Material*.

Three.js docs: <https://threejs.org/docs/#api/materials/ShaderMaterial>

uniforms

```
Dict(default_value={}, trait=Uniform(allow_none=True), allow_none=False).  
↪tag(sync=True, **uniforms_serialization)
```

clipping

```
Bool(False, allow_none=False).tag(sync=True)
```

extensions

```
Dict(default_value={}, allow_none=False).tag(sync=True)
```

fog

```
Bool(False, allow_none=False).tag(sync=True)
```

fragmentShader

```
Unicode("", allow_none=False).tag(sync=True)
```

lights

```
Bool(False, allow_none=False).tag(sync=True)
```

linewidth

```
CFloat(1, allow_none=False).tag(sync=True)
```

morphNormals

```
Bool(False, allow_none=False).tag(sync=True)
```

morphTargets

```
Bool(False, allow_none=False).tag(sync=True)
```

flatShading

```
Bool(False, allow_none=False).tag(sync=True)
```

skinning

```
Bool(False, allow_none=False).tag(sync=True)
```

uniformsNeedUpdate

```
Bool(False, allow_none=False).tag(sync=True)
```

vertexShader

```
Unicode("", allow_none=False).tag(sync=True)
```

wireframe

```
Bool(False, allow_none=False).tag(sync=True)
```

wireframeLinewidth

```
CFloat(1, allow_none=False).tag(sync=True)
```

type

```
Unicode("ShaderMaterial", allow_none=False).tag(sync=True)
```

clipping = Bool(False)

a boolean

extensions = Dict()

a dict with elements of any type

flatShading = Bool(False)

a boolean

fog = Bool(False)

a boolean

fragmentShader = Unicode('')

a unicode string

lights = Bool(False)

a boolean

linewidth = CFloat(1)

a float

morphNormals = Bool(False)

a boolean

morphTargets = Bool(False)

a boolean

skinning = Bool(False)

a boolean

type = Unicode('ShaderMaterial')

a unicode string

uniforms = Dict()

a dict with elements with values that are: a dict or None

uniformsNeedUpdate = Bool(False)

a boolean

```
vertexShader = Unicode('')
    a unicode string

wireframe = Bool(False)
    a boolean

wireframeLinewidth = CFloat(1)
    a float
```

ShadowMaterial

```
class pythreejs.ShadowMaterial
    ShadowMaterial
```

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/materials/ShadowMaterial>

Inherits *ShaderMaterial*.

Three.js docs: <https://threejs.org/docs/#api/materials/ShadowMaterial>

lights

```
Bool(True, allow_none=False).tag(sync=True)
```

transparent

```
Bool(True, allow_none=False).tag(sync=True)
```

type

```
Unicode("ShadowMaterial", allow_none=False).tag(sync=True)
```

```
lights = Bool(True)
    a boolean
```

```
transparent = Bool(True)
    a boolean
```

```
type = Unicode('ShadowMaterial')
    a unicode string
```

SpriteMaterial

```
class pythreejs.SpriteMaterial
    SpriteMaterial
```

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/materials/SpriteMaterial>

Inherits *Material*.

Three.js docs: <https://threejs.org/docs/#api/materials/SpriteMaterial>

color

```
Color("#ffffff", allow_none=False).tag(sync=True)
```

fog

```
Bool(False, allow_none=False).tag(sync=True)
```

lights

```
Bool(False, allow_none=False).tag(sync=True)
```

map

```
Instance(Texture, allow_none=True).tag(sync=True, **widget_serialization)
```

rotation

```
CFloat(0, allow_none=False).tag(sync=True)
```

sizeAttenuation

```
Bool(True, allow_none=False).tag(sync=True)
```

type

```
Unicode("SpriteMaterial", allow_none=False).tag(sync=True)
```

color = Color('#ffffff')

a valid HTML color

fog = Bool(False)

a boolean

lights = Bool(False)

a boolean

map = Instance()

a Texture or None

rotation = CFloat(0)

a float

sizeAttenuation = Bool(True)

a boolean

type = Unicode('SpriteMaterial')

a unicode string

2.5.13 math

interpolants

CubicInterpolant

class pythreejs.CubicInterpolant
CubicInterpolant

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/math/interpolants/CubicInterpolant>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/math/interpolants/CubicInterpolant>

DiscreteInterpolant

class pythreejs.DiscreteInterpolant
DiscreteInterpolant

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/math/interpolants/DiscreteInterpolant>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/math/interpolants/DiscreteInterpolant>

LinearInterpolant

class pythreejs.LinearInterpolant
LinearInterpolant

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/math/interpolants/LinearInterpolant>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/math/interpolants/LinearInterpolant>

QuaternionLinearInterpolant

class pythreejs.QuaternionLinearInterpolant
QuaternionLinearInterpolant

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/math/interpolants/QuaternionLinearInterpolant>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/math/interpolants/QuaternionLinearInterpolant>

Box2

class pythreejs.Box2 (min=[0, 0], max=[0, 0],)
Box2

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/math/Box2>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/math/Box2>

min

```
Vector2 (default_value=[0, 0]) .tag(sync=True)
```

max

```
Vector2 (default_value=[0, 0]) .tag(sync=True)
```

max = **Vector2**((0, 0))

a tuple of any type

min = **Vector2**((0, 0))

a tuple of any type

Box3

class pythreejs.**Box3** (min=[0, 0, 0], max=[0, 0, 0],)

Box3

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/math/Box3>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/math/Box3>

min

```
Vector3 (default_value=[0, 0, 0]) .tag(sync=True)
```

max

```
Vector3 (default_value=[0, 0, 0]) .tag(sync=True)
```

max = **Vector3**((0, 0, 0))

a tuple of any type

min = **Vector3**((0, 0, 0))

a tuple of any type

Cylindrical

class pythreejs.**Cylindrical** (radius=1, theta=0, y=0)

