This project involved creating a three-dimensional scene inspired by a two-dimensional reference image provided by the client. The primary goal was to generate accurate low-polygon 3D representations of objects within the image while applying realistic textures and lighting to enhance the final visualization. The client required a simple approximation of the objects, suitable for eventual 3D printing as a preliminary concept for their business. To achieve this, I carefully selected basic shapes to construct each object in the scene, focusing on reducing polygon count without sacrificing the essential details of the models.

In the 3D scene, I created a total of six distinct objects: two EXPO markers (one green, one blue), a tissue box with a protruding tissue, and an EXPO eraser made up of two boxes to represent the felt base and the foam body. Additionally, a granite plane was used as the surface upon which all objects rest. These objects were crafted using a combination of planes, cylinders, cones, and boxes, ensuring that each shape was well-organized and maintained a low polygon count to meet the project requirements. For example, the EXPO eraser consists of two stacked boxes, and the tissue is represented as a rotated plane to simulate its protrusion from the box.

Texture application was another critical aspect of the project. Each object required carefully selected and accurately projected textures to match the reference image. The markers utilized plastic textures, the tissue box was covered in a cardboard texture, and the tissue itself featured a light paper texture. For the granite plane, I applied a high-resolution texture to simulate the roughness and subtle variations typical of stone surfaces. By choosing royalty-free images with resolutions of 1024 by 1024 pixels or higher, I ensured that the textures were both detailed and fit for the purpose of 3D rendering.

Lighting played a significant role in refining the overall presentation of the scene. I employed two primary light sources: a directional light from the top rear of the scene to cast broad, even illumination, and a point light positioned towards the rear to add depth and highlight the objects’ reflective properties. The lighting setup was carefully designed to prevent areas of the scene from becoming overly dark or losing detail, even when viewed from various angles. To enhance the realism, I incorporated colored lighting for the point light, which added a subtle warmth to the scene and highlighted the polished textures.

Regarding the placement of objects, I paid close attention to the relative positions and orientations of each object to mirror the reference image as closely as possible. The two markers were positioned parallel to each other, the tissue box was placed at a 45-degree angle, and the eraser was positioned beside the markers. Adjusting the X, Y, and Z coordinates allowed me to create a cohesive layout that reflected the client’s vision.

In terms of navigation, I implemented a virtual camera that allows users to explore the scene interactively. The camera can traverse the X, Y, and Z axes using the WASD and QE keys, providing complete control over horizontal, vertical, and depth movement. Additionally, the mouse cursor enables users to adjust the camera’s pitch and yaw, while the scroll wheel allows for smooth adjustments to the movement speed. This setup ensures that users can thoroughly examine all aspects of the 3D scene, experiencing it from multiple perspectives.

Modularity and organization were key principles in my coding approach. To maintain a clean and efficient codebase, I developed custom functions to handle specific tasks, such as setting transformations, applying materials, and binding textures. By encapsulating these processes within dedicated functions, I ensured that the code was both reusable and easy to maintain. For instance, the DefineObjectMaterials function consolidates the logic for diffusion color, specular color and material shininess, allowing me to apply consistent material properties across the scene with minimal code duplication. Similarly, the SetShaderMaterial and SetShaderTexture functions streamline the process of applying materials and textures, enabling me to easily update or modify the appearance of objects as needed.

This project provided me with an opportunity to demonstrate a range of skills in 3D graphics development, from modeling and texturing to lighting and camera control. The final scene not only meets the client’s requirements but also showcases the application of best practices in both coding and design.

Below you will find the reference image used and completed project for easy comparison.

A cardboard box and two white tubes

Description automatically generatedA box of tissues next to a box of tissues

Description automatically generatedReference Image: Completed Project: