

For my CS 330 final project, I used OpenGL to construct a 3D desk scene featuring a computer monitor, a mug, a closed notepad, and a desk lamp on top of a textured desk and floor plane. My major goal was to create a setting that was easy enough to generate using primitive shapes while being realistic and relatable. I chose these things because they are common items found on a study desk, and when combined, they create a unified environment that showcases my modeling, texturing, lighting, and navigation skills.

When choosing objects, I considered both technical capability and aesthetic appeal. Because of its box-like and recognizable design, the monitor was mostly constructed using scaled cubes and planes. The mug was made with a cylinder and a curved handle, allowing me to try combining multiple primitives together. The notebook was designed as a flattened cube, relying on texturing and scale to communicate its identity rather than intricate geometry. The desk lamp was the most elaborate object, with a cone, cylinders, and sphere forming the base, shade, and bulb. I included the lamp precisely because it might serve as the logical source of light in my scene, connecting the modeling and lighting components of the project.

Texture and material selection were critical for achieving contrast and realism. I used a wood grain texture on the desk surface to make it stand out from the simpler colored elements. The floor plane was given a darker tone so that the major elements on the desk stood out visually. For the remaining objects, I utilized basic diffuse colors with specular highlights. This allowed me to see how the lighting reacted with each material, ensuring that the items appeared three-dimensional rather than flat.

Lighting design was an important aspect of the project. I used Phong shading with ambient, diffuse, and specular components to create a balanced appearance. A point light was placed near the lamp to represent it as the scene's light source. Early drafts with strong pink light

washed out the materials, so I played about with intensity and hue until I found a setting that gave warmth and subtle highlights without overpowering the image. This lighting balance enhanced the scene's depth and cohesiveness.

Including camera movement and interaction was a crucial design decision. I implemented keyboard controls that use the WASD keys for movement and Q and E for vertical adjustments. The camera's rotation was controlled by mouse movement, and the speed and zoom were adjusted with the scroll wheel. These interactions were supposed to be natural and straightforward, allowing the user to explore the environment from various angles while displaying my abilities to program camera control in 3D space.

Throughout the process, I faced challenges that need iteration and refining. Initially, the scene appeared flat until I modified the normal vectors and specular highlights. Some things, such as the lamp and mug, overlapped wrongly, so I carefully relocated and resized them to rectify their position. Lighting was the most challenging factor to regulate, as too much color intensity could completely obscure the materials. By experimenting with different numbers and modifying the shader parameters, I was able to get a final render that demonstrated both color brightness and material detail.

In conclusion, this project demonstrates my ability to make intelligent design judgments in computational graphics. By carefully selecting objects, applying textures and materials, fine-tuning lighting, and implementing camera controls, I was able to create a 3D scene that demonstrates both technical understanding and creative problem solving. These design decisions not only assisted me in completing the project successfully but also increased my confidence in dealing with real-time 3D graphics, preparing me for more sophisticated work in both academic and professional settings.

