CSCI441 Library

v1.1

Generated by Doxygen 1.8.14

Contents

Chapter 1

Main Page

This library is intended to be used with OpenGL for CSCI441 at the Colorado School of Mines.

When building, the library must be compiled and linked against OpenGL and glm.

Revision history

v1.1 - 21 Sep 2017

Added OpenGLUtils class to store commonly used helper functions

v1.0.1 - 19 Sep 2017

Added documentation
Added inline definition to functions to prevent duplicate linking errors

v1.0 - 01 Sep 2017

Initial release of all OpenGL 3D objects

Chapter 2

Namespace Index

2.1 Namespace List

Here is a list of all documented namespaces with brief descriptions:

Chapter 3

Class Index

3.1 Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

Chapter 4

File Index

4.1 File List

Here is a list of all documented files with brief descriptions:

Chapter 5

Namespace Documentation

5.1 CSCI441 Namespace Reference

CSCI441 Helper Functions for OpenGL.

Classes

- class OpenGLUtils

  static class containing OpenGL Utilities

Functions

- void drawSolidCone (GLdouble base, GLdouble height, GLint stacks, GLint slices)

  Draws a solid cone.
- void drawWireCone (GLdouble base, GLdouble height, GLint stacks, GLint slices)

  Draws a wireframe cone.
- void drawSolidCube (GLdouble sideLength)

  Draws a solid cube.
- void drawWireCube (GLdouble sideLength)

  Draws a wireframe cube.
- void drawSolidCylinder (GLdouble base, GLdouble top, GLdouble height, GLint stacks, GLint slices)

  Draws a solid open ended cylinder.
- void drawWireCylinder (GLdouble base, GLdouble top, GLdouble height, GLint stacks, GLint slices)

  Draws a wireframe open ended cylinder.
- void drawSolidDisk (GLdouble inner, GLdouble outer, GLint slices, GLint rings)

  Draws a solid disk.
- void drawWireDisk (GLdouble inner, GLdouble outer, GLint slices, GLint rings)

  Draws a wireframe disk.
- void drawSolidPartialDisk (GLdouble inner, GLdouble outer, GLint slices, GLint rings, GLdouble start, G↩ Ldouble sweep)

  Draws part of a solid disk.
- void drawWirePartialDisk (GLdouble inner, GLdouble outer, GLint slices, GLint rings, GLdouble start, G↩ Ldouble sweep)

  Draws part of a wireframe disk.

- void drawSolidSphere (GLdouble radius, GLint stacks, GLint slices)

  Draws a solid sphere.
- void drawWireSphere (GLdouble radius, GLint stacks, GLint slices)

  Draws a wireframe sphere.
- void drawSolidTeapot (GLdouble size)

  Draws a solid teapot.
- void drawWireTeapot (GLdouble size)

  Draws a wireframe teapot.
- void drawSolidTorus (GLdouble innerRadius, GLdouble outerRadius, GLint sides, GLint rings)

  Draws a solid torus.
- void drawWireTorus (GLdouble innerRadius, GLdouble outerRadius, GLint sides, GLint rings)

  Draws a wireframe torus.
- void pushMatrix (glm::mat4 mtx)

  Multiplies current matrix by given matrix.
- void popMatrix (glm::mat4 mtx)

  Multiplies current matrix by inverse of given matrix.

5.1.1 Detailed Description

CSCI441 Helper Functions for OpenGL.

5.1.2 Function Documentation

5.1.2.1 drawSolidCone()

```
void CSCI441::drawSolidCone (
            GLdouble base,
            GLdouble height,
            GLint stacks,
            GLint slices )  [inline]
```

Draws a solid cone.

Cone is oriented along the y-axis with the origin along the base of the cone

Parameters

GLdouble	base - radius of the base of the cone
GLdouble	height - height of the cone from the base to the tip
GLint	stacks - resolution of the number of steps rotated around the central axis of the cone
GLint	slices - resolution of the number of steps to take along the height

Precondition

base must be greater than zero
height must be greater than zero

stacks must be greater than zero
slices must be greater than two

5.1.2.2 drawSolidCube()

```
void CSCI441::drawSolidCube (
            GLdouble sideLength )  [inline]
```

Draws a solid cube.

The origin is at the cube's center of mass. Cube is oriented with our XYZ axes

Parameters

GLdouble	sideLength - length of the edge of the cube

Precondition

sideLength must be greater than zero

5.1.2.3 drawSolidCylinder()

```
void CSCI441::drawSolidCylinder (
            GLdouble base,
            GLdouble top,
            GLdouble height,
            GLint stacks,
            GLint slices )  [inline]
```

Draws a solid open ended cylinder.

