Practical 2 – OpenGL: Basic Rendering and Transformations

OR "OpenGL Bootcamp"

This is your first practical in OpenGL which is designed to get you familiar with OpenGL before you delve into shaders. The aim is to teach you some basics like setting up a standard window and camera, and populating the scene with an object. After you have an object set up, you need to have it move about to demonstrate translations and rotations in OpenGL.

This practical will make use of QT and its OpenGL bindings. A bare-bones QT template project will be provided under assignments. The project contains a Qmake file with the necessary library dependencies already specified. This project will open and run in the linux environment of the computers in the senior lab. The mesa gl drivers, glew**,** the qt core, gui, opengl and widgets**,** as well as their headers must be installed on your machine should you wish to use your home machine for development. This year we will be using OpenGL 3.2 (in contrast to previous years when OpenGL 2.0 and FreeGLUT were used). Make use of your textbook to aid you in completing the practicals as it contains useful information.

You are required to demonstrate the following:

1) Basic window setup

Open up the template project located under assignments. Open the Qmake project file, build, run and ensure that an OpenGL window opens and a green triangle is drawn.

Once you have a working setup you need to modify the draw routines to setup a camera that views the scene. The camera needs to have a target, which must remain fixed at the world origin (0, 0, 0). The camera should remain stationary.

2) Load up an object

Write a method that loads STL format binary files. The specification for STL is available at:

http://en.wikipedia.org/wiki/STL_(file_format)

The bunny.stl file is provided under assignments and should be loaded and drawn at startup. Add "open" and "new" file menu items using QT so that new files can be loaded and the scene reset.

3) Transformations and rotations

Enable the user to translate, scale and rotate the loaded object. Key-presses should be used to change between different modes (e.g., 'R' for to switch between rotation axes, 'S' for scale, etc) and the mouse to drive the actual changes.

4) Colour alteration

The user should be able to change the colour of the model between five different pre-set options using key-presses ('1'-'5'). The choice of colours is up to you.

Plagiarism

Due to the wide availability of OpenGL code around the internet very strict penalties will apply for any code that is found to be not your own! We will be examining these practicals very carefully so please submit code that you have written.

Marking

This practical is designed to be run in Linux and thus failure to compile on the Senior Lab computers will result in a 50% penalty. The majority of the marks are set for the transformations and object loading section which are the primary focus of the practical; you will need to clearly demonstrate mastery of these in order to obtain full marks.

Basic Features	Marks
1) Basic Window Setup	20%
2) Object loading	40%
3) Transformation	30%
4) Colour changes	10%

Submission Date

Hand in by 10:00am Tuesday, 28 April.

Useful Resources

- Google around for OpenGL tutorials
- Consult the QT OpenGL examples
- The GLM project at http://glm.g-truc.net/0.9.6/index.html