The development of the 3D scene was guided by the objective to balance simplicity with realism while meeting the project's criteria. I chose basic primitive shapes, including a plane, box, cylinder, sphere, and a tapered cylinder to construct the real-world scene. The plane serves as the kitchen countertop. The box represents a cutting board. The cylinder represents a wheel of cheese. The sphere resembles a lime. A combination of tapered cylinders, cylinders, and boxes make up the water faucet. To enhance realism, I used high-resolution, royalty-free textures. The marble texture applied to the plane simulates a realistic kitchen countertop, while the wood texture on the box mimics a cutting board. For the cylinder, I applied a cheese pattern to add visual contrast. The faucet has a stainless-steel texture to enhance the realism, while the lime carries a lime texture. I tried to implement a point light to simulate an overhead light source, such as a kitchen light, illuminating the scene. It was a struggle and appears more like a spotlight. I initially intended to use a directional light as well. The Phong lighting model was applied to ensure ambient, diffuse, and specular components were represented accurately. I implemented user-friendly camera controls, including WASD keys for horizontal movement, QE keys for vertical movement, and mouse inputs for pitch and yaw. The user can toggle between perspective and orthographic views, providing flexibility for scene exploration.

The navigation system enhances user interactivity and exploration of the 3D scene. There are keyboard controls and mouse controls. For the keyboard, The W and S keys move forwards and backwards while the A and D keys move left and right. The Q and E keys move the camera vertically up and down. The O key puts the scene in an orthographic view while the P key put the scene in a perspective view. For the mouse, its movements adjust the camera orientation, allowing pitch (up/down) and yaw (left/right) movements. The scroll wheel controls the speed of the camera movements. These controls allow for smooth navigation and enable users to view the scene from various angles and positions.

The project uses modular functions to keep the code organized, reusable, and scalable. For the camera controls, the camera movement and orientation are handled by reusable functions for keyboard and mouse input, making sure there is clear separation between input logic and rendering logic. For the DefineObjectMaterials() function, the materials for the objects such as the ambient, diffuse, and specular components, are configured using this function. It makes sure that object materials are applied consistently and can easily be adjusted to experiment with lighting effects. The SetupSceneLight() function initializes and configures the lighting properties for the 3D scene. It sets light properties like position and color. This modular design allows additional lights to be added or modified without disrupting the overall program.