Cylinder is oriented along the y-axis with the origin along the base

Parameters

GLdouble	base - radius of the base of the cylinder
GLdouble	top - radius of the top of the cylinder
GLdouble	height - height of the cylinder from the base to the top
GLint	stacks - resolution of the number of steps rotated around the central axis of the cylinder
GLint	slices - resolution of the number of steps to take along the height

Precondition

either: (1) base is greater than zero and top is greater than or equal to zero or (2) base is greater than or equal to zero and top is greater than zero

height must be greater than zero
stacks must be greater than zero
slices must be greater than two

5.1.2.4 drawSolidDisk()

```
void CSCI441::drawSolidDisk (
             GLdouble inner,
             GLdouble outer,
             GLint slices,
             GLint rings )  [inline]
```

Draws a solid disk.

Disk is drawn in the XY plane with the origin at its center

Parameters

GLdouble	inner - equivalent to the width of the disk
GLdouble	outer - radius from the center of the disk to the center of the ring
GLint	slices - resolution of the number of steps rotated along the disk
GLint	rings - resolution of the number of steps to take along the disk width

Precondition

inner is greater than zero
outer is greater than zero
outer is greater than inner
slices is greater than two
rings is greater than zero

5.1.2.5 drawSolidPartialDisk()

```
void CSCI441::drawSolidPartialDisk (
             GLdouble inner,
             GLdouble outer,
             GLint slices,
             GLint rings,
             GLdouble start,
             GLdouble sweep )  [inline]
```

Draws part of a solid disk.

Disk is drawn in the XY plane with the origin at its center

Parameters

GLdouble	inner - equivalent to the width of the disk
GLdouble	outer - radius from the center of the disk to the center of the ring
GLint	stacks - resolution of the number of steps rotated along the disk
GLint	rings - resolution of the number of steps to take along the disk width
GLdouble	start - angle in degrees to start the disk at
GLdouble	sweep - distance in degrees to rotate through

Precondition

inner is greater than zero
outer is greater than zero
outer is greater than inner
slices is greater than two
rings is greater than zero
start is between [0, 360]
sweep is between [0, 360]

5.1.2.6 drawSolidSphere()

```
void CSCI441::drawSolidSphere (
            GLdouble radius,
            GLint stacks,
            GLint slices )  [inline]
```

Draws a solid sphere.

Origin is at the center of the sphere

Parameters

GLdouble	radius - radius of the sphere
GLint	stacks - resolution of the number of steps to take along theta (rotate around Y-axis)
GLint	slices - resolution of the number of steps to take along phi (rotate around X- or Z-axis)

Precondition

radius must be greater than 0
stacks must be greater than 2
slices must be greater than 2

5.1.2.7 drawSolidTeapot()

```
void CSCI441::drawSolidTeapot (
            GLdouble size )  [inline]
```

Draws a solid teapot.

Oriented with spout and handle running along X-axis, cap and bottom along Y-axis. Origin is at the center of the teapot

Parameters

GLdouble	size - scale of the teapot

Precondition

size must be greater than zero

5.1.2.8 drawSolidTorus()

```
void CSCI441::drawSolidTorus (
             GLdouble innerRadius,
             GLdouble outerRadius,
             GLint sides,
             GLint rings )  [inline]
```

Draws a solid torus.

Torus is oriented in the XY-plane with the origin at its center

Parameters

innerRadius	- equivalent to the width of the torus ring
outerRadius	- radius from the center of the torus to the center of the ring
sides	- resolution of steps to take around the band of the ring
rings	- resolution of steps to take around the torus

Precondition

innerRadius must be greater than zero
outerRadius must be greater than zero
sides must be greater than two
rings must be greater than two

5.1.2.9 drawWireCone()

```
void CSCI441::drawWireCone (
             GLdouble base,
             GLdouble height,
             GLint stacks,
             GLint slices )  [inline]
```

Draws a wireframe cone.

Cone is oriented along the y-axis with the origin along the base of the cone

Parameters

GLdouble	base - radius of the base of the cone
GLdouble	height - height of the cone from the base to the tip
GLint	stacks - resolution of the number of steps rotated around the central axis of the cone
GLint	slices - resolution of the number of steps to take along the height

Precondition

base must be greater than zero
height must be greater than zero
stacks must be greater than zero
slices must be greater than two

5.1.2.10 drawWireCube()

```
void CSCI441::drawWireCube (
             GLdouble sideLength )  [inline]
```

Draws a wireframe cube.

The origin is at the cube's center of mass. Cube is oriented with our XYZ axes

Parameters

GLdouble	sideLength - length of the edge of the cube

Precondition

sideLength must be greater than zero

5.1.2.11 drawWireCylinder()

```
void CSCI441::drawWireCylinder (
             GLdouble base,
             GLdouble top,
             GLdouble height,
             GLint stacks,
             GLint slices )  [inline]
```

Draws a wireframe open ended cylinder.