Cylindrical

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/math/Cylindrical>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/math/Cylindrical>

radius

```
CFloat(1, allow_none=False).tag(sync=True)
```

theta

```
CFloat(0, allow_none=False).tag(sync=True)
```

y

```
CFloat(0, allow_none=False).tag(sync=True)
```

radius = CFloat(1)
a float

theta = CFloat(0)
a float

y = CFloat(0)
a float

Frustum

class pythreejs.**Frustum**(*p0=None, p1=None, p2=None, p3=None, p4=None, p5=None*)
Frustum

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/math/Frustum>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/math/Frustum>

p0

```
Instance(Plane, allow_none=True).tag(sync=True, **widget_serialization)
```

p1

```
Instance(Plane, allow_none=True).tag(sync=True, **widget_serialization)
```

p2

```
Instance(Plane, allow_none=True).tag(sync=True, **widget_serialization)
```

p3

```
Instance(Plane, allow_none=True).tag(sync=True, **widget_serialization)
```

p4

```
Instance(Plane, allow_none=True).tag(sync=True, **widget_serialization)
```


p5

```
Instance(Plane, allow_none=True).tag(sync=True, **widget_serialization)
```

p0 = Instance()
a Plane or None

p1 = Instance()
a Plane or None

p2 = Instance()
a Plane or None

p3 = Instance()
a Plane or None

p4 = Instance()
a Plane or None

p5 = Instance()
a Plane or None

Interpolant

class pythreejs.**Interpolant**
Interpolant

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/math/Interpolant>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/math/Interpolant>

Line3

class pythreejs.**Line3** (*start*=[0, 0, 0], *end*=[0, 0, 0],)
Line3

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/math/Line3>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/math/Line3>

start

```
Vector3(default_value=[0, 0, 0]).tag(sync=True)
```

end

```
Vector3(default_value=[0, 0, 0]).tag(sync=True)
```

end = Vector3((0, 0, 0))
a tuple of any type

start = Vector3((0, 0, 0))
a tuple of any type

Math

class pythreejs.Math

Math

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/math/Math>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/math/Math>

Plane

class pythreejs.Plane (normal=[0, 0, 0], constant=0,)

Plane

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/math/Plane>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/math/Plane>

normal

```
Vector3(default_value=[0, 0, 0]).tag(sync=True)
```

constant

```
CFloat(0, allow_none=False).tag(sync=True)
```

constant = CFloat(0)

a float

normal = Vector3((0, 0, 0))

a tuple of any type

Quaternion

class pythreejs.Quaternion (x=0, y=0, z=0, w=1)

Quaternion

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/math/Quaternion>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/math/Quaternion>

x

```
CFloat(0, allow_none=False).tag(sync=True)
```

y

```
CFloat(0, allow_none=False).tag(sync=True)
```

z

```
CFloat(0, allow_none=False).tag(sync=True)
```

w

```
CFloat(1, allow_none=False).tag(sync=True)
```

```
w = CFloat(1)
    a float
```

```
x = CFloat(0)
    a float
```

```
y = CFloat(0)
    a float
```

```
z = CFloat(0)
    a float
```

Ray

```
class pythreejs.Ray(origin=[0, 0, 0], direction=[0, 0, 0], )
    Ray
```

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/math/Ray>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/math/Ray>

origin

```
Vector3(default_value=[0, 0, 0]).tag(sync=True)
```

direction

```
Vector3(default_value=[0, 0, 0]).tag(sync=True)
```

```
direction = Vector3((0, 0, 0))
    a tuple of any type
```

```
origin = Vector3((0, 0, 0))
    a tuple of any type
```

Sphere

```
class pythreejs.Sphere(center=[0, 0, 0], radius=0, )
    Sphere
```

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/math/Sphere>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/math/Sphere>

center

```
Vector3(default_value=[0, 0, 0]).tag(sync=True)
```

radius

```
CFloat(0, allow_none=False).tag(sync=True)
```

center = **Vector3**((0, 0, 0))
a tuple of any type

radius = **CFloat**(0)
a float

Spherical

class pythreejs.**Spherical**
Spherical

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/math/Spherical>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/math/Spherical>

Triangle

class pythreejs.**Triangle**(a=[0, 0, 0], b=[0, 0, 0], c=[0, 0, 0],)
Triangle

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/math/Triangle>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/math/Triangle>

a

```
Vector3(default_value=[0, 0, 0]).tag(sync=True)
```

b

```
Vector3(default_value=[0, 0, 0]).tag(sync=True)
```

c

```
Vector3(default_value=[0, 0, 0]).tag(sync=True)
```

a = **Vector3**((0, 0, 0))
a tuple of any type

b = **Vector3**((0, 0, 0))
a tuple of any type

```
c = Vector3((0, 0, 0))  
a tuple of any type
```

2.5.14 objects

Blackbox

class `pythreejs.Blackbox`

A widget with unsynced children.

This widget allows extension authors to expose scene control of a given three object, without attempting to sync its children. This makes it possible for a library to give access to an outer object, without exposing the full object three, and can be useful in avoiding possibly heavy sync operations.

This widget has some manual overrides on the Python side.

Inherits *Object3D*.

Three.js docs: <https://threejs.org/docs/#api/objects/Blackbox>

type

```
Unicode("Blackbox", allow_none=False).tag(sync=True)
```

children = None

Bone

class `pythreejs.Bone`

Bone

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/objects/Bone>

Inherits *Object3D*.

Three.js docs: <https://threejs.org/docs/#api/objects/Bone>

type

```
Unicode("Bone", allow_none=False).tag(sync=True)
```

type = Unicode('Bone')
a unicode string

CloneArray

class `pythreejs.CloneArray (original=None, positions=[], merge=False)`

CloneArray

Autogenerated by generate-wrappers.js This class is a custom class for pythreejs, with no direct corresponding class in three.js.

Inherits *Object3D*.

