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CS 488 Assignment 2

Manual

The view volume is set to clip first to the near and far planes, then it projects onto the near plane and clips to the remaining four planes. The function “clipLine” clips a line to a plane (which is represented as a point and a normal vector). This function is called repeatedly from paintGL.

No matrices are stored in Viewer.cpp because I store them in other classes. Instead there is a class called “Movable” to represent a movable object, such as the camera or a model. There are additional classes called “Model” to represent a model (with additional functionality to scale) and “ViewPoint” to represent the view point (camera).

The class “Movable” contains one matrix that is the total transformations applied to the object so far. An additional tranformation T is applied to this matrix M by multiplying M on the right by T. This is equivalent to “undoing” M, applying T then “reapplying” M (note that $MTM^{-1}M = MT$).

The ViewPoint internally stores the camera matrix – how to transform the camera from the origin to where it should be. This includes a reflection and, by default, a rotation by π. The View matrix is then computed from the camera matrix by inverting it.

The two gnomons and the box are each represented as a model (3 total models). This is to easily separate scaling out from the box and box gnomon, and to provide a common interface for drawing all of them.

One face of the box is drawn in cyan, to help the viewer maintain proper perspective on it. Additionally, the box gnomon is drawn in yellow to differentiate it from the world gnomon, which is drawn in red, blue and green.

Depth Checking

No depth checking was implemented, and lines are always drawn in the same order. As such, certain lines may appear to be “in front” of others, even when they are not. The box is drawn first, then the box gnomon, then the world gnomon, so the world gnomon will always appear “closest”.

Despite this confusion, the different colours were kept because they are beneficial in identifying the different objects.

Assumptions

It is assumed that this program will be run on Ubuntu 14.04 with Qt version 5.2.1.

sum is: /usr/bin/sum

A2:
total 1996
71800380 -rw-r--r-- 1 wmcdonal wmcdonald 13880 Jun 2 16:51 screenshot01.png
31987201 drwxrwx--- 2 wmcdonal cs488 4096 Jun 2 16:48 src/
71800397 drwxrwx--- 4 wmcdonal cs488 4096 Jun 2 16:40 ./
71800381 -rwxr-xr-- 1 wmcdonal wmcdonald 402 Jun 2 16:40 README*
99057873 -rw-r--r-- 1 wmcdonal wmcdonald 84 Jun 2 16:39 shader.vert
124975199 -rw-r--r-- 1 wmcdonal wmcdonald 118 Jun 2 16:39 shader.frag
116475613 -rwxr-xr-x 1 wmcdonal wmcdonald 1986612 Jun 2 16:39 a2*
129680451 drwxrwx--- 7 wmcdonal cs488 4096 May 20 08:40 ../
71800398 drwxrwx--- 2 wmcdonal cs488 4096 May 6 11:55 data/

A2/src:
total 180
25703360 -rw-r--r-- 1 wmcdonal wmcdonald 84 Jun 2 16:48 shader.vert
31987201 drwxrwx--- 2 wmcdonal cs488 4096 Jun 2 16:48 ./
25703359 -rw-r--r-- 1 wmcdonal wmcdonald 118 Jun 2 16:48 shader.frag
71800397 drwxrwx--- 4 wmcdonal cs488 4096 Jun 2 16:40 ../
25703358 -rw-r--r-- 1 wmcdonal wmcdonald 307 Jun 2 16:39 xform.hpp
25703357 -rw-r--r-- 1 wmcdonal wmcdonald 1177 Jun 2 16:39 xform.cpp
25703356 -rw-r--r-- 1 wmcdonal wmcdonald 213 Jun 2 16:39 ViewPoint.hpp
99057886 -rw-r--r-- 1 wmcdonal wmcdonald 472 Jun 2 16:39 ViewPoint.cpp
99057879 -rw-r--r-- 1 wmcdonal wmcdonald 4024 Jun 2 16:39 Viewer.hpp
99057874 -rw-r--r-- 1 wmcdonal wmcdonald 12340 Jun 2 16:39 Viewer.cpp
124975198 -rw-r--r-- 1 wmcdonal wmcdonald 335 Jun 2 16:39 Movable.hpp
124975197 -rw-r--r-- 1 wmcdonal wmcdonald 825 Jun 2 16:39 Movable.cpp
124975196 -rw-r--r-- 1 wmcdonal wmcdonald 508 Jun 2 16:39 Model.hpp
116475621 -rw-r--r-- 1 wmcdonal wmcdonald 563 Jun 2 16:39 Model.cpp
116475620 -rw-r--r-- 1 wmcdonal wmcdonald 75544 Jun 2 16:39 Makefile
116475619 -rw-r--r-- 1 wmcdonal wmcdonald 549 Jun 2 16:39 main.cpp
116475618 -rw-r--r-- 1 wmcdonal wmcdonald 973 Jun 2 16:39 AppWindow.hpp
116475617 -rw-r--r-- 1 wmcdonal wmcdonald 3745 Jun 2 16:39 AppWindow.cpp
116475616 -rw-r--r-- 1 wmcdonal wmcdonald 10113 Jun 2 16:39 algebra.hpp
116475615 -rw-r--r-- 1 wmcdonal wmcdonald 3346 Jun 2 16:39 algebra.cpp
116475614 -rw-r--r-- 1 wmcdonal wmcdonald 540 Jun 2 16:39 a2.pro