Cylinder is oriented along the y-axis with the origin along the base

Parameters

GLdouble	base - radius of the base of the cylinder
GLdouble	top - radius of the top of the cylinder
GLdouble	height - height of the cylinder from the base to the top
GLint	stacks - resolution of the number of steps rotated around the central axis of the cylinder
GLint	slices - resolution of the number of steps to take along the height

Precondition

either: (1) base is greater than zero and top is greater than or equal to zero or (2) base is greater than or equal to zero and top is greater than zero
height must be greater than zero
stacks must be greater than zero
slices must be greater than two

5.1.2.12 drawWireDisk()

```
void CSCI441::drawWireDisk (
            GLdouble inner,
            GLdouble outer,
            GLint slices,
            GLint rings )  [inline]
```

Draws a wireframe disk.

Disk is drawn in the XY plane with the origin at its center

Parameters

GLdouble	inner - equivalent to the width of the disk
GLdouble	outer - radius from the center of the disk to the center of the ring
GLint	slices - resolution of the number of steps rotated along the disk
GLint	rings - resolution of the number of steps to take along the disk width

Precondition

inner is greater than zero
outer is greater than zero
outer is greater than inner
slices is greater than two
rings is greater than zero

5.1.2.13 drawWirePartialDisk()

```
void CSCI441::drawWirePartialDisk (
            GLdouble inner,
```

```
            GLdouble outer,
            GLint slices,
            GLint rings,
            GLdouble start,
            GLdouble sweep )  [inline]
```

Draws part of a wireframe disk.

Disk is drawn in the XY plane with the origin at its center

Parameters

GLdouble	inner - equivalent to the width of the disk
GLdouble	outer - radius from the center of the disk to the center of the ring
GLint	stacks - resolution of the number of steps rotated along the disk
GLint	rings - resolution of the number of steps to take along the disk width
GLdouble	start - angle in degrees to start the disk at
GLdouble	sweep - distance in degrees to rotate through

Precondition

inner is greater than zero
outer is greater than zero
outer is greater than inner
slices is greater than two
rings is greater than zero
start is between [0, 360]
sweep is between [0, 360]

5.1.2.14 drawWireSphere()

```
void CSCI441::drawWireSphere (
            GLdouble radius,
            GLint stacks,
            GLint slices )  [inline]
```

Draws a wireframe sphere.

Origin is at the center of the sphere

Parameters

GLdouble	radius - radius of the sphere
GLint	stacks - resolution of the number of steps to take along theta (rotate around Y-axis)
GLint	slices - resolution of the number of steps to take along phi (rotate around X- or Z-axis)

Precondition

radius must be greater than 0
stacks must be greater than 2
slices must be greater than 2

5.1.2.15 drawWireTeapot()

```
void CSCI441::drawWireTeapot (
            GLdouble size )  [inline]
```

Draws a wireframe teapot.

Oriented with spout and handle running along X-axis, cap and bottom along Y-axis. Origin is at the center of the teapot

Parameters

GLdouble	size - scale of the teapot

Precondition

size must be greater than zero

5.1.2.16 drawWireTorus()

```
void CSCI441::drawWireTorus (
            GLdouble innerRadius,
            GLdouble outerRadius,
            GLint sides,
            GLint rings )  [inline]
```

Draws a wireframe torus.

Torus is oriented in the XY-plane with the origin at its center

Parameters

innerRadius	- equivalent to the width of the torus ring
outerRadius	- radius from the center of the torus to the center of the ring
sides	- resolution of steps to take around the band of the ring
rings	- resolution of steps to take around the torus

Precondition

innerRadius must be greater than zero
outerRadius must be greater than zero
sides must be greater than two
rings must be greater than two

5.1.2.17 popMatrix()

```
void CSCI441::popMatrix (
             glm::mat4 mtx )  [inline]
```

Multiplies current matrix by inverse of given matrix.

Parameters

glm::mat4	mtx - matrix to multiply the current matrix by the inverse of

5.1.2.18 pushMatrix()

```
void CSCI441::pushMatrix (
             glm::mat4 mtx )  [inline]
```

Multiplies current matrix by given matrix.

Parameters

glm::mat4	mtx - matrix to multiply the current matrix by

Chapter 6

Class Documentation

6.1 CSCI441::OpenGLUtils Class Reference

static class containing OpenGL Utilities

`#include <OpenGLUtils.hpp>`

Static Public Member Functions

- static void printOpenGLInfo ()
  Prints information about our OpenGL context.

