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CS 330

Final Project Reflections

**1. Justification of Development Choices**

The primary inspiration behind my 3D scene was to recreate my nightstand with my most important objects. The nightstand is a space that holds items I interact with daily, such as my Apple Watch, Amazon Echo Show, air purifier, and candle. Each of these objects was chosen not only for their personal significance but also to demonstrate my ability to create a variety of shapes and textures within a 3D environment.

The Apple Watch allowed me to showcase more complex geometry with rounded squares and smooth straps. The Amazon Echo Show required careful consideration of slanted and flat surfaces, while the candle and air purifier offered opportunities to experiment with cylindrical and tapered shapes. Together, these objects provided a balanced challenge, allowing me to apply different modeling techniques and demonstrate a range of lighting and material effects. The hardest object by far was the Amazon Echo Show. I was not able to replicate this object.

**2. Programming for Required Functionality**

To achieve the required functionality, I built upon the foundational knowledge from previous assignments. I referenced prior projects and leveraged additional resources provided in the course announcements. These resources helped me understand how to properly apply lighting, textures, and modular design patterns. The step-by-step approach, starting with simple shapes and gradually adding complexity, helped ensure that each element of the scene worked harmoniously.

I was mindful of the Phong lighting model and utilized both directional and point lights to create a well-lit scene. By implementing custom materials and setting appropriate light intensities, I was able to avoid harsh shadows and ensure all objects were visible and well-defined.

**3. User Navigation of the 3D Scene**

The 3D scene is fully interactive, allowing the user to navigate using common input controls:

* **W, A, S, D**: Move forward, left, backward, and right, respectively.
* **Q and E**: Move up and down, providing a full range of vertical control.

These controls mimic standard first-person movement in 3D environments, offering an intuitive experience for the user. The setup for camera movement was designed to handle smooth transitions, ensuring the user could explore the scene comfortably from all angles.

**4. Custom Functions and Modular Code Design**

To keep the code modular and organized, I developed several custom functions:

* **DefineObjectMaterials()**: This function sets up all material properties for the objects in the scene. By defining materials in a single function, I made it easy to adjust material properties without touching the render logic.
* **SetupSceneLights()**: Handles the configuration of all light sources. Having a dedicated function for lighting ensures that any adjustments to light intensity, color, or position remain isolated and do not interfere with object rendering.
* **RenderScene()**: The most critical function, which transforms and draws all objects. Each object rendering block is clearly separated, allowing for easy modifications or additions to the scene.
* **SetTransformations()**: A reusable function that applies scaling, rotation, and translation to objects. By abstracting the transformation logic, I could apply consistent transformations across all objects with minimal code repetition.

Overall, these custom functions not only improve the readability of the code but also enhance reusability. For example, the same function used to render the candle body could easily be adapted to render the cylindrical watch straps by simply changing the scale and position parameters.

By maintaining a clean and modular codebase, I ensured that the project could be expanded upon in the future, whether by adding new objects, implementing advanced lighting techniques, or enhancing user interaction.