

# PyOpenGL game

## API Documentation

September 2, 2015

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# 1 Module bull

## 1.1 Variables

Name	Description
<code>__package__</code>	<b>Value:</b> None

## 1.2 Class Bull

Class Bull represents bullet

### 1.2.1 Methods

<b><code>__init__</code></b> ( <i>self</i> , <i>start</i> , <i>target</i> , <i>power</i> )
Initialize bullet
<b>Parameters</b>
<b>start:</b> start point
<b>target:</b> target
<b>power:</b> power of bullet

<b><code>getStart</code></b> ( <i>self</i> )
Get start point of bullet
<b>Return Value</b>
start point

<b><code>getTarget</code></b> ( <i>self</i> )
Get bullet's target
<b>Return Value</b>
target

<b><code>getPosition</code></b> ( <i>self</i> )
Get bullet's current position
<b>Return Value</b>
current position

<b><code>setPosition</code></b> ( <i>self</i> , <i>position</i> )
Set bullet's position
<b>Parameters</b>
<b>position:</b> position

**getPower**(*self*)

Get bullet's power

**Return Value**

power

## 2 Module engine

### 2.1 Variables

Name	Description
MODE_MENU	Value: 0
MODE_GAME	Value: 1
ALLOW_THREADS	Value: 1
BUFSIZE	Value: 8192
CLIP	Value: 0
COLOR_BLUE	Value: 1
COLOR_GREEN	Value: 2
COLOR_RED	Value: 0
ERR_CALL	Value: 3
ERR_DEFAULT	Value: 0
ERR_DEFAULT2	Value: 521
ERR_IGNORE	Value: 0
ERR_LOG	Value: 5
ERR_PRINT	Value: 4
ERR_RAISE	Value: 2
ERR_WARN	Value: 1
FLOATING_POINT_SUPPORT	Value: 1
FPE_DIVIDEBYZERO	Value: 1
FPE_INVALID	Value: 8
FPE_OVERFLOW	Value: 2
FPE_UNDERFLOW	Value: 4
False_	Value: False
Inf	Value: inf
Infinity	Value: inf
MAXDIMS	Value: 32
NAN	Value: nan
NINF	Value: -inf
NZERO	Value: -0.0
NaN	Value: nan
PINF	Value: inf
PZERO	Value: 0.0
RAISE	Value: 2
SHIFT_DIVIDEBYZERO	Value: 0
SHIFT_INVALID	Value: 9
SHIFT_OVERFLOW	Value: 3
SHIFT_UNDERFLOW	Value: 6
ScalarType	Value: (<type 'int'>, <type 'float'>, <type 'complex'>, <type 'l...)
True_	Value: True
UFUNC_BUFSIZE_DEFAULT	Value: 8192
UFUNC_PYVALS_NAME	Value: 'UFUNC_PYVALS'
WRAP	Value: 1
__package__	Value: None

*continued on next page*

Name	Description
__warningregistry__	Value: {'Not importing directory \'/home/user/work/python/OpenG...
absolute	Value: <ufunc 'absolute'>
add	Value: <ufunc 'add'>
arccos	Value: <ufunc 'arccos'>
arccosh	Value: <ufunc 'arccosh'>
arcsin	Value: <ufunc 'arcsin'>
arcsinh	Value: <ufunc 'arcsinh'>
arctan	Value: <ufunc 'arctan'>
arctan2	Value: <ufunc 'arctan2'>
arctanh	Value: <ufunc 'arctanh'>
bitwise_and	Value: <ufunc 'bitwise_and'>
bitwise_not	Value: <ufunc 'invert'>
bitwise_or	Value: <ufunc 'bitwise_or'>
bitwise_xor	Value: <ufunc 'bitwise_xor'>
c_	Value: <numpy.lib.index_tricks.CClass object at 0x7f9b24d8bdd0>
cast	Value: {<type 'numpy.float64'>: <function <lambda> at 0x7f9b254c...
ceil	Value: <ufunc 'ceil'>
conj	Value: <ufunc 'conjugate'>
conjugate	Value: <ufunc 'conjugate'>
copysign	Value: <ufunc 'copysign'>
cos	Value: <ufunc 'cos'>
cosh	Value: <ufunc 'cosh'>
deg2rad	Value: <ufunc 'deg2rad'>
degrees	Value: <ufunc 'degrees'>
divide	Value: <ufunc 'divide'>
e	Value: 2.71828182846
equal	Value: <ufunc 'equal'>
euler_gamma	Value: 0.577215664902
exp	Value: <ufunc 'exp'>
exp2	Value: <ufunc 'exp2'>
expm1	Value: <ufunc 'expm1'>
fabs	Value: <ufunc 'fabs'>
floor	Value: <ufunc 'floor'>
floor_divide	Value: <ufunc 'floor_divide'>
fmax	Value: <ufunc 'fmax'>
fmin	Value: <ufunc 'fmin'>
fmod	Value: <ufunc 'fmod'>
frexp	Value: <ufunc 'frexp'>
greater	Value: <ufunc 'greater'>
greater_equal	Value: <ufunc 'greater_equal'>
hypot	Value: <ufunc 'hypot'>
index_exp	Value: <numpy.lib.index_tricks.IndexExpression object at 0x7f9b2...
inf	Value: inf
infty	Value: inf
invert	Value: <ufunc 'invert'>
isfinite	Value: <ufunc 'isfinite'>

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Name	Description
isinf	Value: <ufunc 'isinf'>
isnan	Value: <ufunc 'isnan'>
ldexp	Value: <ufunc 'ldexp'>
left_shift	Value: <ufunc 'left_shift'>
less	Value: <ufunc 'less'>
less_equal	Value: <ufunc 'less_equal'>
little_endian	Value: True
log	Value: <ufunc 'log'>
log10	Value: <ufunc 'log10'>
log1p	Value: <ufunc 'log1p'>
log2	Value: <ufunc 'log2'>
logaddexp	Value: <ufunc 'logaddexp'>
logaddexp2	Value: <ufunc 'logaddexp2'>
logical_and	Value: <ufunc 'logical_and'>
logical_not	Value: <ufunc 'logical_not'>
logical_or	Value: <ufunc 'logical_or'>
logical_xor	Value: <ufunc 'logical_xor'>
maximum	Value: <ufunc 'maximum'>
mgrid	Value: <numpy.lib.index_tricks.nd_grid object at 0x7f9b24d8bb90>
minimum	Value: <ufunc 'minimum'>
mod	Value: <ufunc 'remainder'>
modf	Value: <ufunc 'modf'>
multiply	Value: <ufunc 'multiply'>
nan	Value: nan
nbytes	Value: {<type 'numpy.float64'>: 8, <type 'numpy.uint32'>: 4, <ty...
negative	Value: <ufunc 'negative'>
newaxis	Value: None
nextafter	Value: <ufunc 'nextafter'>
not_equal	Value: <ufunc 'not_equal'>
ogrid	Value: <numpy.lib.index_tricks.nd_grid object at 0x7f9b24d8bc90>
pi	Value: 3.14159265359
power	Value: <ufunc 'power'>
r_	Value: <numpy.lib.index_tricks.RClass object at 0x7f9b24d8bd10>
rad2deg	Value: <ufunc 'rad2deg'>
radians	Value: <ufunc 'radians'>
reciprocal	Value: <ufunc 'reciprocal'>
remainder	Value: <ufunc 'remainder'>
right_shift	Value: <ufunc 'right_shift'>
rint	Value: <ufunc 'rint'>
s_	Value: <numpy.lib.index_tricks.IndexExpression object at 0x7f9b2...
sctypeDict	Value: {0: <type 'numpy.bool_'>, 1: <type 'numpy.int8'>, 2: <typ...
sctypeNA	Value: {'?': 'Bool', 'B': 'UInt8', 'Bool': <type 'numpy.bool_'>,...

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Name	Description
sctypes	Value: {'complex': [ <type 'numpy.complex64'>, <type 'numpy.compl...
sign	Value: <ufunc 'sign'>
signbit	Value: <ufunc 'signbit'>
sin	Value: <ufunc 'sin'>
sinh	Value: <ufunc 'sinh'>
spacing	Value: <ufunc 'spacing'>
sqrt	Value: <ufunc 'sqrt'>
square	Value: <ufunc 'square'>
subtract	Value: <ufunc 'subtract'>
tan	Value: <ufunc 'tan'>
tanh	Value: <ufunc 'tanh'>
true_divide	Value: <ufunc 'true_divide'>
trunc	Value: <ufunc 'trunc'>
typeDict	Value: {0: <type 'numpy.bool_'>, 1: <type 'numpy.int8'>, 2: <typ...
typeNA	Value: {'?': 'Bool', 'B': 'UInt8', 'Bool': <type 'numpy.bool_'>,...
typecodes	Value: {'All': '?bhlqpBHILQPefdgFDGSUVOMm', 'AllFloat': 'efdgFD...

## 2.2 Class Engine

Class Engine works with classes Game and GUI to run and visualize game. Also this class gets and process mouse events.

### 2.2.1 Methods

<b><code>__init__(self, window)</code></b> Initialize engine <b>Parameters</b> <b>window:</b> main window
<b><code>setWindowHeight(self, h)</code></b> Set window height <b>Parameters</b> <b>h:</b> window height
<b><code>setWindowWidth(self, w)</code></b> Set window width <b>Parameters</b> <b>w:</b> window width



**camera\_on**(*self*)

Switch on camera mode (only for in game mode)

**camera\_off**(*self*)

Switch off camera mode

**camera\_switch**(*self*)

Switch camera mode

**camera\_scroll**(*self*, *d*)

Process mouse wheel event

**Parameters***d*: wheel rolling direction**shoot\_on**(*self*)

Process mouse left down: Determine click on buttons or start shooting

**shoot\_off**(*self*)

Process mouse left up: Stop shooting

**defeat**(*self*)

Process game defeat: Return to main menu

**step**(*self*, *elapsedTime*)

Process time slice

**Parameters***elapsedTime*: elapsed time

### 3 Module event

#### 3.1 Variables

Name	Description
EVENT_WAVE_TIMER	<b>Value:</b> 0
EVENT_ENEMY	<b>Value:</b> 1
EVENT_DELAY	<b>Value:</b> 2
__package__	<b>Value:</b> None

#### 3.2 Class Event

Class Event represents game event such as enemy spawning, delay and new wave

##### 3.2.1 Methods

<b>init__</b> ( <i>self</i> , <i>type</i> , <i>object</i> )
Initialize event
<b>Parameters</b>
<i>type</i> : event type
<i>object</i> : event object

<b>getType</b> ( <i>self</i> )
Get type of event
<b>Return Value</b>
event type

<b>getObject</b> ( <i>self</i> )
Get event object
<b>Return Value</b>
event object

## 4 Module game

### 4.1 Variables

Name	Description
ALLOW_THREADS	Value: 1
BUFSIZE	Value: 8192
CLIP	Value: 0
COLOR_BLUE	Value: 1
COLOR_GREEN	Value: 2
COLOR_RED	Value: 0
ERR_CALL	Value: 3
ERR_DEFAULT	Value: 0
ERR_DEFAULT2	Value: 521
ERR_IGNORE	Value: 0
ERR_LOG	Value: 5
ERR_PRINT	Value: 4
ERR_RAISE	Value: 2
ERR_WARN	Value: 1
EVENT_DELAY	Value: 2
EVENT_ENEMY	Value: 1
EVENT_WAVE_TIMER	Value: 0
FLOATING_POINT_SUPPORT	Value: 1
FPE_DIVIDEBYZERO	Value: 1
FPE_INVALID	Value: 8
FPE_OVERFLOW	Value: 2
FPE_UNDERFLOW	Value: 4
False_	Value: False
Inf	Value: inf
Infinity	Value: inf
MAXDIMS	Value: 32
NAN	Value: nan
NINF	Value: -inf
NZERO	Value: -0.0
NaN	Value: nan
PINF	Value: inf
PZERO	Value: 0.0
RAISE	Value: 2
SHIFT_DIVIDEBYZERO	Value: 0
SHIFT_INVALID	Value: 9
SHIFT_OVERFLOW	Value: 3
SHIFT_UNDERFLOW	Value: 6
ScalarType	Value: (<type 'int'>, <type 'float'>, <type 'complex'>, <type 'l...)
True_	Value: True
UFUNC_BUFSIZE_DEFAULT	Value: 8192
UFUNC_PYVALS_NAME	Value: 'UFUNC_PYVALS'
WRAP	Value: 1
__package__	Value: None

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Name	Description
absolute	Value: <ufunc 'absolute'>
add	Value: <ufunc 'add'>
arccos	Value: <ufunc 'arccos'>
arccosh	Value: <ufunc 'arccosh'>
arcsin	Value: <ufunc 'arcsin'>
arcsinh	Value: <ufunc 'arcsinh'>
arctan	Value: <ufunc 'arctan'>
arctan2	Value: <ufunc 'arctan2'>
arctanh	Value: <ufunc 'arctanh'>
bitwise_and	Value: <ufunc 'bitwise_and'>
bitwise_not	Value: <ufunc 'invert'>
bitwise_or	Value: <ufunc 'bitwise_or'>
bitwise_xor	Value: <ufunc 'bitwise_xor'>
c_	Value: <numpy.lib.index_tricks.CClass object at 0x7f9b24d8bdd0>
cast	Value: {<type 'numpy.float64'>: <function <lambda> at 0x7f9b254c...>
ceil	Value: <ufunc 'ceil'>
conj	Value: <ufunc 'conjugate'>
conjugate	Value: <ufunc 'conjugate'>
copysign	Value: <ufunc 'copysign'>
cos	Value: <ufunc 'cos'>
cosh	Value: <ufunc 'cosh'>
deg2rad	Value: <ufunc 'deg2rad'>
degrees	Value: <ufunc 'degrees'>
divide	Value: <ufunc 'divide'>
e	Value: 2.71828182846
equal	Value: <ufunc 'equal'>
euler_gamma	Value: 0.577215664902
exp	Value: <ufunc 'exp'>
exp2	Value: <ufunc 'exp2'>
expm1	Value: <ufunc 'expm1'>
fabs	Value: <ufunc 'fabs'>
floor	Value: <ufunc 'floor'>
floor_divide	Value: <ufunc 'floor_divide'>
fmax	Value: <ufunc 'fmax'>
fmin	Value: <ufunc 'fmin'>
fmod	Value: <ufunc 'fmod'>
frexp	Value: <ufunc 'frexp'>
greater	Value: <ufunc 'greater'>
greater_equal	Value: <ufunc 'greater_equal'>
hypot	Value: <ufunc 'hypot'>
index_exp	Value: <numpy.lib.index_tricks.IndexExpression object at 0x7f9b2...>
inf	Value: inf
infty	Value: inf
invert	Value: <ufunc 'invert'>
isfinite	Value: <ufunc 'isfinite'>
isinf	Value: <ufunc 'isinf'>
isnan	Value: <ufunc 'isnan'>