6.1.1 Detailed Description

static class containing OpenGL Utilities

6.1.2 Member Function Documentation

6.1.2.1 printOpenGLInfo()

`void CSCI441::OpenGLUtils::printOpenGLInfo ( )  [inline], [static]`

Prints information about our OpenGL context.

The documentation for this class was generated from the following file:

- OpenGLUtils.hpp

Chapter 7

File Documentation

7.1 objects.hpp File Reference

Helper functions to draw 3D OpenGL 2.1 objects.

```
#include <GL/gl.h>
#include <assert.h>
#include <math.h>
#include <CSCI441/teapot.hpp>
```

Namespaces

- CSCI441

  CSCI441 Helper Functions for OpenGL.

Functions

- void CSCI441::drawSolidCone (GLdouble base, GLdouble height, GLint stacks, GLint slices)

  Draws a solid cone.
- void CSCI441::drawWireCone (GLdouble base, GLdouble height, GLint stacks, GLint slices)

  Draws a wireframe cone.
- void CSCI441::drawSolidCube (GLdouble sideLength)

  Draws a solid cube.
- void CSCI441::drawWireCube (GLdouble sideLength)

  Draws a wireframe cube.
- void CSCI441::drawSolidCylinder (GLdouble base, GLdouble top, GLdouble height, GLint stacks, GLint slices)

  Draws a solid open ended cylinder.
- void CSCI441::drawWireCylinder (GLdouble base, GLdouble top, GLdouble height, GLint stacks, GLint slices)

  Draws a wireframe open ended cylinder.
- void CSCI441::drawSolidDisk (GLdouble inner, GLdouble outer, GLint slices, GLint rings)

  Draws a solid disk.
- void CSCI441::drawWireDisk (GLdouble inner, GLdouble outer, GLint slices, GLint rings)

  Draws a wireframe disk.

- void CSCI441::drawSolidPartialDisk (GLdouble inner, GLdouble outer, GLint slices, GLint rings, GLdouble start, GLdouble sweep)

  Draws part of a solid disk.
- void CSCI441::drawWirePartialDisk (GLdouble inner, GLdouble outer, GLint slices, GLint rings, GLdouble start, GLdouble sweep)

  Draws part of a wireframe disk.
- void CSCI441::drawSolidSphere (GLdouble radius, GLint stacks, GLint slices)

  Draws a solid sphere.
- void CSCI441::drawWireSphere (GLdouble radius, GLint stacks, GLint slices)

  Draws a wireframe sphere.
- void CSCI441::drawSolidTeapot (GLdouble size)

  Draws a solid teapot.
- void CSCI441::drawWireTeapot (GLdouble size)

  Draws a wireframe teapot.
- void CSCI441::drawSolidTorus (GLdouble innerRadius, GLdouble outerRadius, GLint sides, GLint rings)

  Draws a solid torus.
- void CSCI441::drawWireTorus (GLdouble innerRadius, GLdouble outerRadius, GLint sides, GLint rings)

  Draws a wireframe torus.

7.1.1 Detailed Description

Helper functions to draw 3D OpenGL 2.1 objects.

Author

Dr. Jeffrey Paone

Date

Last Edit: 19 Sep 2017

Version

1.0.1

Copyright

These functions draw solid (or wireframe) 3D closed OpenGL objects. All objects are constructed using triangles that have normals and texture coordinates properly set.

Warning

NOTE: This header file will only work with OpenGL 2.1

7.2 OpenGLUtils.hpp File Reference

Helper functions to work with OpenGL.

```
#include <GL/gl.h>
#include <glm/glm.hpp>
#include <stdio.h>
```

Classes

- class CSCI441::OpenGLUtils
  static class containing OpenGL Utilities

Namespaces

- CSCI441
  CSCI441 Helper Functions for OpenGL.

Functions

- void CSCI441::pushMatrix (glm::mat4 mtx)
  Multiplies current matrix by given matrix.
- void CSCI441::popMatrix (glm::mat4 mtx)
  Multiplies current matrix by inverse of given matrix.

7.2.1 Detailed Description

Helper functions to work with OpenGL.

Author

Dr. Jeffrey Paone

Date

Last Edit: 21 Sep 2017

Version

1.1

Copyright

MIT License Copyright (c) 2017 Dr. Jeffrey Paone

These functions

Warning

NOTE: This header file will depends upon glm

7.3 teapot.hpp File Reference

Helper functions to draw teapot with OpenGL 2.1.

```
#include <GL/gl.h>
```

7.3.1 Detailed Description

Helper functions to draw teapot with OpenGL 2.1.

Date

Last Edit: 19 Sep 2017

Warning

NOTE: This header file will only work with OpenGL 2.1

Modified by Dr. Jeffrey Paone to work in Colorado School of Mines CSCI441 course context.

Index