Three.js docs: <https://threejs.org/docs/#api/objects/CloneArray>

original

```
Instance(Object3D, allow_none=True).tag(sync=True, **widget_serialization)
```

positions

```
List(trait=List()).tag(sync=True)
```

merge

```
Bool(False, allow_none=False).tag(sync=True)
```

type

```
Unicode("CloneArray", allow_none=False).tag(sync=True)
```

merge = **Bool(False)**

a boolean

original = **Instance()**

an Object3D or None

positions = **List()**

a list with values that are: a list

type = **Unicode('CloneArray')**

a unicode string

Group

class pythreejs.**Group**

Group

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/objects/Group>

Inherits *Object3D*.

Three.js docs: <https://threejs.org/docs/#api/objects/Group>

type

```
Unicode("Group", allow_none=False).tag(sync=True)
```

type = **Unicode('Group')**

a unicode string

LOD

class pythreejs.**LOD**

LOD

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/objects/LOD>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/objects/LOD>

Line2

class pythreejs.**Line2** (*geometry=UninitializedSentinel, material=UninitializedSentinel*)
Line2

Autogenerated by generate-wrappers.js This class is a custom class for pythreejs, with no direct corresponding class in three.js.

Inherits *Mesh*.

Three.js docs: <https://threejs.org/docs/#api/objects/Line2>

material

```
Union([
    Instance(Uninitialized),
    Instance(LineMaterial),
], default_value=UninitializedSentinel, allow_none=True).tag(sync=True,
↳**uninitialized_serialization)
```

geometry

```
Union([
    Instance(Uninitialized),
    Instance(LineGeometry),
], default_value=UninitializedSentinel, allow_none=True).tag(sync=True,
↳**uninitialized_serialization)
```

type

```
Unicode("Line2", allow_none=False).tag(sync=True)
```

geometry = Union(<pythreejs.traits.Uninitialized object at 0x7f1534098eb8>)
an Uninitialized or a LineGeometry

material = Union(<pythreejs.traits.Uninitialized object at 0x7f1534098eb8>)
an Uninitialized or a LineMaterial

type = Unicode('Line2')
a unicode string

LineLoop

class pythreejs.**LineLoop** (*geometry=None, material=None*)
LineLoop

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/objects/LineLoop>

Inherits *Line*.

Three.js docs: <https://threejs.org/docs/#api/objects/LineLoop>

type

```
Unicode("LineLoop", allow_none=False).tag(sync=True)
```

type = Unicode('LineLoop')
a unicode string

LineSegments2

class pythreejs.**LineSegments2** (*geometry=UninitializedSentinel, material=UninitializedSentinel*)
LineSegments2

Autogenerated by generate-wrappers.js This class is a custom class for pythreejs, with no direct corresponding class in three.js.

Inherits *Mesh*.

Three.js docs: <https://threejs.org/docs/#api/objects/LineSegments2>

material

```
Union([
    Instance(Uninitialized),
    Instance(LineMaterial),
], default_value=UninitializedSentinel, allow_none=True).tag(sync=True,
↳ **uninitialized_serialization)
```

geometry

```
Union([
    Instance(Uninitialized),
    Instance(LineSegmentsGeometry),
], default_value=UninitializedSentinel, allow_none=True).tag(sync=True,
↳ **uninitialized_serialization)
```

type

```
Unicode("LineSegments2", allow_none=False).tag(sync=True)
```

geometry = Union(<pythreejs.traits.Uninitialized object at 0x7f1534098eb8>)
an Uninitialized or a LineSegmentsGeometry

material = Union(<pythreejs.traits.Uninitialized object at 0x7f1534098eb8>)
an Uninitialized or a LineMaterial

type = Unicode('LineSegments2')
a unicode string

LineSegments

class pythreejs.**LineSegments** (*geometry=None, material=None*)
LineSegments

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/objects/LineSegments>

Inherits *Line*.

Three.js docs: <https://threejs.org/docs/#api/objects/LineSegments>

type

```
Unicode("LineSegments", allow_none=False).tag(sync=True)
```

```
type = Unicode('LineSegments')
    a unicode string
```

Line

class pythreejs.**Line** (*geometry=None, material=None*)
Line

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/objects/Line>

Inherits *Object3D*.

Three.js docs: <https://threejs.org/docs/#api/objects/Line>

material

```
Instance(Material, allow_none=True).tag(sync=True, **widget_serialization)
```

geometry

```
Union([
    Instance(BaseGeometry, allow_none=True),
    Instance(BaseBufferGeometry, allow_none=True)
]).tag(sync=True, **widget_serialization)
```

type

```
Unicode("Line", allow_none=False).tag(sync=True)
```

```
geometry = Union()
    a BaseGeometry or None or a BaseBufferGeometry or None
```

```
material = Instance()
    a Material or None
```

```
type = Unicode('Line')
    a unicode string
```

Mesh

class pythreejs.**Mesh** (*geometry=None, material=[]*)
Mesh

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/objects/Mesh>

Inherits *Object3D*.

Three.js docs: <https://threejs.org/docs/#api/objects/Mesh>

material

```
Union([Instance(Material), Tuple()]).tag(sync=True, **widget_serialization)
```

geometry

```
Union([
    Instance(BaseGeometry, allow_none=False),
    Instance(BaseBufferGeometry, allow_none=False)
]).tag(sync=True, **widget_serialization)
```

drawMode

```
Enum(DrawModes, "TrianglesDrawMode", allow_none=False).tag(sync=True)
```

morphTargetInfluences

```
List().tag(sync=True)
```

type

```
Unicode("Mesh", allow_none=False).tag(sync=True)
```

drawMode = Enum('TrianglesDrawMode')
any of ['TriangleFanDrawMode', 'TriangleStripDrawMode', 'TrianglesDrawMode']

geometry = Union()
a BaseGeometry or a BaseBufferGeometry

material = Union()
a Material or a tuple

morphTargetInfluences = List()
a list of any type

type = Unicode('Mesh')
a unicode string

Points

class pythreejs.**Points** (*geometry=None, material=None*)
Points

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/objects/Points>

Inherits *Object3D*.