*continued on next page*

Name	Description
ldexp	Value: <ufunc 'ldexp'>
left_shift	Value: <ufunc 'left_shift'>
less	Value: <ufunc 'less'>
less_equal	Value: <ufunc 'less_equal'>
little_endian	Value: True
log	Value: <ufunc 'log'>
log10	Value: <ufunc 'log10'>
log1p	Value: <ufunc 'log1p'>
log2	Value: <ufunc 'log2'>
logaddexp	Value: <ufunc 'logaddexp'>
logaddexp2	Value: <ufunc 'logaddexp2'>
logical_and	Value: <ufunc 'logical_and'>
logical_not	Value: <ufunc 'logical_not'>
logical_or	Value: <ufunc 'logical_or'>
logical_xor	Value: <ufunc 'logical_xor'>
maximum	Value: <ufunc 'maximum'>
mgrid	Value: <numpy.lib.index_tricks.nd_grid object at 0x7f9b24d8bb90>
minimum	Value: <ufunc 'minimum'>
mod	Value: <ufunc 'remainder'>
modf	Value: <ufunc 'modf'>
multiply	Value: <ufunc 'multiply'>
nan	Value: nan
nbytes	Value: {<type 'numpy.float64'>: 8, <type 'numpy.uint32'>: 4, <ty...
negative	Value: <ufunc 'negative'>
newaxis	Value: None
nextafter	Value: <ufunc 'nextafter'>
not_equal	Value: <ufunc 'not_equal'>
ogrid	Value: <numpy.lib.index_tricks.nd_grid object at 0x7f9b24d8bc90>
pi	Value: 3.14159265359
power	Value: <ufunc 'power'>
r_	Value: <numpy.lib.index_tricks.RClass object at 0x7f9b24d8bd10>
rad2deg	Value: <ufunc 'rad2deg'>
radians	Value: <ufunc 'radians'>
reciprocal	Value: <ufunc 'reciprocal'>
remainder	Value: <ufunc 'remainder'>
right_shift	Value: <ufunc 'right_shift'>
rint	Value: <ufunc 'rint'>
s_	Value: <numpy.lib.index_tricks.IndexExpression object at 0x7f9b2...
sctypeDict	Value: {0: <type 'numpy.bool_'>, 1: <type 'numpy.int8'>, 2: <typ...
sctypeNA	Value: {'?': 'Bool', 'B': 'UInt8', 'Bool': <type 'numpy.bool_'>,...
sctypes	Value: {'complex': [<type 'numpy.complex64'>, <type 'numpy.compl...
sign	Value: <ufunc 'sign'>

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Name	Description
signbit	Value: <ufunc 'signbit'>
sin	Value: <ufunc 'sin'>
sinh	Value: <ufunc 'sinh'>
spacing	Value: <ufunc 'spacing'>
sqrt	Value: <ufunc 'sqrt'>
square	Value: <ufunc 'square'>
subtract	Value: <ufunc 'subtract'>
tan	Value: <ufunc 'tan'>
tanh	Value: <ufunc 'tanh'>
true_divide	Value: <ufunc 'true_divide'>
trunc	Value: <ufunc 'trunc'>
typeDict	Value: {0: <type 'numpy.bool_'>, 1: <type 'numpy.int8'>, 2: <typ...
typeNA	Value: {'?': 'Bool', 'B': 'UInt8', 'Bool': <type 'numpy.bool_'>, ...
typecodes	Value: {'All': '?bhlqpBHILQPefdgFDGSUVOMm', 'AllFloat': 'efdgFD...

## 4.2 Class Game

Class Game represents and processes game logic

### 4.2.1 Methods

<b><code>__init__(self, engine)</code></b>
Initialize game
<b>Parameters</b>
<b>engine</b> : engine which calls this constructor
<b>Return Value</b>

<b><code>getFreeItems(self)</code></b>
Get flying items
<b>Return Value</b>
set of flying items

<b><code>getMainPlayer(self)</code></b>
Get player
<b>Return Value</b>
player

**getEnemies(*self*)**

Get all enemies

**Return Value**

set of enemies

**getBulls(*self*)**

Get all bullets

**Return Value**

set of bullets

**getSP(*self*)**

Get skill points

**Return Value**

skill points

**decSP(*self*)**

Decrease skill points

**getWaveTimerFlag(*self*)**

Get wave timer flag

**Return Value**

wave timer flag

**getWaveTimerTime(*self*)**

Get wave timer time

**Return Value**

wave timer time

**process(*self*, *elapsedTime*)**

Process game logic

**Parameters****elapsedTime:** elapsed time**move(*self*, *elapsedTime*, *direction*)**

Move player to direction

**Parameters****elapsedTime:** elapsed time**direction:** moving direction

**shoot**(*self*, *target*, *up*)

Shoot to target

**Parameters****target:** target**up:** camera up vector



## 5 Module glfont

Version: 1.8.2

### 5.1 Functions

<b>load_font</b> ( <i>filename, size</i> )
Load TrueType font from file
<b>Parameters</b>
<b>filename:</b> name of file
<b>size:</b> size of characters
<b>Return Value</b>
font

<b>render_text</b> ( <i>font, text, color, size</i> )
Render text to image
<b>Parameters</b>
<b>font:</b> font
<b>text:</b> text
<b>color:</b> text color
<b>size:</b> size of characters
<b>Return Value</b>
tuple: (height, width, image data)

### 5.2 Variables

Name	Description
ALLOW_THREADS	<b>Value:</b> 1
BUFSIZE	<b>Value:</b> 8192
CLIP	<b>Value:</b> 0
ERR_CALL	<b>Value:</b> 3
ERR_DEFAULT	<b>Value:</b> 0
ERR_DEFAULT2	<b>Value:</b> 521
ERR_IGNORE	<b>Value:</b> 0
ERR_LOG	<b>Value:</b> 5
ERR_PRINT	<b>Value:</b> 4
ERR_RAISE	<b>Value:</b> 2
ERR_WARN	<b>Value:</b> 1
FLOATING_POINT_SUPPORT	<b>Value:</b> 1
FPE_DIVIDEBYZERO	<b>Value:</b> 1
FPE_INVALID	<b>Value:</b> 8
FPE_OVERFLOW	<b>Value:</b> 2
FPE_UNDERFLOW	<b>Value:</b> 4

*continued on next page*

Name	Description
False_	Value: False
Inf	Value: inf
Infinity	Value: inf
MAXDIMS	Value: 32
NAN	Value: nan
NINF	Value: -inf
NZERO	Value: -0.0
NaN	Value: nan
PINF	Value: inf
PZERO	Value: 0.0
RAISE	Value: 2
SHIFT_DIVIDEBYZERO	Value: 0
SHIFT_INVALID	Value: 9
SHIFT_OVERFLOW	Value: 3
SHIFT_UNDERFLOW	Value: 6
ScalarType	Value: (<type 'int'>, <type 'float'>, <type 'complex'>, <type 'l...
True_	Value: True
UFUNC_BUFSIZE_DEFAULT	Value: 8192
UFUNC_PYVALS_NAME	Value: 'UFUNC_PYVALS'
WRAP	Value: 1
__package__	Value: None
absolute	Value: <ufunc 'absolute'>
add	Value: <ufunc 'add'>
arccos	Value: <ufunc 'arccos'>
arccosh	Value: <ufunc 'arccosh'>
arcsin	Value: <ufunc 'arcsin'>
arcsinh	Value: <ufunc 'arcsinh'>
arctan	Value: <ufunc 'arctan'>
arctan2	Value: <ufunc 'arctan2'>
arctanh	Value: <ufunc 'arctanh'>
bitwise_and	Value: <ufunc 'bitwise_and'>
bitwise_not	Value: <ufunc 'invert'>
bitwise_or	Value: <ufunc 'bitwise_or'>
bitwise_xor	Value: <ufunc 'bitwise_xor'>
c_	Value: <numpy.lib.index_tricks.CClass object at 0x7f9b24d8bdd0>
cast	Value: {<type 'numpy.float64'>: <function <lambda> at 0x7f9b254c...
ceil	Value: <ufunc 'ceil'>
conj	Value: <ufunc 'conjugate'>
conjugate	Value: <ufunc 'conjugate'>
copysign	Value: <ufunc 'copysign'>
cos	Value: <ufunc 'cos'>
cosh	Value: <ufunc 'cosh'>
deg2rad	Value: <ufunc 'deg2rad'>
degrees	Value: <ufunc 'degrees'>
divide	Value: <ufunc 'divide'>
e	Value: 2.71828182846

*continued on next page*

Name	Description
equal	Value: <ufunc 'equal'>
euler_gamma	Value: 0.577215664902
exp	Value: <ufunc 'exp'>
exp2	Value: <ufunc 'exp2'>
expm1	Value: <ufunc 'expm1'>
fabs	Value: <ufunc 'fabs'>
floor	Value: <ufunc 'floor'>
floor_divide	Value: <ufunc 'floor_divide'>
fmax	Value: <ufunc 'fmax'>
fmin	Value: <ufunc 'fmin'>
fmod	Value: <ufunc 'fmod'>
frexp	Value: <ufunc 'frexp'>
greater	Value: <ufunc 'greater'>
greater_equal	Value: <ufunc 'greater_equal'>
hypot	Value: <ufunc 'hypot'>
index_exp	Value: <numpy.lib.index_tricks.IndexExpression object at 0x7f9b2...>
inf	Value: inf
infty	Value: inf
invert	Value: <ufunc 'invert'>
isfinite	Value: <ufunc 'isfinite'>
isinf	Value: <ufunc 'isinf'>
isnan	Value: <ufunc 'isnan'>
ldexp	Value: <ufunc 'ldexp'>
left_shift	Value: <ufunc 'left_shift'>
less	Value: <ufunc 'less'>
less_equal	Value: <ufunc 'less_equal'>
little_endian	Value: True
log	Value: <ufunc 'log'>
log10	Value: <ufunc 'log10'>
log1p	Value: <ufunc 'log1p'>
log2	Value: <ufunc 'log2'>
logaddexp	Value: <ufunc 'logaddexp'>
logaddexp2	Value: <ufunc 'logaddexp2'>
logical_and	Value: <ufunc 'logical_and'>
logical_not	Value: <ufunc 'logical_not'>
logical_or	Value: <ufunc 'logical_or'>
logical_xor	Value: <ufunc 'logical_xor'>
maximum	Value: <ufunc 'maximum'>
mgrid	Value: <numpy.lib.index_tricks.nd_grid object at 0x7f9b24d8bb90>
minimum	Value: <ufunc 'minimum'>
mod	Value: <ufunc 'remainder'>
modf	Value: <ufunc 'modf'>
multiply	Value: <ufunc 'multiply'>
nan	Value: nan
nbytes	Value: {<type 'numpy.float64'>: 8, <type 'numpy.uint32'>: 4, <ty...
negative	Value: <ufunc 'negative'>
newaxis	Value: None

*continued on next page*

Name	Description
nextafter	Value: <ufunc 'nextafter'>
not_equal	Value: <ufunc 'not_equal'>
ogrid	Value: <numpy.lib.index_tricks.nd_grid object at 0x7f9b24d8bc90>
pi	Value: 3.14159265359
power	Value: <ufunc 'power'>
r_	Value: <numpy.lib.index_tricks.RClass object at 0x7f9b24d8bd10>
rad2deg	Value: <ufunc 'rad2deg'>
radians	Value: <ufunc 'radians'>
reciprocal	Value: <ufunc 'reciprocal'>
remainder	Value: <ufunc 'remainder'>
right_shift	Value: <ufunc 'right_shift'>
rint	Value: <ufunc 'rint'>
s_	Value: <numpy.lib.index_tricks.IndexExpression object at 0x7f9b2...
sctypeDict	Value: {0: <type 'numpy.bool_'>, 1: <type 'numpy.int8'>, 2: <typ...
sctypeNA	Value: {'?': 'Bool', 'B': 'UInt8', 'Bool': <type 'numpy.bool_'>,...
sctypes	Value: {'complex': [<type 'numpy.complex64'>, <type 'numpy.compl...
sign	Value: <ufunc 'sign'>
signbit	Value: <ufunc 'signbit'>
sin	Value: <ufunc 'sin'>
sinh	Value: <ufunc 'sinh'>
spacing	Value: <ufunc 'spacing'>
sqrt	Value: <ufunc 'sqrt'>
square	Value: <ufunc 'square'>
subtract	Value: <ufunc 'subtract'>
tan	Value: <ufunc 'tan'>
tanh	Value: <ufunc 'tanh'>
true_divide	Value: <ufunc 'true_divide'>
trunc	Value: <ufunc 'trunc'>
typeDict	Value: {0: <type 'numpy.bool_'>, 1: <type 'numpy.int8'>, 2: <typ...
typeNA	Value: {'?': 'Bool', 'B': 'UInt8', 'Bool': <type 'numpy.bool_'>,...
typecodes	Value: {'All': '?bhilqpBHILQPefdgFDGSUVOMm', 'AllFloat': 'efdgFD...

## 6 Module glfw

Python bindings for GLFW.

**Version:** 1.0.1

**Author:** Florian Rhiem (florian.rhiem@gmail.com)

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**License:** MIT

### 6.1 Functions

#### `init()`

Initializes the GLFW library.

Wrapper for:  
`int glfwInit(void);`

#### `terminate()`

Terminates the GLFW library.

Wrapper for:  
`void glfwTerminate(void);`

#### `get_version()`

Retrieves the version of the GLFW library.

Wrapper for:  
`void glfwGetVersion(int* major, int* minor, int* rev);`

#### `get_version_string()`

Returns a string describing the compile-time configuration.

Wrapper for:  
`const char* glfwGetVersionString(void);`

---

**set\_error\_callback**(*cbfun*)

Sets the error callback.

Wrapper for:

```
GLFWerrorfun glfwSetErrorCallback(GLFWerrorfun cbfun);
```

---

**get\_monitors**()

Returns the currently connected monitors.

Wrapper for:

```
GLFWmonitor** glfwGetMonitors(int* count);
```

---

**get\_primary\_monitor**()

Returns the primary monitor.

Wrapper for:

```
GLFWmonitor* glfwGetPrimaryMonitor(void);
```

---

**get\_monitor\_pos**(*monitor*)

Returns the position of the monitor's viewport on the virtual screen.

Wrapper for:

```
void glfwGetMonitorPos(GLFWmonitor* monitor, int* xpos, int* ypos);
```

---

**get\_monitor\_physical\_size**(*monitor*)

Returns the physical size of the monitor.

Wrapper for:

```
void glfwGetMonitorPhysicalSize(GLFWmonitor* monitor, int* width, int* height);
```

---

**get\_monitor\_name**(*monitor*)

Returns the name of the specified monitor.

Wrapper for:

```
const char* glfwGetMonitorName(GLFWmonitor* monitor);
```

---

**set\_monitor\_callback**(*cbfun*)

Sets the monitor configuration callback.

Wrapper for:

```
GLFWmonitorfun glfwSetMonitorCallback(GLFWmonitorfun cbfun);
```

---

**get\_video\_modes**(*monitor*)

Returns the available video modes for the specified monitor.

Wrapper for:

```
const GLFWvidmode* glfwGetVideoModes(GLFWmonitor* monitor, int* count);
```

---

**get\_video\_mode**(*monitor*)

Returns the current mode of the specified monitor.

