Homework 2: OpenGL

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1 Problem

For this assignment, there were 4 problems to be replicated using OpenGL and its functions. The first problem involved the use of the teapot and to rotate and place 10 teapots in a circle equally spread apart. The second problem involved the cube function to make a stair case with 20 steps. The third problem involved the teapot object again to make an inverted triangle with the height of 6 teapots. The last problem is an open-ended problem therefore I decided to make a pair of glasses using two rendered triangles and the solid cube objects from OpenGL.

2 Method

In order to make these different patterns with the different objects, I used $glutSolidTeapot$ and $glutSolidCube$ to placee the objects within a stack matrix. In order to make many different translations and make multiple objects be at different places on the axis, I used $glPushMatrix$ and $glPopMatrix$ to use the same translations for multiple objects. $glRotatef$ was needed in order to rotate the teapots for the first problem and also the ends of the ear pieces of the glasses and $glTranslatef$ was needed for all problems to move around the objects in x- y- and z-axis.

3 Implementation

3.1 Circle of Teapots

For this problem, I used a for loop to produce ten teapots. I set the starting angle (where the first teapot will be placed) as 15 degrees and rotated the teapot by the z-axis with that angle. Following, I used $glTranslatef$ in order to place the teapot in a circle, so I translated them 1.5 units away from the x-axis. In this case, 1.5 would be the radius of the circle. In each iteration of the for loop, I increased the angle by 36 degrees so the next teapot will rotate away from the previous one and all 10 teapots will be equal length away from each other. (360/10 = 36)

3.2 Staircase

I used two for loops for this problem since the number of cubes will be decreasing as I add more columns. In this example, there are 20 steps therefore there will be 20 columns of cubes. I used a nested matrix in order to keep the starting point of the staircase constant. The first for loop will iterate 20 times in order to make the 20 steps. In the second for loop, it will iterate in order to reach the height of the staircase and decrease a quarter of a step for every column (every translation of the x-axis).

3.3 Inverse Triangle of Teapots

In this inverse triangle of teapots, we will have 6 rows. This problem has two for loops, the outer loop counts the number of rows, the inner loop places the number of teapots in each row. The loop starts with 6 rows, therefore the row will have 6 teapots with 0.6 units of space in between. It will add the teapots and then the starting y position will decrease by 0.5 (space between rows) and the starting x position will decrease by half of the spacing of the teapots (half of the spacing on one side and the other half on the other side).

3.4 Open-Ended Image

Lastly, for the open-ended image I decided to make a pair of glasses. I used a nested matrix to keep the whole glasses frame translated 1 unit in front of the z-axis. I used several different for loops for different parts of the frames. I used a for loop to place cubes in a line for the top part of the frames, the sides, the bottom and the ear piece. In the edge of the earpiece, I rendered two triangles by inputting their coordinates manually, and rotates them along the x-axis so it can represent the bent piece at the end of the ear piece that goes over your ears.

4 Results