Three.js docs: <https://threejs.org/docs/#api/objects/Points>

material

```
Instance(Material, allow_none=False).tag(sync=True, **widget_serialization)
```

geometry

```
Union([
    Instance(BaseGeometry, allow_none=False),
    Instance(BaseBufferGeometry, allow_none=False)
]).tag(sync=True, **widget_serialization)
```

type

```
Unicode("Points", allow_none=False).tag(sync=True)
```

geometry = Union()
a BaseGeometry or a BaseBufferGeometry

material = Instance()
a Material

type = Unicode('Points')
a unicode string

Skeleton

class pythreejs.**Skeleton** (*bones=[]*)
Skeleton

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/objects/Skeleton>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/objects/Skeleton>

bones

```
Tuple().tag(sync=True, **widget_serialization)
```

bones = Tuple()
a tuple of any type

SkinnedMesh

class pythreejs.**SkinnedMesh** (*geometry=None, material=[]*)
SkinnedMesh

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/objects/SkinnedMesh>

Inherits *Mesh*.

Three.js docs: <https://threejs.org/docs/#api/objects/SkinnedMesh>

bindMode

```
Unicode("attached", allow_none=False).tag(sync=True)
```

bindMatrix

```
Matrix4(default_value=[1, 0, 0, 0, 0, 1, 0, 0, 0, 0, 1, 0, 0, 0, 0, 1]).  
↪tag(sync=True)
```

skeleton

```
Instance(Skeleton, allow_none=True).tag(sync=True, **widget_serialization)
```

type

```
Unicode("SkinnedMesh", allow_none=False).tag(sync=True)
```

bindMatrix = **Matrix4**((1, 0, 0, 0, 0, 1, 0, 0, 0, 0, 1, 0, 0, 0, 0, 1))
a tuple of any type

bindMode = **Unicode**('attached')
a unicode string

skeleton = **Instance**()
a Skeleton or None

type = **Unicode**('SkinnedMesh')
a unicode string

Sprite

class pythreejs.**Sprite** (*material=None*)
Sprite

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/objects/Sprite>

Inherits *Object3D*.

Three.js docs: <https://threejs.org/docs/#api/objects/Sprite>

material

```
Instance(SpriteMaterial, allow_none=True).tag(sync=True, **widget_  
↪serialization)
```

center

```
Vector2(default_value=[0.5, 0.5]).tag(sync=True)
```

type

```
Unicode("Sprite", allow_none=False).tag(sync=True)
```

center = **Vector2**((0, 0))
a tuple of any type

material = **Instance**()
a SpriteMaterial or None

```
type = Unicode('Sprite')  
    a unicode string
```

2.5.15 renderers

webgl

WebGLBufferRenderer

```
class pythreejs.WebGLBufferRenderer  
    WebGLBufferRenderer
```

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/renderers/webgl/WebGLBufferRenderer>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/renderers/webgl/WebGLBufferRenderer>

WebGLCapabilities

```
class pythreejs.WebGLCapabilities  
    WebGLCapabilities
```

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/renderers/webgl/WebGLCapabilities>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/renderers/webgl/WebGLCapabilities>

WebGLExtensions

```
class pythreejs.WebGLExtensions  
    WebGLExtensions
```

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/renderers/webgl/WebGLExtensions>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/renderers/webgl/WebGLExtensions>

WebGLGeometries

```
class pythreejs.WebGLGeometries  
    WebGLGeometries
```

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/renderers/webgl/WebGLGeometries>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/renderers/webgl/WebGLGeometries>

WebGLIndexedBufferRenderer

class pythreejs.WebGLIndexedBufferRenderer

WebGLIndexedBufferRenderer

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/renderers/webgl/WebGLIndexedBufferRenderer>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/renderers/webgl/WebGLIndexedBufferRenderer>

WebGLLights

class pythreejs.WebGLLights

WebGLLights

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/renderers/webgl/WebGLLights>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/renderers/webgl/WebGLLights>

WebGLObjects

class pythreejs.WebGLObjects

WebGLObjects

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/renderers/webgl/WebGLObjects>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/renderers/webgl/WebGLObjects>

WebGLProgram

class pythreejs.WebGLProgram

WebGLProgram

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/renderers/webgl/WebGLProgram>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/renderers/webgl/WebGLProgram>

WebGLPrograms

class pythreejs.WebGLPrograms

WebGLPrograms

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/renderers/webgl/WebGLPrograms>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/renderers/webgl/WebGLPrograms>

WebGLProperties

class pythreejs.WebGLProperties

WebGLProperties

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/renderers/webgl/WebGLProperties>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/renderers/webgl/WebGLProperties>

WebGLShader

class pythreejs.WebGLShader

WebGLShader

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/renderers/webgl/WebGLShader>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/renderers/webgl/WebGLShader>

WebGLShadowMap

class pythreejs.WebGLShadowMap

WebGLShadowMap

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/renderers/webgl/WebGLShadowMap>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/renderers/webgl/WebGLShadowMap>

enabled

```
Bool(False, allow_none=False).tag(sync=True)
```

type

```
Enum(ShadowTypes, "PCFShadowMap", allow_none=False).tag(sync=True)
```

enabled = Bool(False)

a boolean

type = Enum('PCFShadowMap')

any of ['BasicShadowMap', 'PCFShadowMap', 'PCFSOFTShadowMap']

WebGLState

class pythreejs.WebGLState

WebGLState

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/renderers/webgl/WebGLState>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/renderers/webgl/WebGLState>

WebGLRenderTargetCube

class pythreejs.WebGLRenderTargetCube
WebGLRenderTargetCube

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/renderers/WebGLRenderTargetCube>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/renderers/WebGLRenderTargetCube>

WebGLRenderTarget

class pythreejs.WebGLRenderTarget
WebGLRenderTarget

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/renderers/WebGLRenderTarget>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/renderers/WebGLRenderTarget>

