Design Decisions

CS330 Comp Graphic and Visualization

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**Justify development choices for the 3D scene**



I chose to render the above image in 3D using 3D shapes. For the complex object using two or more primitive shapes, I chose the snowman. I started the scene with a sandy plane to ground the rest of the objects. I changed the background plane using the texture of snowflakes. To render the snowman, I used three spheres of different sizes descending from the bottom up. I slightly overlapped the spheres to give the “smooshed” appearance of the snowballs sitting atop each other. The top hat is rendered using a flat wide cylinder for the brim and a slightly narrower cylinder with some height added. I also added the carrot nose using a cone shape, rotating it so the wider end was placed properly on the top sphere. The next object I rendered from the scene is the gift box in front of the snowman, which was replicated using a box. The Christmas tree is rendered using a cone shape with small spheres strategically placed for the lights and ornaments. The moon in the picture is replicated using a sphere at the back of the scene. The turret at the front of the scene is rendered using a torus. This scene allowed me to use several different shapes and place them along the XYZ axis to demonstrate understanding and make the picture come to life. I used different textures for the shapes to add texture and dimension.

**Explanation of user navigation of the 3D scene**

For user navigation, I used different keyboard events, which means that when a particular key is pressed on the keyboard, it performs a set function. The escape key or ESC is used to close the window. The W key is used to move forward into the 3D scene. The S key is used to move backward away from the 3D scene. The A key is used to move left, and the D key is used to move right. While the Q key is used to pan up and the E key is used to move down. I used the example provided to switch between orthographic projection and perspective projection. The number 1 key shows a front orthographic view, 2 is a side orthographic view, 3 is a top orthographic view, and 4 is to switch to perspective projection. This was very useful throughout the development of my 3D scene because it allowed me to move around the scene at different angles and ensure everything was lined up and situated to my satisfaction. The mouse cursor changes the camera's orientation to look up and down or left and right.

**Explanation of custom functions that were used to make my code more modular and organized**

While creating my scene, I coded one object at a time and kept the objects created by multiple shapes together. This allowed me to track what was done and what still needed to be completed. This also helped with the coordinates for those shapes and how to build on them appropriately. For instance, the 3 spheres, cone, and 2 cylinders that rendered the snowman were all coded together to keep the code fluid. The lights for the Christmas tree were also coded together and I copied and pasted the code for each light and easily adjusted the coordinates to place them at different locations on the tree. All the functions are handled one at a time to allow the objects to render properly and to keep the code organized and readable. Each texture, object material, and shader were assigned a tag for easy use throughout the code and assignment to objects.

A snowman and a christmas tree

Description automatically generated