Wrapper for:

```
const GLFWvidmode* glfwGetVideoMode(GLFWmonitor* monitor);
```

---

**set\_gamma**(*monitor*, *gamma*)

Generates a gamma ramp and sets it for the specified monitor.

Wrapper for:

```
void glfwSetGamma(GLFWmonitor* monitor, float gamma);
```

---

**get\_gamma\_ramp**(*monitor*)

Retrieves the current gamma ramp for the specified monitor.

Wrapper for:

```
const GLFWgammaramp* glfwGetGammaRamp(GLFWmonitor* monitor);
```

---

**set\_gamma\_ramp**(*monitor*, *ramp*)

Sets the current gamma ramp for the specified monitor.

Wrapper for:

```
void glfwSetGammaRamp(GLFWmonitor* monitor, const GLFWgammaramp* ramp);
```

**default\_\_window\_\_hints()**

Resets all window hints to their default values.

Wrapper for:

```
void glfwDefaultWindowHints(void);
```

**window\_\_hint(*target*, *hint*)**

Sets the specified window hint to the desired value.

Wrapper for:

```
void glfwWindowHint(int target, int hint);
```

**create\_\_window(*width*, *height*, *title*, *monitor*, *share*)**

Creates a window and its associated context.

Wrapper for:

```
GLFWwindow* glfwCreateWindow(int width, int height, const char* title, GLFWmonitor* monitor, GLFWwindow* share);
```

**destroy\_\_window(*window*)**

Destroys the specified window and its context.

Wrapper for:

```
void glfwDestroyWindow(GLFWwindow* window);
```

**window\_\_should\_\_close(*window*)**

Checks the close flag of the specified window.

Wrapper for:

```
int glfwWindowShouldClose(GLFWwindow* window);
```

**set\_\_window\_\_should\_\_close(*window*, *value*)**

Sets the close flag of the specified window.

Wrapper for:

```
void glfwSetWindowShouldClose(GLFWwindow* window, int value);
```



---

**set\_window\_title**(*window*, *title*)

Sets the title of the specified window.

Wrapper for:

```
void glfwSetWindowTitle(GLFWwindow* window, const char* title);
```

---

**get\_window\_pos**(*window*)

Retrieves the position of the client area of the specified window.

Wrapper for:

```
void glfwGetWindowPos(GLFWwindow* window, int* xpos, int* ypos);
```

---

**set\_window\_pos**(*window*, *xpos*, *ypos*)

Sets the position of the client area of the specified window.

Wrapper for:

```
void glfwSetWindowPos(GLFWwindow* window, int xpos, int ypos);
```

---

**get\_window\_size**(*window*)

Retrieves the size of the client area of the specified window.

Wrapper for:

```
void glfwGetWindowSize(GLFWwindow* window, int* width, int* height);
```

---

**set\_window\_size**(*window*, *width*, *height*)

Sets the size of the client area of the specified window.

Wrapper for:

```
void glfwSetWindowSize(GLFWwindow* window, int width, int height);
```

---

**get\_framebuffer\_size**(*window*)

Retrieves the size of the framebuffer of the specified window.

Wrapper for:

```
void glfwGetFramebufferSize(GLFWwindow* window, int* width, int* height);
```

**iconify\_\_window**(*window*)

Iconifies the specified window.

Wrapper for:

```
void glfwIconifyWindow(GLFWwindow* window);
```

**restore\_\_window**(*window*)

Restores the specified window.

Wrapper for:

```
void glfwRestoreWindow(GLFWwindow* window);
```

**show\_\_window**(*window*)

Makes the specified window visible.

Wrapper for:

```
void glfwShowWindow(GLFWwindow* window);
```

**hide\_\_window**(*window*)

Hides the specified window.

Wrapper for:

```
void glfwHideWindow(GLFWwindow* window);
```

**get\_\_window\_\_monitor**(*window*)

Returns the monitor that the window uses for full screen mode.

Wrapper for:

```
GLFWmonitor* glfwGetWindowMonitor(GLFWwindow* window);
```

**get\_\_window\_\_attrib**(*window*, *attrib*)

Returns an attribute of the specified window.

Wrapper for:

```
int glfwGetWindowAttrib(GLFWwindow* window, int attrib);
```

---

**set\_window\_user\_pointer**(*window*, *pointer*)

Sets the user pointer of the specified window.

Wrapper for:

```
void glfwSetWindowUserPointer(GLFWwindow* window, void* pointer);
```

---

**get\_window\_user\_pointer**(*window*)

Returns the user pointer of the specified window.

Wrapper for:

```
void* glfwGetWindowUserPointer(GLFWwindow* window);
```

---

**set\_window\_pos\_callback**(*window*, *cbfun*)

Sets the position callback for the specified window.

Wrapper for:

```
GLFWwindowposfun glfwSetWindowPosCallback(GLFWwindow* window, GLFWwindowposfun cbfun);
```

---

**set\_window\_size\_callback**(*window*, *cbfun*)

Sets the size callback for the specified window.

Wrapper for:

```
GLFWwindowssizefun glfwSetWindowSizeCallback(GLFWwindow* window, GLFWwindowssizefun cbfun);
```

---

**set\_window\_close\_callback**(*window*, *cbfun*)

Sets the close callback for the specified window.

Wrapper for:

```
GLFWwindowclosefun glfwSetWindowCloseCallback(GLFWwindow* window, GLFWwindowclosefun cbfun);
```

---

**set\_window\_refresh\_callback**(*window*, *cbfun*)

Sets the refresh callback for the specified window.

Wrapper for:

```
GLFWwindowrefreshfun glfwSetWindowRefreshCallback(GLFWwindow* window, GLFWwindowrefreshfun cbfun);
```

---

**set\_window\_focus\_callback**(*window*, *cbfun*)

Sets the focus callback for the specified window.

Wrapper for:

```
GLFWwindowfocusfun glfwSetWindowFocusCallback(GLFWwindow* window, GLFWwindowfocusfun cbfun);
```

---

**set\_window\_iconify\_callback**(*window*, *cbfun*)

Sets the iconify callback for the specified window.

Wrapper for:

```
GLFWwindowiconifyfun glfwSetWindowIconifyCallback(GLFWwindow* window, GLFWwindowiconifyfun cbfun);
```

---

**set\_framebuffer\_size\_callback**(*window*, *cbfun*)

Sets the framebuffer resize callback for the specified window.

Wrapper for:

```
GLFWframebuffersizefun glfwSetFramebufferSizeCallback(GLFWwindow* window, GLFWframebuffersizefun cbfun);
```

---

**poll\_events**()

Processes all pending events.

Wrapper for:

```
void glfwPollEvents(void);
```

---

**wait\_events**()

Waits until events are pending and processes them.

Wrapper for:

```
void glfwWaitEvents(void);
```

---

**get\_input\_mode**(*window*, *mode*)

Returns the value of an input option for the specified window.

Wrapper for:

```
int glfwGetInputMode(GLFWwindow* window, int mode);
```

---

**set\_input\_mode**(*window, mode, value*)

Sets an input option for the specified window.

@param[in] window The window whose input mode to set.

@param[in] mode One of 'GLFW\_CURSOR', 'GLFW\_STICKY\_KEYS' or 'GLFW\_STICKY\_MOUSE\_BUTTONS'.

@param[in] value The new value of the specified input mode.

Wrapper for:

```
void glfwSetInputMode(GLFWwindow* window, int mode, int value);
```

---

**get\_key**(*window, key*)

Returns the last reported state of a keyboard key for the specified window.

Wrapper for:

```
int glfwGetKey(GLFWwindow* window, int key);
```

---

**get\_mouse\_button**(*window, button*)

Returns the last reported state of a mouse button for the specified window.

Wrapper for:

```
int glfwGetMouseButton(GLFWwindow* window, int button);
```

---

**get\_cursor\_pos**(*window*)

Retrieves the last reported cursor position, relative to the client area of the window.

Wrapper for:

```
void glfwGetCursorPos(GLFWwindow* window, double* xpos, double* ypos);
```

---

**set\_cursor\_pos**(*window, xpos, ypos*)

Sets the position of the cursor, relative to the client area of the window.

Wrapper for:

```
void glfwSetCursorPos(GLFWwindow* window, double xpos, double ypos);
```

```
set_key_callback(window, cbfun)
```

Sets the key callback.

Wrapper for:

```
GLFWkeyfun glfwSetKeyCallback(GLFWwindow* window, GLFWkeyfun cbfun);
```

```
set_char_callback(window, cbfun)
```

Sets the Unicode character callback.

Wrapper for:

```
GLFWcharfun glfwSetCharCallback(GLFWwindow* window, GLFWcharfun cbfun);
```

```
set_mouse_button_callback(window, cbfun)
```

Sets the mouse button callback.

Wrapper for:

```
GLFWmousebuttonfun glfwSetMouseButtonCallback(GLFWwindow* window, GLFWmousebuttonfun cbfun);
```

```
set_cursor_pos_callback(window, cbfun)
```

Sets the cursor position callback.

Wrapper for:

```
GLFWcursorposfun glfwSetCursorPosCallback(GLFWwindow* window, GLFWcursorposfun cbfun);
```

```
set_cursor_enter_callback(window, cbfun)
```

Sets the cursor enter/exit callback.

Wrapper for:

```
GLFWcursorenterfun glfwSetCursorEnterCallback(GLFWwindow* window, GLFWcursorenterfun cbfun);
```

```
set_scroll_callback(window, cbfun)
```

Sets the scroll callback.

Wrapper for:

```
GLFWscrollfun glfwSetScrollCallback(GLFWwindow* window, GLFWscrollfun cbfun);
```

**joystick\_present(*joy*)**

Returns whether the specified joystick is present.

Wrapper for:

```
int glfwJoystickPresent(int joy);
```

**get\_joystick\_axes(*joy*)**

Returns the values of all axes of the specified joystick.

Wrapper for:

```
const float* glfwGetJoystickAxes(int joy, int* count);
```

**get\_joystick\_buttons(*joy*)**

Returns the state of all buttons of the specified joystick.

Wrapper for:

```
const unsigned char* glfwGetJoystickButtons(int joy, int* count);
```

**get\_joystick\_name(*joy*)**

Returns the name of the specified joystick.

Wrapper for:

```
const char* glfwGetJoystickName(int joy);
```

**set\_clipboard\_string(*window*, *string*)**

Sets the clipboard to the specified string.

Wrapper for:

```
void glfwSetClipboardString(GLFWwindow* window, const char* string);
```

**get\_clipboard\_string(*window*)**

Retrieves the contents of the clipboard as a string.

Wrapper for:

```
const char* glfwGetClipboardString(GLFWwindow* window);
```

**get\_time()**

Returns the value of the GLFW timer.

Wrapper for:

```
double glfwGetTime(void);
```

**set\_time(*time*)**

Sets the GLFW timer.

Wrapper for:

```
void glfwSetTime(double time);
```

**make\_context\_current(*window*)**

Makes the context of the specified window current for the calling thread.

Wrapper for:

```
void glfwMakeContextCurrent(GLFWwindow* window);
```

**get\_current\_context()**

Returns the window whose context is current on the calling thread.

Wrapper for:

```
GLFWwindow* glfwGetCurrentContext(void);
```

**swap\_buffers(*window*)**

Swaps the front and back buffers of the specified window.

Wrapper for:

```
void glfwSwapBuffers(GLFWwindow* window);
```

**swap\_interval(*interval*)**

Sets the swap interval for the current context.

Wrapper for:

```
void glfwSwapInterval(int interval);
```



**extension\_supported**(*extension*)

Returns whether the specified extension is available.

Wrapper for:

```
int glfwExtensionSupported(const char* extension);
```

**get\_proc\_address**(*procname*)

Returns the address of the specified function for the current context.

Wrapper for:

```
GLFWglproc glfwGetProcAddress(const char* procname);
```

## 6.2 Variables

Name	Description
VERSION__MAJOR	Value: 3
VERSION__MINOR	Value: 0
VERSION__REVISION	Value: 3
RELEASE	Value: 0
PRESS	Value: 1
REPEAT	Value: 2
KEY__UNKNOWN	Value: -1
KEY__SPACE	Value: 32
KEY__APOSTROPHE	Value: 39
KEY__COMMA	Value: 44
KEY__MINUS	Value: 45
KEY__PERIOD	Value: 46
KEY__SLASH	Value: 47
KEY__0	Value: 48
KEY__1	Value: 49
KEY__2	Value: 50
KEY__3	Value: 51
KEY__4	Value: 52
KEY__5	Value: 53
KEY__6	Value: 54
KEY__7	Value: 55
KEY__8	Value: 56
KEY__9	Value: 57
KEY__SEMICOLON	Value: 59
KEY__EQUAL	Value: 61
KEY__A	Value: 65
KEY__B	Value: 66
KEY__C	Value: 67
KEY__D	Value: 68

*continued on next page*

Name	Description
KEY_E	Value: 69
KEY_F	Value: 70
KEY_G	Value: 71
KEY_H	Value: 72
KEY_I	Value: 73
KEY_J	Value: 74
KEY_K	Value: 75
KEY_L	Value: 76
KEY_M	Value: 77
KEY_N	Value: 78
KEY_O	Value: 79
KEY_P	Value: 80
KEY_Q	Value: 81
KEY_R	Value: 82
KEY_S	Value: 83
KEY_T	Value: 84
KEY_U	Value: 85
KEY_V	Value: 86
KEY_W	Value: 87
KEY_X	Value: 88
KEY_Y	Value: 89
KEY_Z	Value: 90
KEY_LEFT_BRACKET	Value: 91
KEY_BACKSLASH	Value: 92
KEY_RIGHT_BRACKET	Value: 93
KEY_GRAVE_ACCENT	Value: 96
KEY_WORLD_1	Value: 161
KEY_WORLD_2	Value: 162
KEY_ESCAPE	Value: 256
KEY_ENTER	Value: 257
KEY_TAB	Value: 258
KEY_BACKSPACE	Value: 259
KEY_INSERT	Value: 260
KEY_DELETE	Value: 261
KEY_RIGHT	Value: 262
KEY_LEFT	Value: 263
KEY_DOWN	Value: 264
KEY_UP	Value: 265
KEY_PAGE_UP	Value: 266
KEY_PAGE_DOWN	Value: 267
KEY_HOME	Value: 268
KEY_END	Value: 269
KEY_CAPS_LOCK	Value: 280
KEY_SCROLL_LOCK	Value: 281
KEY_NUM_LOCK	Value: 282
KEY_PRINT_SCREEN	Value: 283
KEY_PAUSE	Value: 284
KEY_F1	Value: 290
KEY_F2	Value: 291
KEY_F3	Value: 292

