**Reflection on 3D Scene Development**

**Development Choices and Justifications**

For my 3D scene, I carefully selected objects that create a realistic and visually appealing interior environment. The scene includes a couch, a table, a tree in a decorative pot, a framed artwork, and textured walls and flooring. Each object was chosen to add depth and realism to the environment. The couch and table provide the primary furniture setup, while the tree adds a natural element to the room. The framed artwork serves as a focal point on the wall, enhancing the aesthetic appeal of the scene.

I implemented different materials to improve the realism of the objects. The wood texture for the table and couch frame gives a natural look, while the cushions and pillows have fabric textures to enhance detail. The tree uses a combination of bark and leaf textures to simulate a real plant, and the decorative pot has a woven texture for added complexity. The wall texture adds a rough, slightly plastered effect to make the scene feel more like a real interior space.

From a programming standpoint, I ensured that each object had the necessary transformations to be placed accurately in the scene. I used functions to apply scaling, rotation, and position changes, allowing for better control over the objects. The lighting setup was an essential part of the development, with multiple light sources casting realistic shadows and highlights. I chose to use red, green, and blue lights to create different lighting effects, ensuring that shadows and reflections interacted naturally with the scene objects.

**User Navigation and Virtual Camera Control**

To allow users to navigate the 3D scene, I implemented a virtual camera that responds to different input devices. The camera is set up with keyboard and mouse controls, allowing users to move around and explore the scene freely. Using the W, A, S, and D keys, users can move forward, backward, left, and right, while the mouse controls the camera’s rotation. This movement system makes it easy to navigate the room naturally.

Additionally, I incorporated smooth movement transitions to avoid abrupt changes in perspective. The camera uses gradual acceleration and deceleration to provide a realistic experience. To ensure flexibility, the field of view and camera speed can be adjusted based on user preferences. The O and P keys can be used to change the camera perspective, while the Q and E keys allow users to move up and down in the scene. Furthermore, a mouse movement lock feature has been implemented to help users maintain a fixed viewing angle when necessary. By implementing this system, users can explore the scene from different angles and fully experience the objects and lighting effects.

**Modular Code and Custom Functions**

One of the most important aspects of this project was ensuring that the code remained modular and reusable. I created several custom functions to simplify and organize different parts of the program. For example, the SetTransformations() function takes in scaling, rotation, and position parameters and applies them to any object in the scene. This eliminates repetitive code and makes it easier to update object placements.

Another key function is SetShaderColor(), which allows for quick changes to object colors. This function takes RGBA values as parameters and applies them to an object, making it easier to modify colors dynamically. Similarly, SetShaderMaterial() assigns predefined materials to objects, ensuring that their textures and surface properties are applied consistently across the scene.

For lighting, I developed the SetupSceneLights() function, which initializes multiple light sources and applies their properties. This function allows me to control the position, color, and intensity of each light, ensuring that the lighting effects are properly distributed throughout the scene.

Overall, my approach to this project focused on creating a well-structured, visually appealing 3D scene while ensuring efficient and organized code. By using modular functions and a controlled camera system, I was able to achieve a dynamic and interactive experience that allows users to explore the environment seamlessly.