2.5.16 scenes

FogExp2

class pythreejs.FogExp2 (color="white", density=0.00025)
FogExp2

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/scenes/FogExp2>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/scenes/FogExp2>

name

```
Unicode("", allow_none=False).tag(sync=True)
```

color

```
Color("white", allow_none=False).tag(sync=True)
```

density

```
CFloat(0.00025, allow_none=False).tag(sync=True)
```

color = Color('white')
a valid HTML color

density = CFloat(0.00025)
a float

name = `Unicode('')`
a unicode string

Fog

class `pythreejs.Fog` (*color="white", near=1, far=1000*)

Fog

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/scenes/Fog>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/scenes/Fog>

name

```
Unicode("", allow_none=False).tag(sync=True)
```

color

```
Color("white", allow_none=False).tag(sync=True)
```

near

```
CFloat(1, allow_none=False).tag(sync=True)
```

far

```
CFloat(1000, allow_none=False).tag(sync=True)
```

color = `Color('white')`

a valid HTML color

far = `CFloat(1000)`

a float

name = `Unicode('')`

a unicode string

near = `CFloat(1)`

a float

Scene

class `pythreejs.Scene`

Scene

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/scenes/Scene>

Inherits *Object3D*.

Three.js docs: <https://threejs.org/docs/#api/scenes/Scene>

fog

```
Union([
    Instance(Fog, allow_none=True),
    Instance(FogExp2, allow_none=True)
]).tag(sync=True, **widget_serialization)
```

overrideMaterial

```
Instance(Material, allow_none=True).tag(sync=True, **widget_serialization)
```

autoUpdate

```
Bool(True, allow_none=False).tag(sync=True)
```

background

```
Color("#ffffff", allow_none=True).tag(sync=True)
```

type

```
Unicode("Scene", allow_none=False).tag(sync=True)
```

autoUpdate = **Bool**(True)

a boolean

background = **Color**(' #ffffff')

a valid HTML color

fog = **Union**()

a Fog or None or a FogExp2 or None

overrideMaterial = **Instance**()

a Material or None

type = **Unicode**('Scene')

a unicode string

2.5.17 textures

CompressedTexture

class pythreejs.**CompressedTexture**

CompressedTexture

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/textures/CompressedTexture>

Inherits *Texture*.

Three.js docs: <https://threejs.org/docs/#api/textures/CompressedTexture>

CubeTexture

```
class pythreejs.CubeTexture (images=[],                               mapping="UVMapping",
                             wrapS="ClampToEdgeWrapping", wrapT="ClampToEdgeWrapping",
                             magFilter="LinearFilter", minFilter="LinearMipMapLinearFilter",
                             format="RGBAFormat", type="UnsignedByteType", anisotropy=1)
```

CubeTexture

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/textures/CubeTexture>

Inherits *Texture*.

Three.js docs: <https://threejs.org/docs/#api/textures/CubeTexture>

images

```
List().tag(sync=True)
```

images = List()
a list of any type

DataTexture3D

```
class pythreejs.DataTexture3D (data=None, format="RGBAFormat", type="UnsignedByteType",
                               mapping="UVMapping", wrapS="ClampToEdgeWrapping",
                               wrapT="ClampToEdgeWrapping", magFilter="NearestFilter",
                               minFilter="NearestFilter", anisotropy=1)
```

This widget has some manual overrides on the Python side.

Inherits *Texture*.

Three.js docs: <https://threejs.org/docs/#api/textures/DataTexture3D>

data

```
WebGLDataUnion().tag(sync=True)
```

minFilter

```
Enum(Filters, "NearestFilter", allow_none=False).tag(sync=True)
```

magFilter

```
Enum(Filters, "NearestFilter", allow_none=False).tag(sync=True)
```

flipY

```
Bool(False, allow_none=False).tag(sync=True)
```

generateMipmaps

```
Bool(False, allow_none=False).tag(sync=True)
```

DataTexture

```
class pythreejs.DataTexture (data=None, format="RGBAFormat", type="UnsignedByteType",
                             mapping="UVMapping", wrapS="ClampToEdgeWrapping",
                             wrapT="ClampToEdgeWrapping", magFilter="NearestFilter",
                             minFilter="NearestFilter", anisotropy=1)
```

This widget has some manual overrides on the Python side.

Inherits *Texture*.

Three.js docs: <https://threejs.org/docs/#api/textures/DataTexture>

data

```
WebGLDataUnion().tag(sync=True)
```

minFilter

```
Enum(Filters, "NearestFilter", allow_none=False).tag(sync=True)
```

magFilter

```
Enum(Filters, "NearestFilter", allow_none=False).tag(sync=True)
```

flipY

```
Bool(False, allow_none=False).tag(sync=True)
```

generateMipmaps

```
Bool(False, allow_none=False).tag(sync=True)
```

DepthTexture

```
class pythreejs.DepthTexture (width=0, height=0, type="UnsignedShortType",
                              wrapS="ClampToEdgeWrapping", wrapT="ClampToEdgeWrapping",
                              magFilter="NearestFilter", minFilter="NearestFilter",
                              anisotropy=1, format="DepthFormat")
```

DepthTexture

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/textures/DepthTexture>

Inherits *Texture*.