*continued on next page*

Name	Description
KEY_F4	Value: 293
KEY_F5	Value: 294
KEY_F6	Value: 295
KEY_F7	Value: 296
KEY_F8	Value: 297
KEY_F9	Value: 298
KEY_F10	Value: 299
KEY_F11	Value: 300
KEY_F12	Value: 301
KEY_F13	Value: 302
KEY_F14	Value: 303
KEY_F15	Value: 304
KEY_F16	Value: 305
KEY_F17	Value: 306
KEY_F18	Value: 307
KEY_F19	Value: 308
KEY_F20	Value: 309
KEY_F21	Value: 310
KEY_F22	Value: 311
KEY_F23	Value: 312
KEY_F24	Value: 313
KEY_F25	Value: 314
KEY_KP_0	Value: 320
KEY_KP_1	Value: 321
KEY_KP_2	Value: 322
KEY_KP_3	Value: 323
KEY_KP_4	Value: 324
KEY_KP_5	Value: 325
KEY_KP_6	Value: 326
KEY_KP_7	Value: 327
KEY_KP_8	Value: 328
KEY_KP_9	Value: 329
KEY_KP_DECIMAL	Value: 330
KEY_KP_DIVIDE	Value: 331
KEY_KP_MULTIPLY	Value: 332
KEY_KP_SUBTRACT	Value: 333
KEY_KP_ADD	Value: 334
KEY_KP_ENTER	Value: 335
KEY_KP_EQUAL	Value: 336
KEY_LEFT_SHIFT	Value: 340
KEY_LEFT_CONTROL	Value: 341
KEY_LEFT_ALT	Value: 342
KEY_LEFT_SUPER	Value: 343
KEY_RIGHT_SHIFT	Value: 344
KEY_RIGHT_CONTROL	Value: 345
KEY_RIGHT_ALT	Value: 346
KEY_RIGHT_SUPER	Value: 347
KEY_MENU	Value: 348
KEY_LAST	Value: 348
MOD_SHIFT	Value: 1

*continued on next page*

Name	Description
MOD_CONTROL	Value: 2
MOD_ALT	Value: 4
MOD_SUPER	Value: 8
MOUSE_BUTTON_1	Value: 0
MOUSE_BUTTON_2	Value: 1
MOUSE_BUTTON_3	Value: 2
MOUSE_BUTTON_4	Value: 3
MOUSE_BUTTON_5	Value: 4
MOUSE_BUTTON_6	Value: 5
MOUSE_BUTTON_7	Value: 6
MOUSE_BUTTON_8	Value: 7
MOUSE_BUTTON_LAST	Value: 7
MOUSE_BUTTON_LEFT	Value: 0
MOUSE_BUTTON_RIGHT	Value: 1
MOUSE_BUTTON_MIDDLE	Value: 2
JOYSTICK_1	Value: 0
JOYSTICK_2	Value: 1
JOYSTICK_3	Value: 2
JOYSTICK_4	Value: 3
JOYSTICK_5	Value: 4
JOYSTICK_6	Value: 5
JOYSTICK_7	Value: 6
JOYSTICK_8	Value: 7
JOYSTICK_9	Value: 8
JOYSTICK_10	Value: 9
JOYSTICK_11	Value: 10
JOYSTICK_12	Value: 11
JOYSTICK_13	Value: 12
JOYSTICK_14	Value: 13
JOYSTICK_15	Value: 14
JOYSTICK_16	Value: 15
JOYSTICK_LAST	Value: 15
NOT_INITIALIZED	Value: 65537
NO_CURRENT_CONTEXT	Value: 65538
INVALID_ENUM	Value: 65539
INVALID_VALUE	Value: 65540
OUT_OF_MEMORY	Value: 65541
API_UNAVAILABLE	Value: 65542
VERSION_UNAVAILABLE	Value: 65543
PLATFORM_ERROR	Value: 65544
FORMAT_UNAVAILABLE	Value: 65545
FOCUSED	Value: 131073
ICONIFIED	Value: 131074
RESIZABLE	Value: 131075
VISIBLE	Value: 131076
DECORATED	Value: 131077
RED_BITS	Value: 135169
GREEN_BITS	Value: 135170
BLUE_BITS	Value: 135171
ALPHA_BITS	Value: 135172

*continued on next page*

Name	Description
DEPTH_BITS	Value: 135173
STENCIL_BITS	Value: 135174
ACCUM_RED_BITS	Value: 135175
ACCUM_GREEN_BITS	Value: 135176
ACCUM_BLUE_BITS	Value: 135177
ACCUM_ALPHA_BITS	Value: 135178
AUX_BUFFERS	Value: 135179
STEREO	Value: 135180
SAMPLES	Value: 135181
SRGB_CAPABLE	Value: 135182
REFRESH_RATE	Value: 135183
CLIENT_API	Value: 139265
CONTEXT_VERSION_MAJOR	Value: 139266
CONTEXT_VERSION_MINOR	Value: 139267
CONTEXT_REVISION	Value: 139268
CONTEXT_ROBUSTNESS	Value: 139269
OPENGGL_FORWARD_COMPAT	Value: 139270
OPENGGL_DEBUG_CONTEXT	Value: 139271
OPENGGL_PROFILE	Value: 139272
OPENGGL_API	Value: 196609
OPENGGL_ES_API	Value: 196610
NO_ROBUSTNESS	Value: 0
NO_RESET_NOTIFICATION	Value: 200705
LOSE_CONTEXT_ON_RESET	Value: 200706
OPENGGL_ANY_PROFILE	Value: 0
OPENGGL_CORE_PROFILE	Value: 204801
OPENGGL_COMPAT_PROFILE	Value: 204802
CURSOR	Value: 208897
STICKY_KEYS	Value: 208898
STICKY_MOUSE_BUTTONS	Value: 208899
CURSOR_NORMAL	Value: 212993
CURSOR_HIDDEN	Value: 212994
CURSOR_DISABLED	Value: 212995
CONNECTED	Value: 262145
DISCONNECTED	Value: 262146
__package__	Value: None

## 7 Module gobject

Version: 1.8.2

### 7.1 Variables

Name	Description
ALLOW_THREADS	Value: 1
BUFSIZE	Value: 8192
CLIP	Value: 0
COLOR_LOCATION	Value: 31
ERR_CALL	Value: 3
ERR_DEFAULT	Value: 0
ERR_DEFAULT2	Value: 521
ERR_IGNORE	Value: 0
ERR_LOG	Value: 5
ERR_PRINT	Value: 4
ERR_RAISE	Value: 2
ERR_WARN	Value: 1
FLOATING_POINT_SUPPORT	Value: 1
FPE_DIVIDEBYZERO	Value: 1
FPE_INVALID	Value: 8
FPE_OVERFLOW	Value: 2
FPE_UNDERFLOW	Value: 4
False_	Value: False
Inf	Value: inf
Infinity	Value: inf
LIGHTING_FLAG_LOCATION	Value: 32
MAXDIMS	Value: 32
MODEL_MATRIX_LOCATION	Value: 13
NAN	Value: nan
NINF	Value: -inf
NORMAL_LOCATION	Value: 1
NORMAL_MATRIX_LOCATION	Value: 21
NZERO	Value: -0.0
NaN	Value: nan
PINF	Value: inf
POSITION_LOCATION	Value: 0
PROJECTION_MATRIX_LOCATION	Value: 25
PZERO	Value: 0.0
RAISE	Value: 2
SHIFT_DIVIDEBYZERO	Value: 0
SHIFT_INVALID	Value: 9
SHIFT_OVERFLOW	Value: 3
SHIFT_UNDERFLOW	Value: 6

*continued on next page*

Name	Description
ScalarType	Value: (<type 'int'>, <type 'float'>, <type 'complex'>, <type 'l...
TEXTURE_FLAG_LOCATION	Value: 30
TEXTURE_LOCATION	Value: 2
TEXTURE_SAMPLER_LOCATION	Value: 29
True_	Value: True
UFUNC_BUFSIZE_DEFAULT	Value: 8192
UFUNC_PYVALS_NAME	Value: 'UFUNC_PYVALS'
VIEW_MATRIX_LOCATION	Value: 17
WRAP	Value: 1
__package__	Value: None
absolute	Value: <ufunc 'absolute'>
add	Value: <ufunc 'add'>
arccos	Value: <ufunc 'arccos'>
arccosh	Value: <ufunc 'arccosh'>
arcsin	Value: <ufunc 'arcsin'>
arcsinh	Value: <ufunc 'arcsinh'>
arctan	Value: <ufunc 'arctan'>
arctan2	Value: <ufunc 'arctan2'>
arctanh	Value: <ufunc 'arctanh'>
bitwise_and	Value: <ufunc 'bitwise_and'>
bitwise_not	Value: <ufunc 'invert'>
bitwise_or	Value: <ufunc 'bitwise_or'>
bitwise_xor	Value: <ufunc 'bitwise_xor'>
c_	Value: <numpy.lib.index_tricks.CClass object at 0x7f9b24d8bdd0>
ceil	Value: <ufunc 'ceil'>
conj	Value: <ufunc 'conjugate'>
conjugate	Value: <ufunc 'conjugate'>
copysign	Value: <ufunc 'copysign'>
cos	Value: <ufunc 'cos'>
cosh	Value: <ufunc 'cosh'>
deg2rad	Value: <ufunc 'deg2rad'>
degrees	Value: <ufunc 'degrees'>
divide	Value: <ufunc 'divide'>
e	Value: 2.71828182846
equal	Value: <ufunc 'equal'>
euler_gamma	Value: 0.577215664902
exp	Value: <ufunc 'exp'>
exp2	Value: <ufunc 'exp2'>
expm1	Value: <ufunc 'expm1'>
fabs	Value: <ufunc 'fabs'>
floor	Value: <ufunc 'floor'>
floor_divide	Value: <ufunc 'floor_divide'>
fmax	Value: <ufunc 'fmax'>
fmin	Value: <ufunc 'fmin'>

*continued on next page*

Name	Description
fmod	Value: <ufunc 'fmod'>
frexp	Value: <ufunc 'frexp'>
greater	Value: <ufunc 'greater'>
greater_equal	Value: <ufunc 'greater_equal'>
hypot	Value: <ufunc 'hypot'>
index_exp	Value: <numpy.lib.index_tricks.IndexExpression object at 0x7f9b2...
inf	Value: inf
infty	Value: inf
invert	Value: <ufunc 'invert'>
isfinite	Value: <ufunc 'isfinite'>
isinf	Value: <ufunc 'isinf'>
isnan	Value: <ufunc 'isnan'>
ldexp	Value: <ufunc 'ldexp'>
left_shift	Value: <ufunc 'left_shift'>
less	Value: <ufunc 'less'>
less_equal	Value: <ufunc 'less_equal'>
little_endian	Value: True
log	Value: <ufunc 'log'>
log10	Value: <ufunc 'log10'>
log1p	Value: <ufunc 'log1p'>
log2	Value: <ufunc 'log2'>
logaddexp	Value: <ufunc 'logaddexp'>
logaddexp2	Value: <ufunc 'logaddexp2'>
logical_and	Value: <ufunc 'logical_and'>
logical_not	Value: <ufunc 'logical_not'>
logical_or	Value: <ufunc 'logical_or'>
logical_xor	Value: <ufunc 'logical_xor'>
maximum	Value: <ufunc 'maximum'>
mgrid	Value: <numpy.lib.index_tricks.nd_grid object at 0x7f9b24d8bb90>
minimum	Value: <ufunc 'minimum'>
mod	Value: <ufunc 'remainder'>
modf	Value: <ufunc 'modf'>
multiply	Value: <ufunc 'multiply'>
nan	Value: nan
nbytes	Value: {<type 'numpy.float64'>: 8, <type 'numpy.uint32'>: 4, <ty...
negative	Value: <ufunc 'negative'>
newaxis	Value: None
nextafter	Value: <ufunc 'nextafter'>
not_equal	Value: <ufunc 'not_equal'>
ogrid	Value: <numpy.lib.index_tricks.nd_grid object at 0x7f9b24d8bc90>
pi	Value: 3.14159265359
power	Value: <ufunc 'power'>
r_	Value: <numpy.lib.index_tricks.RClass object at 0x7f9b24d8bd10>
rad2deg	Value: <ufunc 'rad2deg'>
radians	Value: <ufunc 'radians'>

*continued on next page*



Name	Description
reciprocal	Value: <ufunc 'reciprocal'>
remainder	Value: <ufunc 'remainder'>
right_shift	Value: <ufunc 'right_shift'>
rint	Value: <ufunc 'rint'>
s_	Value: <numpy.lib.index_tricks.IndexExpression object at 0x7f9b2...
sctypeDict	Value: {0: <type 'numpy.bool_'>, 1: <type 'numpy.int8'>, 2: <typ...
sctypeNA	Value: {'?': 'Bool', 'B': 'UInt8', 'Bool': <type 'numpy.bool_'>,...
sctypes	Value: {'complex': [<type 'numpy.complex64'>, <type 'numpy.compl...
sign	Value: <ufunc 'sign'>
signbit	Value: <ufunc 'signbit'>
sin	Value: <ufunc 'sin'>
sinh	Value: <ufunc 'sinh'>
spacing	Value: <ufunc 'spacing'>
sqrt	Value: <ufunc 'sqrt'>
square	Value: <ufunc 'square'>
subtract	Value: <ufunc 'subtract'>
tan	Value: <ufunc 'tan'>
tanh	Value: <ufunc 'tanh'>
true_divide	Value: <ufunc 'true_divide'>
trunc	Value: <ufunc 'trunc'>
typeDict	Value: {0: <type 'numpy.bool_'>, 1: <type 'numpy.int8'>, 2: <typ...
typeNA	Value: {'?': 'Bool', 'B': 'UInt8', 'Bool': <type 'numpy.bool_'>,...
typecodes	Value: {'All': '?bhilqpBHILQPefdgFDGSUVOMm', 'AllFloat': 'efdgFD...

## 7.2 Class VertexData

Class VertexData represents vertex. Vertex three parameters: position, normal and texture coordinates

### 7.2.1 Methods

<b>__init__</b> ( <i>self</i> )
Initialize vertex data

## 7.3 Class GLObject

**Known Subclasses:** objectcube.objectCube, objectquad.objectQuad

GLObject represents OpenGL-drawable object. GLObject contains set of points and set of it's indices for all triangles of the object. Also GLObject have Vertex Array Object and Vertex Buffer Objects.

