Final Project: 3D Computer Desk Scene

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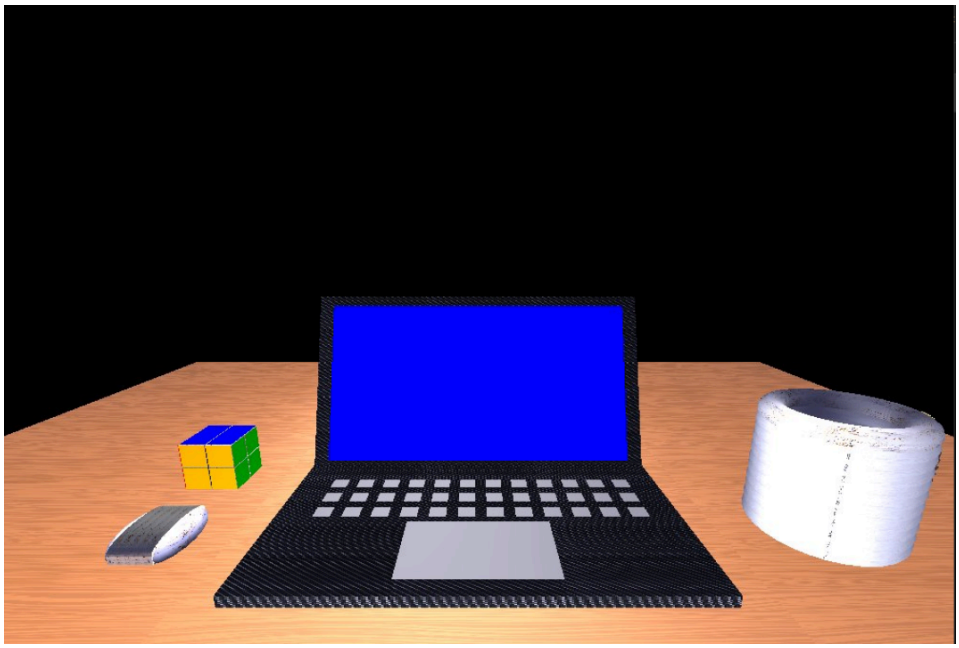
Reflection

9. Justifying my development choices for the 3D scene



The figure above is a depiction of a 2D image that I have chosen to replicate within the OpenGL environment, a digital 3D version for Triangle and Cube Studios. The reason why I chose this particular scene and the objects within it is because the table, coffee mug, laptop, Rubik's Cube, and computer mouse utilize various shapes such as planes, boxes, tori, cylinders, and spheres which I thought would be excellent for practicing the skills of object formation, applying textures, lighting, and appropriate object placement. The coffee mug was the initial object developed throughout the milestones, which was made out of cylinders for the base/handle of the mug, and several tori for the overall mug structure. The laptop at the center of the scene was simply made out of boxes which represent the body of the laptop, and a number of planes which represent the keyboard, monitor and trackpad. One of the boxes that make up the screen of the laptop was tilted about 160 degrees around the X-axis to imitate a similar tilt as depicted in the 2D image above. The rubik's cube was made out of 8 boxes in a 2x2x2 arrangement with a black box at the center to delineate the borders between the boxes. Several planes with various shader colors were simply placed on top of the boxes to fully imitate the 3D object of a Rubik's Cube and its colors for each side of the Rubik's Cube. And finally, the computer mouse consisted of a box, a cylinder, and spheres. This object required the most adjustment in object scaling and positioning to accurately imitate the shape of a computer mouse as it contains many curves about the structure.

Textures and material selection for the objects within the scene were carefully selected to demonstrate rendering for various object surfaces, as well as the effects of lighting upon the objects with varying materials such as: gold, wood, clay, glass, tile, and cement. The mug contains both porcelain and gold textures applied to it as one of the two objects required for texturing for Project Two. The second textured object is the laptop, which is wrapped with a dark

carbon fiber appearance. Porcelain was also textured over the computer mouse for additional styling for the 3D scene.

For the users to perceive the objects within the scene, appropriate lighting has to be applied from several angles that aim toward the desired part of the scene. There are a total of five lights within the 3D scene as depicted in the above figure, beginning with a global ambient light which allows for all the objects to be seen within the environment. Then, there are an additional 4 lights surrounding the table objects with varying intensities of diffuse and specular lighting. The fifth light illuminates an amber color towards the scene as one of the colored lights for the project.

Users can navigate about the 3D scene by pressing the WASD keys on a standard keyboard which controls side-to-side strafing as well as forward and backward movements. The Q and E keys control upward and downward movement of the camera. If the user desires to look around the scene, a mouse can be used to emulate head movement from a fixed position; for example, moving the computer mouse forward on a track pad will tilt the camera up within the 3D scene. To adjust the camera movement speed, the user can scroll up or down on the mouse wheel to make the appropriate changes. For example, for a macbook mouse, scrolling up will slow the camera down by 0.2f per increment.

There is also the option to switch between perspective and orthographic views on the camera by simply pressing either the “P” key for perspective view or the “O” key for orthographic view. Pressing either of these keys will affect the camera position or orientation.

The custom functions within my program that I am using to make my code more modular and organized include the: DefineObjectMaterials(), SetupSceneLights(), and SetShaderTextures() functions. The DefineObjectMaterials() function is responsible for creating a list of materials that

respond differently depending on the light that shines upon the surface of an object with a preset material. This function is reusable in such a way that a developer can add, remove, and refine materials as necessary throughout the development lifecycle. The SetupSceneLights() function is used for illumination of various lights towards a 3D scene, and is very useful in making quick changes to desired light settings such as diffuse, specular, and ambient intensities. Finally, the SetShaderTextures() function is useful for adding a texture to the surface of an object as well as making future changes with simple file swaps, qualifying this function as modular.