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CS-330

**Project Two Reflection**

Throughout the development of my 3D scene for the final project, I focused on building a realistic and engaging kitchen countertop arrangement. The scene features a wooden bowl, a ceramic mug, a spoon, a plate, and an apple, each constructed from basic 3D shapes, such as cylinders, spheres, and toruses. I chose these objects because they allowed me to demonstrate key concepts such as shape modeling, transformations, lighting, and texture mapping. Each object had distinct physical characteristics and materials, making them ideal for displaying how lighting and texture interact with surfaces. For example, the bowl and spoon were rendered using wood textures, while the mug utilized a ceramic image, and the plate featured a marble-like surface. These choices not only reflect a consistent visual theme but also provide variety in surface reflectivity and complexity.

Programming this scene required careful management of object placement and scale. I used a combination of scaling, rotation, and translation to arrange the items naturally within the scene. The objects were spaced deliberately to avoid overlapping, while maintaining a composition that feels realistic and intentional. To enhance the scene visually, I applied multiple light sources, including directional and ambient lights, to create soft shadows and highlights across the objects. These lighting setups also helped in distinguishing materials and provided depth and contrast in the final render. I was able to meet the required functionality by structuring my rendering logic with reusable functions, ensuring that changes to positioning or appearance could be made easily across the project.

Navigation within the scene was a key feature I wanted to make smooth and intuitive for the user. To achieve this, I implemented controls that allow the camera to move along the X, Y, and Z axes. The WASD keys enable movement forward, backward, and side to side, while the Q and E keys allow the camera to move vertically up and down. This full range of motion will enable users to explore the entire scene from multiple perspectives. Additionally, I incorporated mouse controls to adjust the pitch and yaw of the camera, allowing users to look around the scene fluidly. The mouse scroll wheel is used to change the zoom level or travel speed, enabling users to exert precise control over their movement through the space. These features were designed to make exploration intuitive, giving users the flexibility to inspect any object up close or from a distance.

To further enhance user interaction, I implemented the ability to switch between perspective and orthographic views. By pressing the P key, users can toggle to perspective mode, which provides a more realistic 3D experience with depth and foreshortening. Pressing the O key switches to orthographic mode, which helps analyze spatial relationships without distortion. This toggle feature helped demonstrate how the scene looks under different camera projection types, and it was implemented in a way that maintains the camera’s orientation and position for a seamless transition.

Throughout the project, I prioritized code modularity and clarity by creating custom functions for key rendering tasks. For example, the SetTransformations() function takes in position, rotation, and scale values, then applies the appropriate matrix transformations and updates the shader. This made it easy to adjust object placement without duplicating transformation logic across the codebase. Similarly, the SetShaderTexture() and SetShaderMaterial() functions streamlined the process of assigning materials and textures, reducing repetition and making it easier to test changes. The CreateGLTexture() function was particularly useful for loading and configuring multiple image files without requiring the rewriting of OpenGL texture setup code. These modular functions allowed me to maintain an organized structure, which proved invaluable when adding new features or debugging issues.

Overall, this project was a great opportunity to combine creativity with technical skill. By selecting meaningful objects, designing a dynamic camera system, and writing clean, reusable code, I successfully met all of the project’s technical and visual objectives. Each part of the development process, from design choices to user interaction and code structure, was guided by an emphasis on clarity, usability, and visual polish.