7-1 Submit Breakfast 3D Scene

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**Reflection**

1. **Justify development choices for your 3D scene**. As you write, think about why you chose your selected objects. Also consider how you were able to program for the required functionality.

I selected a Breakfast 3D Scene, because I love eating an orange or any fruit with hot herbal tea or coffee in the mornings. So, I was very familiar on my idea to create a breakfast as usual by first using a Plane 3D object as a wooden table where I consider on creating a 3D scene of a platter with an orange fruit and next to it a teacup with lemon inside which the matrix of the diameter and radius from each corner of my breakfast 3D primitives’ objects will be considered in the making of my project. As I reviewed the resources material that I researched, I found it practical but a good challenge in a way to making all triangle 2D shapes to form my 3D cube, plane, sphere, and cylinder objects. Had to use programmatic and mathematical functions in OpenGL code to generate the original image that I took to be rendered into a recreated 3D graphic scene.

1. **Explain how a user can navigate your 3D scene**. As you compose your thoughts, discuss how you set up to control the virtual camera for your 3D scene using different input devices.

Accordingly, to the navigation functionality of the 3D scene objects, I had to use the same skill set that I had learned from the resources and chapters within the module. I had to utilize the A,S,W,D keys to provide moves in camera forward, left, back, and right functionality, the Q, E keys will move camera up and down, and P key will change scene between orthographic and perspective projection matrices which makes the camera to position and move effectively. While this is implemented, it enables a user to run the graphic language code in a full 360-degree motion around the 3D scene objects in the world. So, in other terms the mouse cursor will be used to adjust camera pitch and yaw while mouse scroll will adjust the speed of camera movement. For the keys, it will enable the finer adjustments of the position in the camera when the 3D scene objects are in motion. The user will be able to navigate thoroughly by the breakfast 3D scene with mouse and keyboard control functionality.

1. **Explain the custom functions in your program that you are using to make your code more modular and organized**. Ask yourself, what does the function you developed do and how is it reusable?

I have learned many constructive lessons and pointing out an important one would be creating well-read clean code and supported in-line comments. As I have created myself a repository in GitHub and Bitbucket accounts to keep all my projects together to help me look back and understand thoroughly how I accomplished my targeted goals in each of those projects. As I constructed this 3D scene project along the way I kept it clean and well-read code with in-line comments to enable me to see how the pieces in the puzzle where to be created and very useful for the project to be successful. I had times that I will render the images in Visual Studios when I typed the code and I will get errors every time, but when I went back to the pieces that did work properly in the Source.cpp code. There then I’d find the solution to continue coding the next step into researching more resources that will apply to the errors that I would be getting at first. However, this can be always done with well-read code along with in-line comments that can demonstrate to a user on how these pieces of code can be effective to accomplish the functionality of a 3D scene project.

Therefore, when I started this course, I just wanted to learn how OpenGL would be useful and all the imported libraries that would affect the 3D shapes and objects in my project. Then, I realize that it had levels to rendering the images in the Visual Studio IDE. Since I learned each functionality phase from Vertex shader to the Fragment shader. I started to go piece by piece with the help of the resources that our instructor and modules where able to share. Next, I started to critically think on how each step would be done from modularizing the objects and applying features like colored textures, lightning using the Phong model, etc. Therefore, I considered the tools to use within the program which I used here was C++, an object-oriented and lower-level programming language to be known to work with different program applications and APIs for example. Another tool that was used in this program was the OpenGL which is an API for graphical designing which has libraries like GLEW, GLFW, and GLAD to be imported into the program. Now the GLM library is known to be used from the OpenGL API for mathematics which is a header-only library that enables a linear algebraic computation to perform graphical processing. Also, the stb\_image.h in OpenGL API is a header-only library for loading images from different file-types into the program. Overall, I’ve well enjoyed my time in this course and all the material resources that has helped me take my career and skill set portfolio to the next level.