Three.js docs: <https://threejs.org/docs/#api/textures/DepthTexture>

width

```
CInt(0, allow_none=False).tag(sync=True)
```

height

```
CInt(0, allow_none=False).tag(sync=True)
```

format

```
Enum(DepthFormats, "DepthFormat", allow_none=False).tag(sync=True)
```

type

```
Enum(DataTypes, "UnsignedShortType", allow_none=False).tag(sync=True)
```

minFilter

```
Enum(Filters, "NearestFilter", allow_none=False).tag(sync=True)
```

magFilter

```
Enum(Filters, "NearestFilter", allow_none=False).tag(sync=True)
```

flipY

```
Bool(False, allow_none=False).tag(sync=True)
```

generateMipmaps

```
Bool(False, allow_none=False).tag(sync=True)
```

flipY = Bool(False)

a boolean

format = Enum('DepthFormat')

any of ['DepthFormat', 'DepthStencilFormat']

generateMipmaps = Bool(False)

a boolean

height = CInt(0)

an int

magFilter = Enum('NearestFilter')

any of ['LinearFilter', 'LinearMipMapLinearFilter', 'LinearMipMapNearestFilter', 'NearestFilter', 'NearestMipMapLinearFilter', 'NearestMipMapNearestFilter']

minFilter = Enum('NearestFilter')

any of ['LinearFilter', 'LinearMipMapLinearFilter', 'LinearMipMapNearestFilter', 'NearestFilter', 'NearestMipMapLinearFilter', 'NearestMipMapNearestFilter']

type = Enum('UnsignedShortType')

any of ['ByteType', 'FloatType', 'HalfFloatType', 'IntType', 'ShortType', 'UnsignedByteType', 'UnsignedIntType', 'UnsignedShortType']

width = CInt(0)

an int

ImageTexture

```
class pythreejs.ImageTexture (imageUri="", mapping="UVMapping",
                               wrapS="ClampToEdgeWrapping", wrapT="ClampToEdgeWrapping",
                               magFilter="LinearFilter", minFilter="LinearMipMapLinearFilter",
                               format="RGBAFormat", type="UnsignedByteType", anisotropy=1)
```

ImageTexture

Autogenerated by generate-wrappers.js This class is a custom class for pythreejs, with no direct corresponding class in three.js.

Inherits *Texture*.

Three.js docs: <https://threejs.org/docs/#api/textures/ImageTexture>

imageUri

```
Unicode("", allow_none=False).tag(sync=True)
```

imageUri = Unicode('')
a unicode string

TextTexture

```
class pythreejs.TextTexture (string="")
```

TextTexture

Autogenerated by generate-wrappers.js This class is a custom class for pythreejs, with no direct corresponding class in three.js.

Inherits *Texture*.

Three.js docs: <https://threejs.org/docs/#api/textures/TextTexture>

color

```
Color("white", allow_none=False).tag(sync=True)
```

fontFace

```
Unicode("Arial", allow_none=False).tag(sync=True)
```

size

```
CInt(12, allow_none=False).tag(sync=True)
```

string

```
Unicode("", allow_none=False).tag(sync=True)
```

squareTexture

```
Bool(True, allow_none=False).tag(sync=True)
```

color = Color('white')

a valid HTML color

fontFace = Unicode('Arial')

a unicode string

size = CInt(12)

an int

squareTexture = Bool(True)

a boolean

string = Unicode('')

a unicode string

Texture

class pythreejs.Texture

Texture

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/textures/Texture>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/textures/Texture>

name

```
Unicode("", allow_none=False).tag(sync=True)
```

mapping

```
Enum(MappingModes, "UVMapping", allow_none=False).tag(sync=True)
```

wrapS

```
Enum(WrappingModes, "ClampToEdgeWrapping", allow_none=False).tag(sync=True)
```

wrapT

```
Enum(WrappingModes, "ClampToEdgeWrapping", allow_none=False).tag(sync=True)
```

magFilter

```
Enum(Filters, "LinearFilter", allow_none=False).tag(sync=True)
```

minFilter

```
Enum(Filters, "LinearMipMapLinearFilter", allow_none=False).tag(sync=True)
```

format

```
Enum(PixelFormats, "RGBAFormat", allow_none=False).tag(sync=True)
```

type

```
Enum(DataTypes, "UnsignedByteType", allow_none=False).tag(sync=True)
```

anisotropy

```
CFloat(1, allow_none=False).tag(sync=True)
```

repeat

```
Vector2(default_value=[1, 1]).tag(sync=True)
```

offset

```
Vector2(default_value=[0, 0]).tag(sync=True)
```

generateMipmaps

```
Bool(True, allow_none=False).tag(sync=True)
```

premultiplyAlpha

```
Bool(False, allow_none=False).tag(sync=True)
```

flipY

```
Bool(True, allow_none=False).tag(sync=True)
```

unpackAlignment

```
CInt(4, allow_none=False).tag(sync=True)
```

encoding

```
Enum(TextureEncodings, "LinearEncoding", allow_none=False).tag(sync=True)
```

version

```
CInt(0, allow_none=False).tag(sync=True)
```

rotation


```
CFloat(0, allow_none=False).tag(sync=True)
```

anisotropy = CFloat(1)

a float

encoding = Enum('LinearEncoding')

any of ['BasicDepthPacking', 'GammaEncoding', 'LinearEncoding', 'LogLuvEncoding', 'RGBADepthPacking', 'RGBDEncoding', 'RGBEEncoding', 'RGBM16Encoding', 'RGBM7Encoding', 'sRGBEncoding']

flipY = Bool(True)

a boolean

format = Enum('RGBAFormat')

any of ['AlphaFormat', 'DepthFormat', 'DepthStencilFormat', 'LuminanceAlphaFormat', 'LuminanceFormat', 'RGBAFormat', 'RGBEFormat', 'RGBFormat', 'RedFormat']

generateMipmaps = Bool(True)

a boolean

magFilter = Enum('LinearFilter')

any of ['LinearFilter', 'LinearMipMapLinearFilter', 'LinearMipMapNearestFilter', 'NearestFilter', 'NearestMipMapLinearFilter', 'NearestMipMapNearestFilter']

mapping = Enum('UVMapping')

any of ['CubeReflectionMapping', 'CubeRefractionMapping', 'CubeUVReflectionMapping', 'CubeUVRefractionMapping', 'EquirectangularReflectionMapping', 'EquirectangularRefractionMapping', 'SphericalReflectionMapping', 'UVMapping']

minFilter = Enum('LinearMipMapLinearFilter')

