**Design Decisions for 3D Scene Representation**

**3D Objects**

In developing the 3D scene, I focused on creating low-polygon representations of real-world objects to achieve a balance between visual fidelity and computational efficiency. The scene includes a grey tabletop, a branch, and a pinecone, which collectively replicate the image selected in Milestone One. Each object was constructed using basic shapes like cylinders, spheres, and planes, all while maintaining a polygon count below 1,000 triangles. This approach not only streamlined the modeling process but also ensured that the objects were simple and functional for 3D printing, which was a key requirement from the client.

**Texturing**

To enhance the realism of the scene, I applied accurately projected textures to two of the objects. The grey tabletop uses a texture that simulates a wood material, while the pinecone and branch were given textures that mimic their natural appearance. These textures were sourced from royalty-free images with resolutions of 1024 by 1024 pixels, ensuring they were of high quality and appropriate for the scale of the objects in the scene. The choice of these textures was guided by the need to closely match the materials depicted in the reference image while also considering the limitations of the final 3D print.

**Lighting**

Lighting plays a critical role in the final presentation of the 3D scene. Two light sources were implemented: a warm directional light from the right side and a cooler, more neutral point light from above, simulating a ceiling fan light setting. These lights were carefully positioned to avoid casting shadows that would obscure key details of the objects, fulfilling the Phong shading model’s components of ambient, diffuse, and specular lighting. The warm light accentuates the textures, while the cooler light provides a balanced contrast, resulting in a polished visualization that highlights the forms and textures of the objects.

**Navigation and Camera Control**

To enable comprehensive exploration of the 3D scene, I incorporated horizontal, vertical, and depth camera navigation using the WASD and QE keys. The mouse cursor controls the orientation of the camera, allowing the user to look around the scene, while the scroll wheel adjusts the movement speed. These controls ensure that the user can easily navigate and examine the objects from various angles. The camera's ability to switch between perspective and orthographic views with a single key press provides flexibility in how the scene is viewed, adding to the interactive experience.

**Best Practices in Coding**

Throughout the project, I adhered to coding best practices, ensuring that the code is modular, well-commented, and follows industry-standard formatting. Functions were developed to be reusable, with clear logic and descriptive comments, which facilitated debugging and future modifications. The modular approach not only improved the readability of the code but also allowed for easier integration of new features, such as the additional lighting and camera controls.

**References**

de Vries , J. (2014, June 1). *Getting started, Lighting, Transformations, Coordinate Systems, and Camera*. LearnOpenGL. [https://learnopengl.com/](https://learnopengl.com/Lighting/Colors)