### 7.3.1 Methods

<b><code>__init__</code></b> ( <i>self</i> )
--

Initialize <i>GLObject</i>
----------------------------

<b><code>draw</code></b> ( <i>self</i> )
--

Draw object
-------------

<b><code>initGLBuffers</code></b> ( <i>self</i> )
---

Initialize Vertex Array Object and Vertex Buffer Objects and fill them with data from <i>pData</i> and <i>pIndices</i>
--

<b><code>release</code></b> ( <i>self</i> )
---

Delete Vertex Array Object and Vertex Buffer Objects
--

## 8 Module *glutils*

Version: 1.8.2

### 8.1 Functions

**dist**( $x, y$ )

Calculate  $\text{dist}^2$  between two points

**Parameters**

**x**: first point

**y**: second point

**Return Value**

$\text{distance}^2$

**comparer**( $pos$ )

Return comparator for points

**Parameters**

**pos**: center position

**mul**( $a, b$ )

Multiply two matrices represented in transposed form

**Parameters**

**a**: first matrix

**b**: second matrix

**Return Value**

$a * b$

**mul\_v**( $a, b$ )

Multiply matrix represented in transposed form on vector

**Parameters**

**a**: matrix

**b**: vector

**Return Value**

$\text{matrix} * \text{vector}$

**v3\_v4**( $a$ )

Transform 3D vector to 4D vector

**Parameters**

**a**: 3D vector

**Return Value**

4D vector

<b>v4_v3(<i>a</i>)</b>
Transform 4D vector to 3D vector
<b>Parameters</b>
<b>a</b> : 4D vector
<b>Return Value</b>
3D vector

<b>normalize(<i>x</i>)</b>
Normalize vector
<b>Parameters</b>
<b>x</b> : vector
<b>Return Value</b>
normalized vector

<b>translate(<i>v</i>)</b>
Calculate translation matrix
<b>Parameters</b>
<b>v</b> : translation vector
<b>Return Value</b>
translation matrix

<b>rotate(<i>angle</i>, <i>axis</i>)</b>
Calculate rotation matrix
<b>Parameters</b>
<b>angle</b> : angle
<b>axis</b> : axis
<b>Return Value</b>
rotation matrix

<b>scale(<i>s</i>)</b>
Calculate scale matrix
<b>Parameters</b>
<b>s</b> : scale
<b>Return Value</b>
scale matrix

## 8.2 Variables

Name	Description
ALLOW_THREADS	<b>Value:</b> 1
BUFSIZE	<b>Value:</b> 8192
CLIP	<b>Value:</b> 0
ERR_CALL	<b>Value:</b> 3

*continued on next page*

Name	Description
ERR_DEFAULT	Value: 0
ERR_DEFAULT2	Value: 521
ERR_IGNORE	Value: 0
ERR_LOG	Value: 5
ERR_PRINT	Value: 4
ERR_RAISE	Value: 2
ERR_WARN	Value: 1
FLOATING_POINT_SUPPORT	Value: 1
FPE_DIVIDEBYZERO	Value: 1
FPE_INVALID	Value: 8
FPE_OVERFLOW	Value: 2
FPE_UNDERFLOW	Value: 4
False_	Value: False
Inf	Value: inf
Infinity	Value: inf
MAXDIMS	Value: 32
NAN	Value: nan
NINF	Value: -inf
NZERO	Value: -0.0
NaN	Value: nan
PINF	Value: inf
PZERO	Value: 0.0
RAISE	Value: 2
SHIFT_DIVIDEBYZERO	Value: 0
SHIFT_INVALID	Value: 9
SHIFT_OVERFLOW	Value: 3
SHIFT_UNDERFLOW	Value: 6
ScalarType	Value: (<type 'int'>, <type 'float'>, <type 'complex'>, <type 'l...
True_	Value: True
UFUNC_BUFSIZE_DEFAULT	Value: 8192
UFUNC_PYVALS_NAME	Value: 'UFUNC_PYVALS'
WRAP	Value: 1
__package__	Value: None
absolute	Value: <ufunc 'absolute'>
add	Value: <ufunc 'add'>
arccos	Value: <ufunc 'arccos'>
arccosh	Value: <ufunc 'arccosh'>
arcsin	Value: <ufunc 'arcsin'>
arcsinh	Value: <ufunc 'arcsinh'>
arctan	Value: <ufunc 'arctan'>
arctan2	Value: <ufunc 'arctan2'>
arctanh	Value: <ufunc 'arctanh'>
bitwise_and	Value: <ufunc 'bitwise_and'>
bitwise_not	Value: <ufunc 'invert'>
bitwise_or	Value: <ufunc 'bitwise_or'>
bitwise_xor	Value: <ufunc 'bitwise_xor'>

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Name	Description
c_	Value: <numpy.lib.index_tricks.CClass object at 0x7f9b24d8bdd0>
cast	Value: {<type 'numpy.float64'>: <function <lambda> at 0x7f9b254c...>
ceil	Value: <ufunc 'ceil'>
conj	Value: <ufunc 'conjugate'>
conjugate	Value: <ufunc 'conjugate'>
copysign	Value: <ufunc 'copysign'>
cos	Value: <ufunc 'cos'>
cosh	Value: <ufunc 'cosh'>
deg2rad	Value: <ufunc 'deg2rad'>
degrees	Value: <ufunc 'degrees'>
divide	Value: <ufunc 'divide'>
e	Value: 2.71828182846
equal	Value: <ufunc 'equal'>
euler_gamma	Value: 0.577215664902
exp	Value: <ufunc 'exp'>
exp2	Value: <ufunc 'exp2'>
expm1	Value: <ufunc 'expm1'>
fabs	Value: <ufunc 'fabs'>
floor	Value: <ufunc 'floor'>
floor_divide	Value: <ufunc 'floor_divide'>
fmax	Value: <ufunc 'fmax'>
fmin	Value: <ufunc 'fmin'>
fmod	Value: <ufunc 'fmod'>
frexp	Value: <ufunc 'frexp'>
greater	Value: <ufunc 'greater'>
greater_equal	Value: <ufunc 'greater_equal'>
hypot	Value: <ufunc 'hypot'>
index_exp	Value: <numpy.lib.index_tricks.IndexExpression object at 0x7f9b2...>
inf	Value: inf
infty	Value: inf
invert	Value: <ufunc 'invert'>
isfinite	Value: <ufunc 'isfinite'>
isinf	Value: <ufunc 'isinf'>
isnan	Value: <ufunc 'isnan'>
ldexp	Value: <ufunc 'ldexp'>
left_shift	Value: <ufunc 'left_shift'>
less	Value: <ufunc 'less'>
less_equal	Value: <ufunc 'less_equal'>
little_endian	Value: True
log	Value: <ufunc 'log'>
log10	Value: <ufunc 'log10'>
log1p	Value: <ufunc 'log1p'>
log2	Value: <ufunc 'log2'>
logaddexp	Value: <ufunc 'logaddexp'>
logaddexp2	Value: <ufunc 'logaddexp2'>
logical_and	Value: <ufunc 'logical_and'>
logical_not	Value: <ufunc 'logical_not'>

*continued on next page*

Name	Description
logical_or	Value: <ufunc 'logical_or'>
logical_xor	Value: <ufunc 'logical_xor'>
maximum	Value: <ufunc 'maximum'>
mgrid	Value: <numpy.lib.index_tricks.nd_grid object at 0x7f9b24d8bb90>
minimum	Value: <ufunc 'minimum'>
mod	Value: <ufunc 'remainder'>
modf	Value: <ufunc 'modf'>
multiply	Value: <ufunc 'multiply'>
nan	Value: nan
nbytes	Value: {<type 'numpy.float64'>: 8, <type 'numpy.uint32'>: 4, <ty...
negative	Value: <ufunc 'negative'>
newaxis	Value: None
nextafter	Value: <ufunc 'nextafter'>
not_equal	Value: <ufunc 'not_equal'>
ogrid	Value: <numpy.lib.index_tricks.nd_grid object at 0x7f9b24d8bc90>
pi	Value: 3.14159265359
power	Value: <ufunc 'power'>
r_	Value: <numpy.lib.index_tricks.RClass object at 0x7f9b24d8bd10>
rad2deg	Value: <ufunc 'rad2deg'>
radians	Value: <ufunc 'radians'>
reciprocal	Value: <ufunc 'reciprocal'>
remainder	Value: <ufunc 'remainder'>
right_shift	Value: <ufunc 'right_shift'>
rint	Value: <ufunc 'rint'>
s_	Value: <numpy.lib.index_tricks.IndexExpression object at 0x7f9b2...
sctypeDict	Value: {0: <type 'numpy.bool_'>, 1: <type 'numpy.int8'>, 2: <typ...
sctypeNA	Value: {'?': 'Bool', 'B': 'UInt8', 'Bool': <type 'numpy.bool_'>,...
sctypes	Value: {'complex': [<type 'numpy.complex64'>, <type 'numpy.compl...
sign	Value: <ufunc 'sign'>
signbit	Value: <ufunc 'signbit'>
sin	Value: <ufunc 'sin'>
sinh	Value: <ufunc 'sinh'>
spacing	Value: <ufunc 'spacing'>
sqrt	Value: <ufunc 'sqrt'>
square	Value: <ufunc 'square'>
subtract	Value: <ufunc 'subtract'>
tan	Value: <ufunc 'tan'>
tanh	Value: <ufunc 'tanh'>
true_divide	Value: <ufunc 'true_divide'>
trunc	Value: <ufunc 'trunc'>
typeDict	Value: {0: <type 'numpy.bool_'>, 1: <type 'numpy.int8'>, 2: <typ...

*continued on next page*

Name	Description
typeNA	<b>Value:</b> {'?': 'Bool', 'B': 'UInt8', 'Bool': <type 'numpy.bool_'>,...
typecodes	<b>Value:</b> {'All': '?bhlqpBHILQPefdgFDGSUVOMm', 'AllFloat': 'efdgFD...



## 9 Module gui

### 9.1 Variables

Name	Description
TEXT_COUNT	Value: 64
ALLOW_THREADS	Value: 1
BUFSIZE	Value: 8192
CLIP	Value: 0
COLOR_LOCATION	Value: 31
ERR_CALL	Value: 3
ERR_DEFAULT	Value: 0
ERR_DEFAULT2	Value: 521
ERR_IGNORE	Value: 0
ERR_LOG	Value: 5
ERR_PRINT	Value: 4
ERR_RAISE	Value: 2
ERR_WARN	Value: 1
FLOATING_POINT_SUPPORT	Value: 1
FPE_DIVIDEBYZERO	Value: 1
FPE_INVALID	Value: 8
FPE_OVERFLOW	Value: 2
FPE_UNDERFLOW	Value: 4
False_	Value: False
Inf	Value: inf
Infinity	Value: inf
LIGHTING_FLAG_LOCATION	Value: 32
MAXDIMS	Value: 32
MODEL_MATRIX_LOCATION	Value: 13
NAN	Value: nan
NINF	Value: -inf
NORMAL_LOCATION	Value: 1
NORMAL_MATRIX_LOCATION	Value: 21
NZERO	Value: -0.0
NaN	Value: nan
PINF	Value: inf
POSITION_LOCATION	Value: 0
PROJECTION_MATRIX_LOCATION	Value: 25
PZERO	Value: 0.0
RAISE	Value: 2
SHIFT_DIVIDEBYZERO	Value: 0
SHIFT_INVALID	Value: 9
SHIFT_OVERFLOW	Value: 3
SHIFT_UNDERFLOW	Value: 6
ScalarType	Value: (<type 'int'>, <type 'float'>, <type 'complex'>, <type 'l...

*continued on next page*

Name	Description
TEXTURE_FLAG_LOCATION	Value: 30
TEXTURE_LOCATION	Value: 2
TEXTURE_SAMPLER_LOCATION	Value: 29
True_	Value: True
UFUNC_BUFSIZE_DEFAULT	Value: 8192
UFUNC_PYVALS_NAME	Value: 'UFUNC_PYVALS'
VIEW_MATRIX_LOCATION	Value: 17
WRAP	Value: 1
__package__	Value: None
absolute	Value: <ufunc 'absolute'>
add	Value: <ufunc 'add'>
arccos	Value: <ufunc 'arccos'>
arccosh	Value: <ufunc 'arccosh'>
arcsin	Value: <ufunc 'arcsin'>
arcsinh	Value: <ufunc 'arcsinh'>
arctan	Value: <ufunc 'arctan'>
arctan2	Value: <ufunc 'arctan2'>
arctanh	Value: <ufunc 'arctanh'>
bitwise_and	Value: <ufunc 'bitwise_and'>
bitwise_not	Value: <ufunc 'invert'>
bitwise_or	Value: <ufunc 'bitwise_or'>
bitwise_xor	Value: <ufunc 'bitwise_xor'>
c_	Value: <numpy.lib.index_tricks.CClass object at 0x7f9b24d8bdd0>
cast	Value: {<type 'numpy.float64'>: <function <lambda> at 0x7f9b254c...>
ceil	Value: <ufunc 'ceil'>
conj	Value: <ufunc 'conjugate'>
conjugate	Value: <ufunc 'conjugate'>
copysign	Value: <ufunc 'copysign'>
cos	Value: <ufunc 'cos'>
cosh	Value: <ufunc 'cosh'>
deg2rad	Value: <ufunc 'deg2rad'>
degrees	Value: <ufunc 'degrees'>
divide	Value: <ufunc 'divide'>
e	Value: 2.71828182846
equal	Value: <ufunc 'equal'>
euler_gamma	Value: 0.577215664902
exp	Value: <ufunc 'exp'>
exp2	Value: <ufunc 'exp2'>
expm1	Value: <ufunc 'expm1'>
fabs	Value: <ufunc 'fabs'>
floor	Value: <ufunc 'floor'>
floor_divide	Value: <ufunc 'floor_divide'>
fmax	Value: <ufunc 'fmax'>
fmin	Value: <ufunc 'fmin'>

*continued on next page*

Name	Description
fmod	Value: <ufunc 'fmod'>
frexp	Value: <ufunc 'frexp'>
greater	Value: <ufunc 'greater'>
greater_equal	Value: <ufunc 'greater_equal'>
hypot	Value: <ufunc 'hypot'>
index_exp	Value: <numpy.lib.index_tricks.IndexExpression object at 0x7f9b2...
inf	Value: inf
infty	Value: inf
invert	Value: <ufunc 'invert'>
isfinite	Value: <ufunc 'isfinite'>
isinf	Value: <ufunc 'isinf'>
isnan	Value: <ufunc 'isnan'>
ldexp	Value: <ufunc 'ldexp'>
left_shift	Value: <ufunc 'left_shift'>
less	Value: <ufunc 'less'>
less_equal	Value: <ufunc 'less_equal'>
little_endian	Value: True
log	Value: <ufunc 'log'>
log10	Value: <ufunc 'log10'>
log1p	Value: <ufunc 'log1p'>
log2	Value: <ufunc 'log2'>
logaddexp	Value: <ufunc 'logaddexp'>
logaddexp2	Value: <ufunc 'logaddexp2'>
logical_and	Value: <ufunc 'logical_and'>
logical_not	Value: <ufunc 'logical_not'>
logical_or	Value: <ufunc 'logical_or'>
logical_xor	Value: <ufunc 'logical_xor'>
maximum	Value: <ufunc 'maximum'>
mgrid	Value: <numpy.lib.index_tricks.nd_grid object at 0x7f9b24d8bb90>
minimum	Value: <ufunc 'minimum'>
mod	Value: <ufunc 'remainder'>
modf	Value: <ufunc 'modf'>
multiply	Value: <ufunc 'multiply'>
nan	Value: nan
nbytes	Value: {<type 'numpy.float64'>: 8, <type 'numpy.uint32'>: 4, <ty...
negative	Value: <ufunc 'negative'>
newaxis	Value: None
nextafter	Value: <ufunc 'nextafter'>
not_equal	Value: <ufunc 'not_equal'>
ogrid	Value: <numpy.lib.index_tricks.nd_grid object at 0x7f9b24d8bc90>
pi	Value: 3.14159265359
power	Value: <ufunc 'power'>
r_	Value: <numpy.lib.index_tricks.RClass object at 0x7f9b24d8bd10>
rad2deg	Value: <ufunc 'rad2deg'>
radians	Value: <ufunc 'radians'>

*continued on next page*

Name	Description
reciprocal	Value: <ufunc 'reciprocal'>
remainder	Value: <ufunc 'remainder'>
right_shift	Value: <ufunc 'right_shift'>
rint	Value: <ufunc 'rint'>
s_	Value: <numpy.lib.index_tricks.IndexExpression object at 0x7f9b2...>
sctypeDict	Value: {0: <type 'numpy.bool_'>, 1: <type 'numpy.int8'>, 2: <typ...
sctypeNA	Value: {'?': 'Bool', 'B': 'UInt8', 'Bool': <type 'numpy.bool_'>, ...}
sctypes	Value: {'complex': [<type 'numpy.complex64'>, <type 'numpy.compl...
sign	Value: <ufunc 'sign'>
signbit	Value: <ufunc 'signbit'>
sin	Value: <ufunc 'sin'>
sinh	Value: <ufunc 'sinh'>
spacing	Value: <ufunc 'spacing'>
sqrt	Value: <ufunc 'sqrt'>
square	Value: <ufunc 'square'>
subtract	Value: <ufunc 'subtract'>
tan	Value: <ufunc 'tan'>
tanh	Value: <ufunc 'tanh'>
true_divide	Value: <ufunc 'true_divide'>
trunc	Value: <ufunc 'trunc'>
typeDict	Value: {0: <type 'numpy.bool_'>, 1: <type 'numpy.int8'>, 2: <typ...
typeNA	Value: {'?': 'Bool', 'B': 'UInt8', 'Bool': <type 'numpy.bool_'>, ...}
typecodes	Value: {'All': '?bhilqpBHILQPefdgFDGSUVOMm', 'AllFloat': 'efdgFD...