any of ['LinearFilter', 'LinearMipMapLinearFilter', 'LinearMipMapNearestFilter', 'NearestFilter', 'NearestMipMapLinearFilter', 'NearestMipMapNearestFilter']

name = Unicode('')

a unicode string

offset = Vector2((0, 0))

a tuple of any type

premultiplyAlpha = Bool(False)

a boolean

repeat = Vector2((0, 0))

a tuple of any type

rotation = CFloat(0)

a float

type = Enum('UnsignedByteType')

any of ['ByteType', 'FloatType', 'HalfFloatType', 'IntType', 'ShortType', 'UnsignedByteType', 'UnsignedIntType', 'UnsignedShortType']

unpackAlignment = CInt(4)

an int

version = CInt(0)

an int

wrapS = Enum('ClampToEdgeWrapping')

any of ['ClampToEdgeWrapping', 'MirroredRepeatWrapping', 'RepeatWrapping']

```
wrapT = Enum('ClampToEdgeWrapping')
    any of ['ClampToEdgeWrapping', 'MirroredRepeatWrapping', 'RepeatWrapping']
```

VideoTexture

```
class pythreejs.VideoTexture
    VideoTexture
```

Autogenerated by generate-wrappers.js See <https://threejs.org/docs/#api/textures/VideoTexture>

Inherits *ThreeWidget*.

Three.js docs: <https://threejs.org/docs/#api/textures/VideoTexture>

2.5.18 traits

```
class pythreejs.traits.Color (default_value=traitlets.Undefined,          allow_none=False,
                              read_only=None, help=None, config=None, **kwargs)
```

A string holding a valid HTML color such as 'blue', '#060482', '#A80'

```
default_value = traitlets.Undefined
```

```
info_text = 'a valid HTML color'
```

```
validate (obj, value)
```

```
class pythreejs.traits.Euler (default_value=traitlets.Undefined, **kwargs)
```

A trait for a set of Euler angles.

Expressed as a tuple of tree floats (the angles), and the order as a string. See the three.js docs for futher details.

```
default_value = (0, 0, 0, 'XYZ')
```

```
info_text = 'a set of Euler angles'
```

```
class pythreejs.traits.Face3 (**kwargs)
```

A trait for a named tuple corresponding to a three.js Face3.

Accepts named tuples with the field names: ('a', 'b', 'c', 'normal', 'color', 'materialIndex')

```
info_text = 'a named tuple representing a Face3'
```

```
class
```

alias of *Face3*

```
class pythreejs.traits.Matrix3 (trait=<class          'traitlets.traitlets.CFloat'>,          de-
                               fault_value=traitlets.Undefined, **kwargs)
```

A trait for a 9-tuple corresponding to a three.js Matrix3.

```
default_value = (1, 0, 0, 0, 1, 0, 0, 0, 1)
```

```
info_text = 'a three-by-three matrix (9 element tuple)'
```

```
class pythreejs.traits.Matrix4 (trait=<class          'traitlets.traitlets.CFloat'>,          de-
                               fault_value=traitlets.Undefined, **kwargs)
```

A trait for a 16-tuple corresponding to a three.js Matrix4.

```
default_value = (1, 0, 0, 0, 0, 1, 0, 0, 0, 0, 1, 0, 0, 0, 0, 1)
```

```
info_text = 'a four-by-four matrix (16 element tuple)'
```

```
class pythreejs.traits.Uniform (default_value=traitlets.Undefined, **kwargs)
```

A dict holding uniforms for a ShaderMaterial

```

class pythreejs.traits.Uninitialized
    Placeholder sentinel used while waiting for a initialization via sync

class pythreejs.traits.Vector2 (trait=<class      'traitlets.traitlets.CFloat'>,      de-
                                fault_value=traitlets.Undefined, **kwargs)
    A trait for a 2-tuple corresponding to a three.js Vector2.

    default_value = (0, 0)

    info_text = 'a two-element vector'

class pythreejs.traits.Vector3 (trait=<class      'traitlets.traitlets.CFloat'>,      de-
                                fault_value=traitlets.Undefined, **kwargs)
    A trait for a 3-tuple corresponding to a three.js Vector3.

    default_value = (0, 0, 0)

    info_text = 'a three-element vector'

class pythreejs.traits.Vector4 (trait=<class      'traitlets.traitlets.CFloat'>,      de-
                                fault_value=traitlets.Undefined, **kwargs)
    A trait for a 4-tuple corresponding to a three.js Vector4.

    default_value = (0, 0, 0, 0)

    info_text = 'a four-element vector'

class pythreejs.traits.WebGLDataUnion (default_value=traitlets.Undefined,      dtype=None,
                                       shape_constraint=None,      kw_array=None,
                                       kw_widget=None, **kwargs)
    A trait that accepts either a numpy array, or an NDArrayWidget reference.

    Also constrains the use of 64-bit arrays, as this is not supported by WebGL.

    validate (obj, value)

```

2.6 Extending pythreejs

While you can do a lot with pythreejs out of the box, you might have some custom rendering you want to do, that would be more efficient to configure as a separate widget. To be able to integrate such objects with pythreejs, the following extension guide can be helpful.

2.6.1 Blackbox object

Pythreejs exports a *Blackbox* Widget, which inherits *Object3D*. The intention is for third-party widget libraries to inherit from it on both the Python and JS side. You would add the traits needed to set up your object, and have the JS side set up the corresponding three.js object. The three.js object itself would not be synced across the wire, which is why it is called a blackbox, but you can still manipulate it in a scene (transforming, putting it as a child, etc.). This can be very efficient e.g. for complex, generated objects, where the final three.js data would be prohibitively expensive to synchronize.

Example implementation

Below is an example implementation for rendering a crystal lattice. It takes a basis structure, and then tiles copies of this basis in x/y/z, potentially generating thousands of spheres.

