**Detail report for COSC4370 Fall 20 HW4 - OpenGL**

**Objective**

Objective of this Project practice little more deeply into OpenGL with 3D scene and along with that we will be adding some more features to a barebones ray tracer.

**Environment**

If there is no required libraries for openGL then first you should do follow STEP 1 for the setup.

On my HW3 I have already installed STEP 1 libraries, so I don’t have to do it again for this project.

STEP 1: -

In this project we will be using the GLUT/freeglut, GLEW, GLFW and GLM library for our OpenGL code. If you are on Windows, we can find a freeglut 3.0.0 package for Visual Studio (MSVC) at http://www.transmissionzero.co.uk/software/freeglutdevel/. On OS X, GLUT should be installed by default. Finally, if we are on Linux and don’t have GLUT already installed, you should be able to install it by running sudo apt-get install freeglut3-dev or sudo yum install freeglut devel in a terminal. We have written the included Makefile so that the project should compile with it on Linux or OS X. For Windows, we will need to create a project in Visual Studio rather than using the Makefile.

For windows :

Put glut.h inside “C:\Program  
Files(x86)\Microsoft Visual Studio  
10.0\VC\include\**GL**\” (you may need to create the directory **GL with** yourself).  
λ Put glut32.lib inside “C:\Program  
Files\Microsoft Visual Studio 9.0\VC\lib\”.  
**Windows 32-Bit Users**: Put glut32.dll inside  
“C:\Windows\System32\”.  
**Windows 64-Bit Users**: Put glut32.dll inside  
“C:\Windows\SysWOW64\”.

For other Libraries:-

* <https://sourceforge.net/projects/glew/files/glew/1.13.0/>
* <https://www.glfw.org/download.html>
* <https://github.com/g-truc/glm/releases/tag/0.9.9.8>

For linking all these libraries to my project I watched youtube videos which I have mentioned in the reference section.

For this assignment I have used Eigen library (3.1.1) for linear algebra which was provided to us and for more detail and to explore more about this library I visited eigen.tuxfamily.org.

Furthermore, I have added more files in the src and include directories and I have modified the Makefile.

**Project Details**

In this project we directed to go through different header(.h) and .cpp which I have mentioned down below:-

* Image.h/.cpp

This provides the simple functionality for writing, .png images. For this to compile it requires libpng library.

* Scene.h/.cpp

This stores the objects in a scene and performs basic ray tracing. This is an abstract class for representing a shape and also defines the Ray and HitRecord structs.

* Sphere.h /.cpp

This is for the class of shape.

* main.cpp

This is the entry point for the program which sets up a scene, initiates ray tracing and saves the output.

I have added shape.h, a vector color and call a constructor to set the color for each object in red, green, and blue.

In the problem 2 and 3 I change scene trace. In my problem 1 I added plane.h/cpp with the math logic. I have added Phong shading which is based on the problem 2.

For problem 4, I added support for mirrored surfaces that reflects rays of light according to the law of reflection. In my .cpp file I have commented which will tell everything what will create by the function.

I run my program by using visual studio in windows 10.

**Result:**

After successfully running the code I got following results:-

A picture containing ball, egg

Description automatically generated Problem 1 A picture containing ball

Description automatically generated Problem 2

A picture containing ball

Description automatically generated Problem 3 A picture containing logo

Description automatically generated Problem 4

**Reference:**

For this assignment our class lecture helped me a lot. Beside our class lecture I took a reference of following links which is youtube video and course:-

* <https://learnopengl.com/>
* http://www.lemoda.net/c/write-png/
* <https://www.youtube.com/watch?v=W3gAzLwfIP0&list=PLlrATfBNZ98foTJPJ_Ev03o2oq3-GGOS2&ab_channel=TheCherno>
* http://www.cs.cornell.edu/courses/cs4620/2012fa/lectures/35raytracing.pdf