## 9.2 Class GUI

Class GUI provide methods to interact with OpenGL

### 9.2.1 Methods

<b><code>__init__(self)</code></b>
Initialize GUI
<b><code>getWindowHeight(self)</code></b>
Get window height
<b>Return Value</b>
window height

**setWindowHeight**(*self*, *h*)

Set window height

**Parameters***h*: window height**getWindowWidth**(*self*)

Get window width

**Return Value**

window width

**setWindowWidth**(*self*, *w*)

Set window width

**Parameters***w*: window width**sendMatrices**(*self*)

Send projection, view and model matrices to vertex shader

**setColor**(*self*, *color*)

Send color to fragment shader

**Parameters***color*: color**cross**(*self*, *u*, *v*)

Calculate cross production of two vectors

**Parameters***u*: first vector*v*: second vector**Return Value** $u \times v$ **lookAt**(*self*)

Calculate view matrix for current camera position, direction and up vector

**Return Value**

view matrix

**perspective**(*self*)

Calculate perspective projection matrix

**Return Value**

projection matrix

<b>initTexture</b> ( <i>self, id, filename</i> )
Load texture from file
<b>Parameters</b>
<b>id:</b> texture id
<b>filename:</b> name of file

  

<b>renderText</b> ( <i>self, id, fontname, size, text, color</i> )
Render text to texture
<b>Parameters</b>
<b>id:</b> texture id
<b>fontname:</b> font filename
<b>size:</b> size of characters
<b>text:</b> text
<b>color:</b> text color

  

<b>bindTexture</b> ( <i>self, id</i> )
Bind texture
<b>Parameters</b>
<b>id:</b> texture id, if -1 then disable texturing

  

<b>enableLighting</b> ( <i>self</i> )
Enable lighting

  

<b>disableLighting</b> ( <i>self</i> )
Disable lighting

### 9.2.2 Class Variables

Name	Description
window__height	<b>Value:</b> 480
window__width	<b>Value:</b> 640
aspect	<b>Value:</b> 1.33333333333
shaderProgram	<b>Value:</b> ShaderProgram()
eye	<b>Value:</b> array([ 0., 0., 0.], dtype=float32)
cen	<b>Value:</b> array([ 0., 0., 0.], dtype=float32)
up	<b>Value:</b> array([ 0., 1., 0.], dtype=float32)
viewMatrix	<b>Value:</b> array([[ 1., 0., 0., 0...
modelMatrix	<b>Value:</b> array([[ 1., 0., 0., 0...
projectionMatrix	<b>Value:</b> array([[ 1., 0., 0., 0...
normalMatrix	<b>Value:</b> array([[ 1., 0., 0., 0...
textures	<b>Value:</b> []

## 10 Module item

### 10.1 Variables

Name	Description
COLOR_RED	Value: 0
COLOR_BLUE	Value: 1
COLOR_GREEN	Value: 2
__package__	Value: None

### 10.2 Class Item

Class Item represent flyint item.

#### 10.2.1 Methods

<b>init__</b> ( <i>self</i> , <i>position</i> , <i>color</i> , <i>count</i> )
Initialize flying item
<b>Parameters</b>
<i>position</i> : position
<i>color</i> : color
<i>count</i> : item count when picked up
<b>Return Value</b>

<b>getPosition</b> ( <i>self</i> )
Get item position
<b>Return Value</b>
item position

<b>setPosition</b> ( <i>self</i> , <i>position</i> )
Set item position
<b>Parameters</b>
<i>position</i> : position

<b>getColor</b> ( <i>self</i> )
Get item color
<b>Return Value</b>
item color

**setColor**(*self*, *color*)

Set item color

**Parameters****color:** color**getCount**(*self*)

Get item count

**Return Value**

item count

**setCount**(*self*, *count*)

Set item count

**Parameters****count:** count**getLifetime**(*self*)

Get item lifetime

**Return Value**

item lifetime

**setLifetime**(*self*, *lifetime*)

Set item lifetime

**Parameters****lifetime:** lifetime



## 11 Module main

### 11.1 Functions

<code>main()</code>
---------------------

### 11.2 Variables

Name	Description
<code>__package__</code>	<b>Value:</b> None

## 12 Module objectcube

### 12.1 Variables

Name	Description
ALLOW_THREADS	Value: 1
BUFSIZE	Value: 8192
CLIP	Value: 0
COLOR_LOCATION	Value: 31
DEFAULT_MODE	Value: 0
ERR_CALL	Value: 3
ERR_DEFAULT	Value: 0
ERR_DEFAULT2	Value: 521
ERR_IGNORE	Value: 0
ERR_LOG	Value: 5
ERR_PRINT	Value: 4
ERR_RAISE	Value: 2
ERR_WARN	Value: 1
FLOATING_POINT_SUPPORT	Value: 1
FPE_DIVIDEBYZERO	Value: 1
FPE_INVALID	Value: 8
FPE_OVERFLOW	Value: 2
FPE_UNDERFLOW	Value: 4
False_	Value: False
Inf	Value: inf
Infinity	Value: inf
LIGHTING_FLAG_LOCATION	Value: 32
MAXDIMS	Value: 32
MODEL_MATRIX_LOCATION	Value: 13
NAN	Value: nan
NINF	Value: -inf
NORMAL_LOCATION	Value: 1
NORMAL_MATRIX_LOCATION	Value: 21
NZERO	Value: -0.0
NaN	Value: nan
PINF	Value: inf
POSITION_LOCATION	Value: 0
PROJECTION_MATRIX_LOCATION	Value: 25
PZERO	Value: 0.0
RAISE	Value: 2
RTLD_GLOBAL	Value: 256
RTLD_LOCAL	Value: 0
SHIFT_DIVIDEBYZERO	Value: 0
SHIFT_INVALID	Value: 9
SHIFT_OVERFLOW	Value: 3
SHIFT_UNDERFLOW	Value: 6

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Name	Description
ScalarType	Value: (<type 'int'>, <type 'float'>, <type 'complex'>, <type 'l...
TEXTURE_FLAG_LOCATION	Value: 30
TEXTURE_LOCATION	Value: 2
TEXTURE_SAMPLER_LOCATION	Value: 29
True_	Value: True
UFUNC_BUFSIZE_DEFAULT	Value: 8192
UFUNC_PYVALS_NAME	Value: 'UFUNC_PYVALS'
VIEW_MATRIX_LOCATION	Value: 17
WRAP	Value: 1
__package__	Value: None
absolute	Value: <ufunc 'absolute'>
add	Value: <ufunc 'add'>
arccos	Value: <ufunc 'arccos'>
arccosh	Value: <ufunc 'arccosh'>
arcsin	Value: <ufunc 'arcsin'>
arcsinh	Value: <ufunc 'arcsinh'>
arctan	Value: <ufunc 'arctan'>
arctan2	Value: <ufunc 'arctan2'>
arctanh	Value: <ufunc 'arctanh'>
bitwise_and	Value: <ufunc 'bitwise_and'>
bitwise_not	Value: <ufunc 'invert'>
bitwise_or	Value: <ufunc 'bitwise_or'>
bitwise_xor	Value: <ufunc 'bitwise_xor'>
c_	Value: <numpy.lib.index_tricks.CClass object at 0x7f9b24d8bdd0>
cdll	Value: <ctypes.LibraryLoader object at 0x7f9b232c1f10>
ceil	Value: <ufunc 'ceil'>
conj	Value: <ufunc 'conjugate'>
conjugate	Value: <ufunc 'conjugate'>
copysign	Value: <ufunc 'copysign'>
cos	Value: <ufunc 'cos'>
cosh	Value: <ufunc 'cosh'>
deg2rad	Value: <ufunc 'deg2rad'>
degrees	Value: <ufunc 'degrees'>
divide	Value: <ufunc 'divide'>
e	Value: 2.71828182846
equal	Value: <ufunc 'equal'>
euler_gamma	Value: 0.577215664902
exp	Value: <ufunc 'exp'>
exp2	Value: <ufunc 'exp2'>
expm1	Value: <ufunc 'expm1'>
fabs	Value: <ufunc 'fabs'>
floor	Value: <ufunc 'floor'>
floor_divide	Value: <ufunc 'floor_divide'>

*continued on next page*

Name	Description
fmax	Value: <ufunc 'fmax'>
fmin	Value: <ufunc 'fmin'>
fmod	Value: <ufunc 'fmod'>
frexp	Value: <ufunc 'frexp'>
greater	Value: <ufunc 'greater'>
greater_equal	Value: <ufunc 'greater_equal'>
hypot	Value: <ufunc 'hypot'>
index_exp	Value: <numpy.lib.index_tricks.IndexExpression object at 0x7f9b2...
inf	Value: inf
infty	Value: inf
invert	Value: <ufunc 'invert'>
isfinite	Value: <ufunc 'isfinite'>
isinf	Value: <ufunc 'isinf'>
isnan	Value: <ufunc 'isnan'>
ldexp	Value: <ufunc 'ldexp'>
left_shift	Value: <ufunc 'left_shift'>
less	Value: <ufunc 'less'>
less_equal	Value: <ufunc 'less_equal'>
little_endian	Value: True
log	Value: <ufunc 'log'>
log10	Value: <ufunc 'log10'>
log1p	Value: <ufunc 'log1p'>
log2	Value: <ufunc 'log2'>
logaddexp	Value: <ufunc 'logaddexp'>
logaddexp2	Value: <ufunc 'logaddexp2'>
logical_and	Value: <ufunc 'logical_and'>
logical_not	Value: <ufunc 'logical_not'>
logical_or	Value: <ufunc 'logical_or'>
logical_xor	Value: <ufunc 'logical_xor'>
maximum	Value: <ufunc 'maximum'>
memmove	Value: <CFunctionType object at 0x7f9b25bda870>
memset	Value: <CFunctionType object at 0x7f9b25bda940>
mgrid	Value: <numpy.lib.index_tricks.nd_grid object at 0x7f9b24d8bb90>
minimum	Value: <ufunc 'minimum'>
mod	Value: <ufunc 'remainder'>
modf	Value: <ufunc 'modf'>
multiply	Value: <ufunc 'multiply'>
nan	Value: nan
nbytes	Value: {<type 'numpy.float64'>: 8, <type 'numpy.uint32'>: 4, <ty...
negative	Value: <ufunc 'negative'>
newaxis	Value: None
nextafter	Value: <ufunc 'nextafter'>
not_equal	Value: <ufunc 'not_equal'>
ogrid	Value: <numpy.lib.index_tricks.nd_grid object at 0x7f9b24d8bc90>
pi	Value: 3.14159265359
power	Value: <ufunc 'power'>

*continued on next page*

Name	Description
<code>pydll</code>	Value: <ctypes.LibraryLoader object at 0x7f9b232c1f50>
<code>pythonapi</code>	Value: <PyDLL 'None', handle 7f9b28c451c8 at 7f9b232c1f90>
<code>r_</code>	Value: <numpy.lib.index_tricks.RClass object at 0x7f9b24d8bd10>
<code>rad2deg</code>	Value: <ufunc 'rad2deg'>
<code>radians</code>	Value: <ufunc 'radians'>
<code>reciprocal</code>	Value: <ufunc 'reciprocal'>
<code>remainder</code>	Value: <ufunc 'remainder'>
<code>right_shift</code>	Value: <ufunc 'right_shift'>
<code>rint</code>	Value: <ufunc 'rint'>
<code>s_</code>	Value: <numpy.lib.index_tricks.IndexExpression object at 0x7f9b2...
<code>sctypeDict</code>	Value: {0: <type 'numpy.bool_'>, 1: <type 'numpy.int8'>, 2: <typ...
<code>sctypeNA</code>	Value: {'?': 'Bool', 'B': 'UInt8', 'Bool': <type 'numpy.bool_'>,...
<code>sctypes</code>	Value: {'complex': [<type 'numpy.complex64'>, <type 'numpy.compl...
<code>sign</code>	Value: <ufunc 'sign'>
<code>signbit</code>	Value: <ufunc 'signbit'>
<code>sin</code>	Value: <ufunc 'sin'>
<code>sinh</code>	Value: <ufunc 'sinh'>
<code>spacing</code>	Value: <ufunc 'spacing'>
<code>sqrt</code>	Value: <ufunc 'sqrt'>
<code>square</code>	Value: <ufunc 'square'>
<code>subtract</code>	Value: <ufunc 'subtract'>
<code>tan</code>	Value: <ufunc 'tan'>
<code>tanh</code>	Value: <ufunc 'tanh'>
<code>true_divide</code>	Value: <ufunc 'true_divide'>
<code>trunc</code>	Value: <ufunc 'trunc'>
<code>typeDict</code>	Value: {0: <type 'numpy.bool_'>, 1: <type 'numpy.int8'>, 2: <typ...
<code>typeNA</code>	Value: {'?': 'Bool', 'B': 'UInt8', 'Bool': <type 'numpy.bool_'>,...
<code>typecodes</code>	Value: {'All': '?bhilqpBHILQPefdgFDGSUVOMm', 'AllFloat': 'efdgFD...