Note: This example is not a good/optimized crystal structure viewer. It is merely used to convey the concept of a widget with a few parameters translating to something with potentially huge amounts of data/objects.

Python:

```
import traitlets
import pythreejs

class CubicLattice(pythreejs.Blackbox):
    _model_name: traitlets.Unicode('CubicLatticeModel').tag(sync=True)
    _model_module = traitlets.Unicode('my_module_name').tag(sync=True)

    basis = traitlets.List(
        trait=pythreejs.Vector3(),
        default_value=[[0, 0, 0]],
        max_length=5
    ).tag(sync=True)

    repetitions = traitlets.List(
        trait=traitlets.Int(),
        default_value=[5, 5, 5],
        min_length=3,
        max_length=3
    ).tag(sync=True)
```

JavaScript:

```
import * as THREE from "three";

import {
    BlackboxModel
} from 'jupyter-threejs';

const atomGeometry = new THREE.SphereBufferGeometry(0.2, 16, 8);
const atomMaterials = [
    new THREE.MeshLambertMaterial({color: 'red'}),
    new THREE.MeshLambertMaterial({color: 'green'}),
    new THREE.MeshLambertMaterial({color: 'yellow'}),
    new THREE.MeshLambertMaterial({color: 'blue'}),
    new THREE.MeshLambertMaterial({color: 'cyan'}),
];

export class CubicLatticeModel extends BlackboxModel {
    defaults() {
        return {...super.defaults(), ...{
            _model_name: 'CubicLatticeModel',
            _model_module: 'my_module_name',
            basis: [[0, 0, 0]],
            repetitions: [5, 5, 5],
        }};
    }

    // This method is called to create the three.js object of the model:
    constructThreeObject() {
        const root = new THREE.Group();
```

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```

    // Create the children of this group:
    // This is the part that is specific to this example
    this.createLattice(root);
    return root;
}

// This method is called whenever the model changes:
onChange(model, options) {
    super.onChange(model, options);
    // If any of the parameters change, simply rebuild children:
    this.createLattice();
}

// Our custom method to build the lattice:
createLattice(obj) {
    obj = obj || this.obj;

    // Set up the basis to tile:
    const basisInput = this.get('basis');
    const basis = new THREE.Group();
    for (let i=0; i < basisInput.length; ++i) {
        let mesh = new THREE.Mesh(atomGeometry, atomMaterials[i]);
        mesh.position.fromArray(basisInput[i]);
        basis.add(mesh);
    }

    // Tile in x, y, z:
    const [nx, ny, nz] = this.get('repetitions');
    const children = [];
    for (let x = 0; x < nx; ++x) {
        for (let y = 0; y < ny; ++y) {
            for (let z = 0; z < nz; ++z) {
                let copy = basis.clone();
                copy.position.set(x, y, z);
                children.push(copy);
            }
        }
    }

    obj.remove(...obj.children);
    obj.add(...children);
}
}

```

This code should then be wrapped up in a widget extension (see documentation from ipywidgets on how to do this).

Usage:

```

import pythreejs
from IPython.display import display
from my_module import CubicLattice

lattice = CubicLattice(basis=[[0,0,0], [0.5, 0.5, 0.5]])

# Preview the lattice directly:
display(lattice)

```

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```
# Or put it in a scene:
width=600
height=400
key_light = pythreejs.DirectionalLight(position=[-5, 5, 3], intensity=0.7)
ambient_light = pythreejs.AmbientLight(color='#777777')

camera = pythreejs.PerspectiveCamera(
    position=[-5, 0, -5],
    children=[
        # Have the key light follow the camera:
        key_light
    ],
    aspect=width/height,
)
control = pythreejs.OrbitControls(controlling=camera)

scene = pythreejs.Scene(children=[lattice, camera, ambient_light])

renderer = pythreejs.Renderer(camera=camera,
                               scene=scene,
                               controls=[control],
                               width=width, height=height)

display(renderer)
```

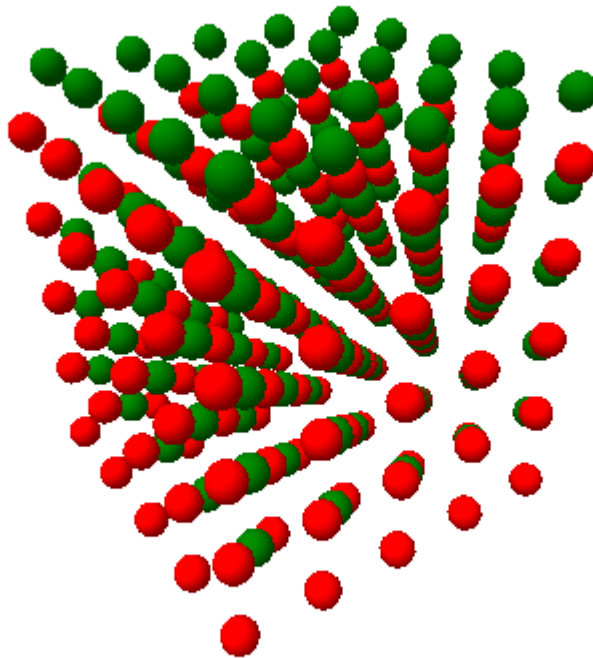


Fig. 1: Figure: Example view of the rendered lattice object.

2.7 Developer install

To install a developer version of pythreejs, you will first need to clone the repository:

```
git clone https://github.com/jupyter-widgets/pythreejs.git
cd pythreejs
```

Next, install it with a develop install using pip:

```
pip install -e .
```

If you are not planning on working on the JS/frontend code, you can simply install the extensions as you would for a *normal install*. For a JS develop install, you should link your extensions:

```
jupyter nbextension install [--sys-prefix / --user / --system] --symlink --py_
↪pythreejs

jupyter nbextension enable [--sys-prefix / --user / --system] --py pythreejs
```

with the **appropriate flag**. Or, if you are using Jupyterlab:

```
jupyter labextension link ./js
```


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