**Introduction**  
The purpose of this project was to design and implement a 3D scene in OpenGL that demonstrated the use of object creation, textures, lighting, and camera controls. My overall goal was to create a cohesive scene with four objects while providing interactive controls that allowed the user to navigate and explore the environment. This paper explains the major design decisions that shaped the final product, including choices about objects, lighting, textures, and user interaction, as well as the rationale behind these choices.

**Objects and Scene Composition**  
For the scene, I decided to include four objects: a table, a candle, a mug, and a book. Initially, my object selection was not tied to a specific theme; instead, I chose everyday items that could showcase a variety of textures and shapes. For example, the table provided a larger surface area and allowed me to experiment with wood textures. The candle introduced cylindrical geometry and provided an opportunity to experiment with lighting effects such as a glowing flame. The mug demonstrated the use of torus and cylindrical forms, and the book added rectangular structure with a distinct leather texture. I also attempted to create clear glasses, but due to time constraints, this object was not completed.

**Lighting Design**  
Lighting was an important part of the project, though it proved to be one of the more challenging aspects. I attempted to implement a two-light system: a cool ambient light to illuminate the overall scene and a warmer light source positioned near the candle to simulate its glow. The intention was to balance the lighting and make it seem real. While the lighting did not fully meet my expectations due to technical challenges, the attempt helped me understand how different light sources interact in OpenGL and how they affect the appearance of textured objects.

**Textures and Materials**  
To enhance realism, I applied multiple textures to the objects. The table was mapped with a wood texture to create a natural appearance, while the book was assigned a leather material to contrast with the smoothness of other objects. The candle used a wax texture, and I experimented with a flame texture from a cone but ultimately I went with a spherical shape. These choices were made to add variety to the scene and to demonstrate how different surface properties can be represented visually in OpenGL. Each texture decision was made with the intent of balancing simplicity and detail while working within the time constraints of the project.

**User Interaction and Camera Controls**  
An important design decision was to implement camera controls that made the scene interactive. I used the **Q** and **E** keys to allow vertical movement, and the scroll wheel was programmed to adjust the camera’s velocity. These controls gave users the ability to explore the scene from different perspectives and at different speeds, increasing engagement with the objects and textures. I considered adding additional controls such as orbiting or zoom, but I prioritized smooth movement and simple functionality.

**Code Structure and Design Approach**  
In designing the code, I relied on classes such as SceneManager, ShaderManager, and ShapeMeshes to keep the project organized. This modular approach allowed me to separate concerns between scene setup, shader handling, and geometry creation. This decision supported clarity and made it easier to test and adjust individual parts of the project without breaking the overall system.

**Conclusion**  
Overall, my design decisions were guided by a balance between creativity and practicality. While some features, such as the candle’s lighting effects and the clear glasses, were not fully realized, the completed objects, textures, and user controls met the project’s core goals. The process taught me the importance of planning, time management, and iterative testing in OpenGL development. These decisions not only shaped the final outcome but also provided me with valuable insights into 3D graphics programming that I can apply to future projects.

**References**

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