A2/data:
total 8
71800397 drwxrwx--- 4 wmcdonal cs488 4096 Jun 2 16:40 ../
71800398 drwxrwx--- 2 wmcdonal cs488 4096 May 6 11:55 ./

A2
A2/a2 42280 1941
A2/data
A2/README 19105 1
A2/screenshot01.png 28680 14
A2/shader.frag 23161 1
A2/shader.vert 10278 1
A2/src
A2/src/a2.pro 50085 1
A2/src/algebra.cpp 53552 4
A2/src/algebra.hpp 55500 10
A2/src/AppWindow.cpp 36382 4
A2/src/AppWindow.hpp 29667 1
A2/src/main.cpp 41289 1
A2/src/Makefile 33390 74

A2/src/Model.cpp	03052	1
A2/src/Model.hpp	37247	1
A2/src/Movable.cpp	45835	1
A2/src/Movable.hpp	50411	1
A2/src/shader.frag	23161	1
A2/src/shader.vert	10278	1
A2/src/Viewer.cpp	15511	13
A2/src/Viewer.hpp	62677	4
A2/src/ViewPoint.cpp	07135	1
A2/src/ViewPoint.hpp	34724	1
A2/src/xform.cpp	62304	2
A2/src/xform.hpp	18932	1

1.14 Objectives: Assignment 2

Due: Wednesday, June 3rd [Week 5].

Name: _____

UserID: _____

Student ID: _____

___ **1:** All model transformations are carried out with respect to the box's local origin. (This means, for example, that an x translation will not necessarily be parallel to the world's x axis, if the box has been rotated about its y or z axis.)

___ **2:** Viewing transformations work as expected according to the eye's coordinates. This is indicated by where the world gnomon is displayed.

___ **3:** Model transformations are applied to the box gnomon, except that the box gnomon is carried along **unscaled**.

___ **4:** The transformations in all modes act smoothly **while** the mouse is being moved. Pressing two buttons at the same time results in the two transformations being performed together.

___ **5:** Rotations, translations, and scales can be invoked in any order. Interaction modes may be entered and left as often as desired. There are no restrictions that prevent model transformations from being applied after the view has changed, or view transformations after the box has been transformed. No matter what sequence of transformations is entered, the box never distorts so that its edges fail to meet at right angles (in 3D).

___ **6:** A menubar with pulldown menus is used, with the functionality specified in the assignment description, including a reset for all transformations, the use of radiobuttons, and on screen feedback indicating the current interaction mode, and near and far plane locations.

___ **7:** The perspective transformation has been correctly implemented, and the field-of-view can be changed as specified in the assignment description.

___ **8:** The viewport user interface and the viewport mapping works as specified in the assignment description, and the initial viewport is about centered with 90% maximum size.

___ **9:** Lines are clipped to the near and far planes. The near and far planes can be changed as specified in the assignment description.

___ **10:** Lines are clipped to the sides of the viewing volume.

Declaration:

I have read the statements regarding cheating in the CS488/688 course handouts. I affirm with my signature that I have worked out my own solution to this assignment, and the code I am handing in is my own.

Signature:

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Name (printed):

Student id:

User id:

Signature:

Date: