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CS 330 Comp Graphic and Visualization

7-1 Project (Design Decisions)

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**Justify development choices for your 3D scene**

The image I selected at the beginning of the term for the project consisted of four unique 2D objects that were transformed into a 3D scene. The image consisted of an Apple MacBook charger, a stone pyramid, a stack of coasters, and a upside down bowl. A cube, cylinder, pyramid, and sphere were the four 3D shapes needed. The Apple Charger was represented by the cube. A plane used was a representation of a dining room table. A cylindrical shape was used to create the coaster stack. The bowl, which would have been my final object would have used a half of a sphere. A cylinder was used to depict the top of the coaster stack, which needed to be separated into multiple 3D objects laid upon each other. A pyramid sliced embodied the center section, and a cylinder was used to represent the bottom section of the coasters. A cube served as a representation of the white object on the right with the apple logo.

Each of the objects in the chosen image were represented well by the shapes that were chosen to define them. Being that they are discernible as cuboids, I went with a cube to symbolize the apple charger. Although the cuboid wasn’t one of the provided 3D shapes, it depicted a cube with variation of side lengths. The plane is a good representation of the table and flat surface. The best 3D depiction of the stack of coasters is a sphere because of how similar each coaster is to a sphere, but flat. The upside-down bowl was the most challenging to depict. Due to the stack of coasters consisting of multiple 3D shapes, the instructions presented a need for various primitive shapes. The top portion of the coasters was depicted as a cylinder in 3D as it appeared to be cylindrical in shape. The coaster stack center section was shaped as a cylinder with a cutout at the top. A cylinder shape was the most appropriate because the coaster stacks final portion appeared to be greatly cylindrical.

**Explain how a user can navigate your 3D scene**

The modeled 3D scene from the selected image utilizes different techniques to maneuver through it. The keyboard is the input device with different keys to move the scene in different directions and zoom in and out. Functions were created to facilitate the movements in four directions. The WASD keys are used to move the scene. The W key and the A key allow for forward and backward movement by the user. The S and D keys allow for left and right movement by the user. The P and O keys are used for the zoom-in and out technique. Apart from the 6 keys, two other keys were also used to enable upward and downward movement. The Q and E move the scene upward and downward. The Q key moves the objects up while the E moves the objects down.

The mouse can also be used as a controller to navigate through the 3D scene. The mouse movement is used to pitch and yaw the object at different angles. The scene can be viewed from a different angle using the camera movement. The cursor of the mouse alters the orientation of the camera to look upon the upside, downside, left, or right of the 3D objects. The mouse scroll can be used to control speed of the objects movement which translates as the speed used by the camera which traverses around the object.

**Custom functions to make code more modular and organized**

Modularity was gained through functions inputted in the code. Different functions were inputted to perform various actions with the 3D scene. UmouseScrollBack function was used to control the speed of the camera movement. UMousePositionCallback was used to get the position of the image and pitch and yaw the image based on the mouse movements. UcreateTexture was used to define the texture of the 3D objects and UShaderProgram was used to implement the lighting of the 3D objects. Finally, Urender was used to render the objects on the screen based on the coded vertices and colors from the UCreateMesh functions. These functions were primarily used in the project to make them reusable and reach modularity.