**CS-330 Project Reflection**

Elizabeth Ristenpart

Southern New Hampshire University

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Professor Eugenio Rodriguez

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For this project, I wanted to include shapes that did not seem easy to create. Throughout this course we mainly focused on building 2D triangles, 3D cubes, and 3D pyramids. Due to this, I thought it would be best to learn how to make spheres and cylinders to truly challenge myself. I also wanted to keep the design simple as I did not want to be unable to complete the final scene. The objects I ended up selecting were a snow globe, a tennis ball, a charging cube, and a coaster. When initially deciding on my project scene I focused more on the items than the total scenes cohesiveness.

When creating each of the items, some were easier than others. The cylinder and the sphere required a calculation to find the vertices unlike the cube where I was able to write out the vertices. Due to this, separate cpp files were created to keep the program more organized. The cylinder was broken down into the top, bottom and middle region calculations. The top and bottom of the cylinder were 2D circles. Each of the shapes created could be called upon in the main file and used multiple times. I ended up using the sphere twice, once for the tennis ball and another for the top of the snow globe. The cube was able to be scaled into many different sizes and used multiple times. I used the cube code to create the charging cube, the floor plane, the coaster base, the coaster top and the point lights. I chose to use multiple point lights to ensure the scene was well lit, similar to the picture. To meet the light color requirement, I decided to add a subtle yellow color to one of the point lights to imitate sunlight coming from a potential window.

A camera was created and can be used to look around the scene and see the different objects from many different angles. The user is able to use the keys W, A, S , and D to control the forward, backward, left and right movement. The user is also able to use the keys Q, and E for upward and downward movement. The keys P, and O are used for changing the display of the 3D world from orthographic (2D) back to perspective (3D). The mouse wheel can be used to adjust the movement speed and finally the mouse can be used to change the orientation of the camera from up, down, left or right.

As stated previously, the code created has the ability to be reused for multiple objects. The cubes vertices were re-used to create planes, flatter cubes, light cubes, and more. The sphere could be drawn and rendered multiple times. While the cylinder was only used once, the cylinder could be rendered more than once to create multiple cylinders in the same scene. To make multiple point lights, a for loop was created and utilized, the cube was translated based on its position and scaled to be smaller than the initial vertices cube. All objects in the scene are very reusable in many ways. Comments were made throughout the code so others can see what areas of the program make up the specific object. This helped when making changes to the objects.

Overall, the scene became similar to the picture initially taken. If I had the opportunity, I would most likely create a more cohesive scene as my objects did not go together very well and seemed like random items. This project taught me a lot of different concepts on OpenGL and made me appreciate all the games that have previously been created with it.