## 12.2 Class `objectCube`

`globject.GLObject` — `objectcube.objectCube`

Class `objectCube` represents drawable cube

### 12.2.1 Methods

<code>__init__(self)</code>
Initialize cube object
Overrides: <code>gobject.GLObject.__init__</code>

*Inherited from `gobject.GLObject`(Section 7.3)*

`draw()`, `initGLBuffers()`, `release()`

## 13 Module objectquad

### 13.1 Variables

Name	Description
ALLOW_THREADS	Value: 1
BUFSIZE	Value: 8192
CLIP	Value: 0
COLOR_LOCATION	Value: 31
DEFAULT_MODE	Value: 0
ERR_CALL	Value: 3
ERR_DEFAULT	Value: 0
ERR_DEFAULT2	Value: 521
ERR_IGNORE	Value: 0
ERR_LOG	Value: 5
ERR_PRINT	Value: 4
ERR_RAISE	Value: 2
ERR_WARN	Value: 1
FLOATING_POINT_SUPPORT	Value: 1
FPE_DIVIDEBYZERO	Value: 1
FPE_INVALID	Value: 8
FPE_OVERFLOW	Value: 2
FPE_UNDERFLOW	Value: 4
False_	Value: False
Inf	Value: inf
Infinity	Value: inf
LIGHTING_FLAG_LOCATION	Value: 32
MAXDIMS	Value: 32
MODEL_MATRIX_LOCATION	Value: 13
NAN	Value: nan
NINF	Value: -inf
NORMAL_LOCATION	Value: 1
NORMAL_MATRIX_LOCATION	Value: 21
NZERO	Value: -0.0
NaN	Value: nan
PINF	Value: inf
POSITION_LOCATION	Value: 0
PROJECTION_MATRIX_LOCATION	Value: 25
PZERO	Value: 0.0

*continued on next page*

Name	Description
RAISE	Value: 2
RTLD_GLOBAL	Value: 256
RTLD_LOCAL	Value: 0
SHIFT_DIVIDEBYZERO	Value: 0
SHIFT_INVALID	Value: 9
SHIFT_OVERFLOW	Value: 3
SHIFT_UNDERFLOW	Value: 6
ScalarType	Value: (<type 'int'>, <type 'float'>, <type 'complex'>, <type 'l...
TEXTURE_FLAG_LOCATION	Value: 30
TEXTURE_LOCATION	Value: 2
TEXTURE_SAMPLER_LOCATION	Value: 29
True_	Value: True
UFUNC_BUFSIZE_DEFAULT	Value: 8192
UFUNC_PYVALS_NAME	Value: 'UFUNC_PYVALS'
VIEW_MATRIX_LOCATION	Value: 17
WRAP	Value: 1
__package__	Value: None
absolute	Value: <ufunc 'absolute'>
add	Value: <ufunc 'add'>
arccos	Value: <ufunc 'arccos'>
arccosh	Value: <ufunc 'arccosh'>
arcsin	Value: <ufunc 'arcsin'>
arcsinh	Value: <ufunc 'arcsinh'>
arctan	Value: <ufunc 'arctan'>
arctan2	Value: <ufunc 'arctan2'>
arctanh	Value: <ufunc 'arctanh'>
bitwise_and	Value: <ufunc 'bitwise_and'>
bitwise_not	Value: <ufunc 'invert'>
bitwise_or	Value: <ufunc 'bitwise_or'>
bitwise_xor	Value: <ufunc 'bitwise_xor'>
c_	Value: <numpy.lib.index_tricks.CClass object at 0x7f9b24d8bdd0>
cdll	Value: <ctypes.LibraryLoader object at 0x7f9b232c1f10>
ceil	Value: <ufunc 'ceil'>

*continued on next page*



Name	Description
conj	Value: <ufunc 'conjugate'>
conjugate	Value: <ufunc 'conjugate'>
copysign	Value: <ufunc 'copysign'>
cos	Value: <ufunc 'cos'>
cosh	Value: <ufunc 'cosh'>
deg2rad	Value: <ufunc 'deg2rad'>
degrees	Value: <ufunc 'degrees'>
divide	Value: <ufunc 'divide'>
e	Value: 2.71828182846
equal	Value: <ufunc 'equal'>
euler_gamma	Value: 0.577215664902
exp	Value: <ufunc 'exp'>
exp2	Value: <ufunc 'exp2'>
expm1	Value: <ufunc 'expm1'>
fabs	Value: <ufunc 'fabs'>
floor	Value: <ufunc 'floor'>
floor_divide	Value: <ufunc 'floor_divide'>
fmax	Value: <ufunc 'fmax'>
fmin	Value: <ufunc 'fmin'>
fmod	Value: <ufunc 'fmod'>
frexp	Value: <ufunc 'frexp'>
greater	Value: <ufunc 'greater'>
greater_equal	Value: <ufunc 'greater_equal'>
hypot	Value: <ufunc 'hypot'>
index_exp	Value: <numpy.lib.index_tricks.IndexExpression object at 0x7f9b2...
inf	Value: inf
infty	Value: inf
invert	Value: <ufunc 'invert'>
isfinite	Value: <ufunc 'isfinite'>
isinf	Value: <ufunc 'isinf'>
isnan	Value: <ufunc 'isnan'>
ldexp	Value: <ufunc 'ldexp'>
left_shift	Value: <ufunc 'left_shift'>
less	Value: <ufunc 'less'>
less_equal	Value: <ufunc 'less_equal'>
little_endian	Value: True
log	Value: <ufunc 'log'>
log10	Value: <ufunc 'log10'>
log1p	Value: <ufunc 'log1p'>
log2	Value: <ufunc 'log2'>

*continued on next page*

Name	Description
logaddexp	Value: <ufunc 'logaddexp'>
logaddexp2	Value: <ufunc 'logaddexp2'>
logical_and	Value: <ufunc 'logical_and'>
logical_not	Value: <ufunc 'logical_not'>
logical_or	Value: <ufunc 'logical_or'>
logical_xor	Value: <ufunc 'logical_xor'>
maximum	Value: <ufunc 'maximum'>
memmove	Value: <CFunctionType object at 0x7f9b25bda870>
memset	Value: <CFunctionType object at 0x7f9b25bda940>
mgrid	Value: <numpy.lib.index_tricks.nd_grid object at 0x7f9b24d8bb90>
minimum	Value: <ufunc 'minimum'>
mod	Value: <ufunc 'remainder'>
modf	Value: <ufunc 'modf'>
multiply	Value: <ufunc 'multiply'>
nan	Value: nan
nbytes	Value: {<type 'numpy.float64'>: 8, <type 'numpy.uint32'>: 4, <ty...
negative	Value: <ufunc 'negative'>
newaxis	Value: None
nextafter	Value: <ufunc 'nextafter'>
not_equal	Value: <ufunc 'not_equal'>
ogrid	Value: <numpy.lib.index_tricks.nd_grid object at 0x7f9b24d8bc90>
pi	Value: 3.14159265359
power	Value: <ufunc 'power'>
pydll	Value: <ctypes.LibraryLoader object at 0x7f9b232c1f50>
pythonapi	Value: <PyDLL 'None', handle 7f9b28c451c8 at 7f9b232c1f90>
r_	Value: <numpy.lib.index_tricks.RClass object at 0x7f9b24d8bd10>
rad2deg	Value: <ufunc 'rad2deg'>
radians	Value: <ufunc 'radians'>
reciprocal	Value: <ufunc 'reciprocal'>
remainder	Value: <ufunc 'remainder'>
right_shift	Value: <ufunc 'right_shift'>
rint	Value: <ufunc 'rint'>
s_	Value: <numpy.lib.index_tricks.IndexExpression object at 0x7f9b2...

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Name	Description
<code>sctypeDict</code>	<b>Value:</b> {0: <type 'numpy.bool_'>, 1: <type 'numpy.int8'>, 2: <typ...
<code>sctypeNA</code>	<b>Value:</b> {'?': 'Bool', 'B': 'UInt8', 'Bool': <type 'numpy.bool_'>,...
<code>sctypes</code>	<b>Value:</b> {'complex': [<type 'numpy.complex64'>, <type 'numpy.compl...
<code>sign</code>	<b>Value:</b> <ufunc 'sign'>
<code>signbit</code>	<b>Value:</b> <ufunc 'signbit'>
<code>sin</code>	<b>Value:</b> <ufunc 'sin'>
<code>sinh</code>	<b>Value:</b> <ufunc 'sinh'>
<code>spacing</code>	<b>Value:</b> <ufunc 'spacing'>
<code>sqrt</code>	<b>Value:</b> <ufunc 'sqrt'>
<code>square</code>	<b>Value:</b> <ufunc 'square'>
<code>subtract</code>	<b>Value:</b> <ufunc 'subtract'>
<code>tan</code>	<b>Value:</b> <ufunc 'tan'>
<code>tanh</code>	<b>Value:</b> <ufunc 'tanh'>
<code>true_divide</code>	<b>Value:</b> <ufunc 'true_divide'>
<code>trunc</code>	<b>Value:</b> <ufunc 'trunc'>
<code>typeDict</code>	<b>Value:</b> {0: <type 'numpy.bool_'>, 1: <type 'numpy.int8'>, 2: <typ...
<code>typeNA</code>	<b>Value:</b> {'?': 'Bool', 'B': 'UInt8', 'Bool': <type 'numpy.bool_'>,...
<code>typecodes</code>	<b>Value:</b> {'All': '?bhlqpBHILQPefdgFDGSUVOMm', 'AllFloat': 'efdgFD...

## 13.2 Class `objectQuad`

`globject.GLObject` —  
`objectquad.objectQuad`

Class `objectQuad` represents drawable quad

### 13.2.1 Methods

<b><code>__init__</code></b> ( <i>self</i> )
Initialize quad object
Overrides: <code>globject.GLObject.__init__</code>

*Inherited from `gobject.GLObject` (Section 7.3)*

`draw()`, `initGLBuffers()`, `release()`

## 14 Module player

Version: 1.8.2

### 14.1 Variables

Name	Description
ALLOW_THREADS	Value: 1
BUFSIZE	Value: 8192
CLIP	Value: 0
ERR_CALL	Value: 3
ERR_DEFAULT	Value: 0
ERR_DEFAULT2	Value: 521
ERR_IGNORE	Value: 0
ERR_LOG	Value: 5
ERR_PRINT	Value: 4
ERR_RAISE	Value: 2
ERR_WARN	Value: 1
FLOATING_POINT_SUPPORT	Value: 1
FPE_DIVIDEBYZERO	Value: 1
FPE_INVALID	Value: 8
FPE_OVERFLOW	Value: 2
FPE_UNDERFLOW	Value: 4
False_	Value: False
Inf	Value: inf
Infinity	Value: inf
MAXDIMS	Value: 32
NAN	Value: nan
NINF	Value: -inf
NZERO	Value: -0.0
NaN	Value: nan
PINF	Value: inf
PZERO	Value: 0.0
RAISE	Value: 2
SHIFT_DIVIDEBYZERO	Value: 0
SHIFT_INVALID	Value: 9
SHIFT_OVERFLOW	Value: 3
SHIFT_UNDERFLOW	Value: 6
ScalarType	Value: (<type 'int'>, <type 'float'>, <type 'complex'>, <type 'l...
True_	Value: True

*continued on next page*

Name	Description
UFUNC_BUFSIZE_DEFAULT	Value: 8192
UFUNC_PYVALS_NAME	Value: 'UFUNC_PYVALS'
WRAP	Value: 1
__package__	Value: None
absolute	Value: <ufunc 'absolute'>
add	Value: <ufunc 'add'>
arccos	Value: <ufunc 'arccos'>
arccosh	Value: <ufunc 'arccosh'>
arcsin	Value: <ufunc 'arcsin'>
arcsinh	Value: <ufunc 'arcsinh'>
arctan	Value: <ufunc 'arctan'>
arctan2	Value: <ufunc 'arctan2'>
arctanh	Value: <ufunc 'arctanh'>
bitwise_and	Value: <ufunc 'bitwise_and'>
bitwise_not	Value: <ufunc 'invert'>
bitwise_or	Value: <ufunc 'bitwise_or'>
bitwise_xor	Value: <ufunc 'bitwise_xor'>
c_	Value: <numpy.lib.index_tricks.CClass object at 0x7f9b24d8bdd0>
cast	Value: {<type 'numpy.float64':<function <lambda> at 0x7f9b254c...
ceil	Value: <ufunc 'ceil'>
conj	Value: <ufunc 'conjugate'>
conjugate	Value: <ufunc 'conjugate'>
copysign	Value: <ufunc 'copysign'>
cos	Value: <ufunc 'cos'>
cosh	Value: <ufunc 'cosh'>
deg2rad	Value: <ufunc 'deg2rad'>
degrees	Value: <ufunc 'degrees'>
divide	Value: <ufunc 'divide'>
e	Value: 2.71828182846
equal	Value: <ufunc 'equal'>
euler_gamma	Value: 0.577215664902
exp	Value: <ufunc 'exp'>
exp2	Value: <ufunc 'exp2'>
expm1	Value: <ufunc 'expm1'>
fabs	Value: <ufunc 'fabs'>
floor	Value: <ufunc 'floor'>
floor_divide	Value: <ufunc 'floor_divide'>
fmax	Value: <ufunc 'fmax'>

*continued on next page*

Name	Description
fmin	Value: <ufunc 'fmin'>
fmod	Value: <ufunc 'fmod'>
frexp	Value: <ufunc 'frexp'>
greater	Value: <ufunc 'greater'>
greater_equal	Value: <ufunc 'greater_equal'>
hypot	Value: <ufunc 'hypot'>
index_exp	Value: <numpy.lib.index_tricks.IndexExpression object at 0x7f9b2...
inf	Value: inf
infty	Value: inf
invert	Value: <ufunc 'invert'>
isfinite	Value: <ufunc 'isfinite'>
isinf	Value: <ufunc 'isinf'>
isnan	Value: <ufunc 'isnan'>
ldexp	Value: <ufunc 'ldexp'>
left_shift	Value: <ufunc 'left_shift'>
less	Value: <ufunc 'less'>
less_equal	Value: <ufunc 'less_equal'>
little_endian	Value: True
log	Value: <ufunc 'log'>
log10	Value: <ufunc 'log10'>
log1p	Value: <ufunc 'log1p'>
log2	Value: <ufunc 'log2'>
logaddexp	Value: <ufunc 'logaddexp'>
logaddexp2	Value: <ufunc 'logaddexp2'>
logical_and	Value: <ufunc 'logical_and'>
logical_not	Value: <ufunc 'logical_not'>
logical_or	Value: <ufunc 'logical_or'>
logical_xor	Value: <ufunc 'logical_xor'>
maximum	Value: <ufunc 'maximum'>
mgrid	Value: <numpy.lib.index_tricks.nd_grid object at 0x7f9b24d8bb90>
minimum	Value: <ufunc 'minimum'>
mod	Value: <ufunc 'remainder'>
modf	Value: <ufunc 'modf'>
multiply	Value: <ufunc 'multiply'>
nan	Value: nan
nbytes	Value: {<type 'numpy.float64'>: 8, <type 'numpy.uint32'>: 4, <ty...
negative	Value: <ufunc 'negative'>
newaxis	Value: None

*continued on next page*

Name	Description
nextafter	Value: <ufunc 'nextafter'>
not_equal	Value: <ufunc 'not_equal'>
ogrid	Value: <numpy.lib.index_tricks.nd_grid object at 0x7f9b24d8bc90>
pi	Value: 3.14159265359
power	Value: <ufunc 'power'>
r_	Value: <numpy.lib.index_tricks.RClass object at 0x7f9b24d8bd10>
rad2deg	Value: <ufunc 'rad2deg'>
radians	Value: <ufunc 'radians'>
reciprocal	Value: <ufunc 'reciprocal'>
remainder	Value: <ufunc 'remainder'>
right_shift	Value: <ufunc 'right_shift'>
rint	Value: <ufunc 'rint'>
s_	Value: <numpy.lib.index_tricks.IndexExpression object at 0x7f9b2...
sctypeDict	Value: {0: <type 'numpy.bool_'>, 1: <type 'numpy.int8'>, 2: <typ...
sctypeNA	Value: {'?': 'Bool', 'B': 'UInt8', 'Bool': <type 'numpy.bool_'>,...
sctypes	Value: {'complex': [<type 'numpy.complex64'>, <type 'numpy.compl...
sign	Value: <ufunc 'sign'>
signbit	Value: <ufunc 'signbit'>
sin	Value: <ufunc 'sin'>
sinh	Value: <ufunc 'sinh'>
spacing	Value: <ufunc 'spacing'>
sqrt	Value: <ufunc 'sqrt'>
square	Value: <ufunc 'square'>
subtract	Value: <ufunc 'subtract'>
tan	Value: <ufunc 'tan'>
tanh	Value: <ufunc 'tanh'>
true_divide	Value: <ufunc 'true_divide'>
trunc	Value: <ufunc 'trunc'>
typeDict	Value: {0: <type 'numpy.bool_'>, 1: <type 'numpy.int8'>, 2: <typ...
typeNA	Value: {'?': 'Bool', 'B': 'UInt8', 'Bool': <type 'numpy.bool_'>,...
typecodes	Value: {'All': '?bhilqpBHILQPefdgFDGSUVOMm', 'AllFloat': 'efdgFD...

continued on next page



Name	Description
------	-------------

## 14.2 Class Player

Class Player represents player or enemy

### 14.2.1 Methods

<b><code>__init__</code></b> ( <i>self</i> , <i>power</i> =1, <i>defence</i> =1, <i>speed</i> =1)
Initialize
<b>Parameters</b>
<i>power</i> : power
<i>defence</i> : defenct
<i>speed</i> : speed

<b><code>getPosition</code></b> ( <i>self</i> )
Get position
<b>Return Value</b>
position

<b><code>setPosition</code></b> ( <i>self</i> , <i>position</i> )
Set position
<b>Parameters</b>
<i>position</i> : position

<b><code>getRedItems</code></b> ( <i>self</i> )
Get red items count
<b>Return Value</b>
red items count

<b><code>setRedItems</code></b> ( <i>self</i> , <i>red_items</i> )
Set red items count
<b>Parameters</b>
<i>red_items</i> : red items count

**addRedItems**(*self*, *red\_items*)

Add red items

**Parameters***red\_items*: red items count**getBlueItems**(*self*)

Get blue items count

**Return Value**

blue items count

**setBlueItems**(*self*, *blue\_items*)

Set blue items count

**Parameters***blue\_items*: blue items count**addBlueItems**(*self*, *blue\_items*)

Add blue items

**Parameters***blue\_items*: blue items count**getGreenItems**(*self*)

Get green items count

**Return Value**

green items count

**setGreenItems**(*self*, *green\_items*)

Set green items count

**Parameters***green\_items*: green items count**addGreenItems**(*self*, *green\_items*)

Add green items

**Parameters***green\_items*: green items count

**getPower**(*self*)

Get power

**Return Value**

power

**setPower**(*self*, *power*)

Set power

**Parameters****power:** power**addPower**(*self*, *power*)

Add power

**Parameters****power:** power**getDefence**(*self*)

Get defence

**Return Value**

defence

**setDefence**(*self*, *defence*)

Set defence

**Parameters****defence:** defence**addDefence**(*self*, *defence*)

Add defence

**Parameters****defence:** defence**getSpeed**(*self*)

Get speed

**Return Value**

speed

**setSpeed**(*self*, *speed*)

Set speed

**Parameters****speed:** speed**addSpeed**(*self*, *speed*)

Add speed

**Parameters****speed:** speed**getReload**(*self*)

Get reload counter

**Return Value**

reload counter

**setReload**(*self*, *reload*)

Set reload counter

**Parameters****reload:** reload counter**getHealth**(*self*)

Get health

**Return Value**

health

**setHealth**(*self*, *health*)

Set health

**Parameters****health:** health**getStamina**(*self*)

Get stamina

**Return Value**

stamina

**setStamina**(*self*, *stamina*)

Set stamina

**Parameters****stamina:** stamina**addStamina**(*self*, *stamina*)

Add stamina

**Parameters****stamina:** stamina**getTexture**(*self*)

Get texture number

**Return Value**

texture number

## **15   Module setup**

## 16 Module shader

### 16.1 Variables

Name	Description
<code>__package__</code>	<b>Value:</b> None

### 16.2 Class Shader

Class Shader represents OpenGL shader

#### 16.2.1 Methods

<b><code>__init__(self)</code></b>
Initialize shader

<b><code>getShaderType(self)</code></b>
Get shader type
<b>Return Value</b> shader type

<b><code>getShaderObject(self)</code></b>
Get shader object
<b>Return Value</b> shader object

<b><code>read(self, filename, type)</code></b>
Read shader source from file
<b>Parameters</b> <b>filename:</b> name of file <b>type:</b> shader type

<b><code>compile(self)</code></b>
Compile shader

<b>readAndCompile</b> ( <i>self</i> , <i>filename</i> , <i>type</i> )
Read shader source from file and compile
<b>Parameters</b>
<b>filename:</b> name of file
<b>type:</b> shader type

<b>release</b> ( <i>self</i> )
Free shader object



## 17 Module shaderprogram

### 17.1 Variables

Name	Description
POSITION_LOCATION	<b>Value:</b> 0
NORMAL_LOCATION	<b>Value:</b> 1
TEXTURE_LOCATION	<b>Value:</b> 2
TEXTURE_SAMPLER_LOCATION	<b>Value:</b> 29
TEXTURE_FLAG_LOCATION	<b>Value:</b> 30
MODEL_MATRIX_LOCATION	<b>Value:</b> 13
VIEW_MATRIX_LOCATION	<b>Value:</b> 17
NORMAL_MATRIX_LOCATION	<b>Value:</b> 21
PROJECTION_MATRIX_LOCATION	<b>Value:</b> 25
COLOR_LOCATION	<b>Value:</b> 31
LIGHTING_FLAG_LOCATION	<b>Value:</b> 32
__package__	<b>Value:</b> None

### 17.2 Class ShaderProgram

Class ShaderProgram represents OpenGL shader program

#### 17.2.1 Methods

<b>__init__</b> ( <i>self</i> )
Initialize shader program

**init**(*self*, *vertexShaderName*, *fragmentShaderName*)

Initialize shader program

**Parameters****vertexShaderName:** vertex shader filename**fragmentShaderName:** fragment shader filename**Return Value****getProgramObject**(*self*)

Get program object

**Return Value**

program object

## 18 Module texture

Version: 1.8.2

### 18.1 Variables

Name	Description
ALLOW_THREADS	Value: 1
BUFSIZE	Value: 8192
CLIP	Value: 0
ERR_CALL	Value: 3
ERR_DEFAULT	Value: 0
ERR_DEFAULT2	Value: 521
ERR_IGNORE	Value: 0
ERR_LOG	Value: 5
ERR_PRINT	Value: 4
ERR_RAISE	Value: 2
ERR_WARN	Value: 1
FLOATING_POINT_SUPPORT	Value: 1
FPE_DIVIDEBYZERO	Value: 1
FPE_INVALID	Value: 8
FPE_OVERFLOW	Value: 2
FPE_UNDERFLOW	Value: 4
False_	Value: False
Inf	Value: inf
Infinity	Value: inf
MAXDIMS	Value: 32
NAN	Value: nan
NINF	Value: -inf
NZERO	Value: -0.0
NaN	Value: nan
PINF	Value: inf
PZERO	Value: 0.0
RAISE	Value: 2
SHIFT_DIVIDEBYZERO	Value: 0
SHIFT_INVALID	Value: 9
SHIFT_OVERFLOW	Value: 3
SHIFT_UNDERFLOW	Value: 6
ScalarType	Value: (<type 'int'>, <type 'float'>, <type 'complex'>, <type 'l...
True_	Value: True

*continued on next page*

Name	Description
UFUNC_BUFSIZE_DEFAULT	Value: 8192
UFUNC_PYVALS_NAME	Value: 'UFUNC_PYVALS'
WRAP	Value: 1
__package__	Value: None
absolute	Value: <ufunc 'absolute'>
add	Value: <ufunc 'add'>
arccos	Value: <ufunc 'arccos'>
arccosh	Value: <ufunc 'arccosh'>
arcsin	Value: <ufunc 'arcsin'>
arcsinh	Value: <ufunc 'arcsinh'>
arctan	Value: <ufunc 'arctan'>
arctan2	Value: <ufunc 'arctan2'>
arctanh	Value: <ufunc 'arctanh'>
bitwise_and	Value: <ufunc 'bitwise_and'>
bitwise_not	Value: <ufunc 'invert'>
bitwise_or	Value: <ufunc 'bitwise_or'>
bitwise_xor	Value: <ufunc 'bitwise_xor'>
c_	Value: <numpy.lib.index_tricks.CClass object at 0x7f9b24d8bdd0>
cast	Value: {<type 'numpy.float64':<function <lambda> at 0x7f9b254c...
ceil	Value: <ufunc 'ceil'>
conj	Value: <ufunc 'conjugate'>
conjugate	Value: <ufunc 'conjugate'>
copysign	Value: <ufunc 'copysign'>
cos	Value: <ufunc 'cos'>
cosh	Value: <ufunc 'cosh'>
deg2rad	Value: <ufunc 'deg2rad'>
degrees	Value: <ufunc 'degrees'>
divide	Value: <ufunc 'divide'>
e	Value: 2.71828182846
equal	Value: <ufunc 'equal'>
euler_gamma	Value: 0.577215664902
exp	Value: <ufunc 'exp'>
exp2	Value: <ufunc 'exp2'>
expm1	Value: <ufunc 'expm1'>
fabs	Value: <ufunc 'fabs'>
floor	Value: <ufunc 'floor'>
floor_divide	Value: <ufunc 'floor_divide'>
fmax	Value: <ufunc 'fmax'>

*continued on next page*

Name	Description
fmin	Value: <ufunc 'fmin'>
fmod	Value: <ufunc 'fmod'>
frexp	Value: <ufunc 'frexp'>
greater	Value: <ufunc 'greater'>
greater_equal	Value: <ufunc 'greater_equal'>
hypot	Value: <ufunc 'hypot'>
index_exp	Value: <numpy.lib.index_tricks.IndexExpression object at 0x7f9b2...
inf	Value: inf
infty	Value: inf
invert	Value: <ufunc 'invert'>
isfinite	Value: <ufunc 'isfinite'>
isinf	Value: <ufunc 'isinf'>
isnan	Value: <ufunc 'isnan'>
ldexp	Value: <ufunc 'ldexp'>
left_shift	Value: <ufunc 'left_shift'>
less	Value: <ufunc 'less'>
less_equal	Value: <ufunc 'less_equal'>
little_endian	Value: True
log	Value: <ufunc 'log'>
log10	Value: <ufunc 'log10'>
log1p	Value: <ufunc 'log1p'>
log2	Value: <ufunc 'log2'>
logaddexp	Value: <ufunc 'logaddexp'>
logaddexp2	Value: <ufunc 'logaddexp2'>
logical_and	Value: <ufunc 'logical_and'>
logical_not	Value: <ufunc 'logical_not'>
logical_or	Value: <ufunc 'logical_or'>
logical_xor	Value: <ufunc 'logical_xor'>
maximum	Value: <ufunc 'maximum'>
mgrid	Value: <numpy.lib.index_tricks.nd_grid object at 0x7f9b24d8bb90>
minimum	Value: <ufunc 'minimum'>
mod	Value: <ufunc 'remainder'>
modf	Value: <ufunc 'modf'>
multiply	Value: <ufunc 'multiply'>
nan	Value: nan
nbytes	Value: {<type 'numpy.float64'>: 8, <type 'numpy.uint32'>: 4, <ty...
negative	Value: <ufunc 'negative'>
newaxis	Value: None

*continued on next page*

Name	Description
nextafter	Value: <ufunc 'nextafter'>
not_equal	Value: <ufunc 'not_equal'>
ogrid	Value: <numpy.lib.index_tricks.nd_grid object at 0x7f9b24d8bc90>
pi	Value: 3.14159265359
power	Value: <ufunc 'power'>
r_	Value: <numpy.lib.index_tricks.RClass object at 0x7f9b24d8bd10>
rad2deg	Value: <ufunc 'rad2deg'>
radians	Value: <ufunc 'radians'>
reciprocal	Value: <ufunc 'reciprocal'>
remainder	Value: <ufunc 'remainder'>
right_shift	Value: <ufunc 'right_shift'>
rint	Value: <ufunc 'rint'>
s_	Value: <numpy.lib.index_tricks.IndexExpression object at 0x7f9b2...
sctypeDict	Value: {0: <type 'numpy.bool_'>, 1: <type 'numpy.int8'>, 2: <typ...
sctypeNA	Value: {'?': 'Bool', 'B': 'UInt8', 'Bool': <type 'numpy.bool_'>,...
sctypes	Value: {'complex': [<type 'numpy.complex64'>, <type 'numpy.compl...
sign	Value: <ufunc 'sign'>
signbit	Value: <ufunc 'signbit'>
sin	Value: <ufunc 'sin'>
sinh	Value: <ufunc 'sinh'>
spacing	Value: <ufunc 'spacing'>
sqrt	Value: <ufunc 'sqrt'>
square	Value: <ufunc 'square'>
subtract	Value: <ufunc 'subtract'>
tan	Value: <ufunc 'tan'>
tanh	Value: <ufunc 'tanh'>
true_divide	Value: <ufunc 'true_divide'>
trunc	Value: <ufunc 'trunc'>
typeDict	Value: {0: <type 'numpy.bool_'>, 1: <type 'numpy.int8'>, 2: <typ...
typeNA	Value: {'?': 'Bool', 'B': 'UInt8', 'Bool': <type 'numpy.bool_'>,...
typecodes	Value: {'All': '?bhilqpBHILQPefdgFDGSUVOMm', 'AllFloat': 'efdgFD...

*continued on next page*

Name	Description
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## 18.2 Class Texture

Class Texture represents OpenGL texture

### 18.2.1 Methods

<b><code>__init__(self, texture_id)</code></b>
Initialize texture
<b>Parameters</b> <b><code>texture_id</code></b> : texture id
<b><code>load(self, filename)</code></b>
Load texture from file
<b>Parameters</b> <b><code>filename</code></b> : name of file
<b><code>load_raw(self, width, height, data)</code></b>
Load texture from array
<b>Parameters</b> <b><code>width</code></b> : width <b><code>height</code></b> : height <b><code>data</code></b> : data
<b><code>bind(self)</code></b>
Bind texture
<b><code>isInitied(self)</code></b>
Get initied flag
<b>Return Value</b> initied flag

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