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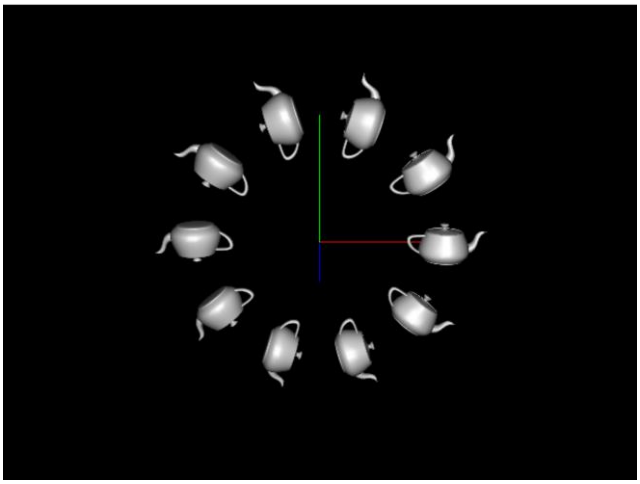
Homework 2

HW2 involved recreating scenes from the images provided using OpenGL. The first scene involved 10 teapots rotated and transformed into a counterclockwise, circular configuration. The second scene involved 15 squares scaled and transformed to look like a smooth staircase. The third scene involved translating multiple teapots into 6 rows of a pyramid configuration. Lastly, the final scene was up to creativity, as long as it is deemed complex enough.

Tackling the first scene was relatively straightforward. Clearly the teapots are rotated along an axis. Based on the fact that the axes were provided as starting points on the scene, it was much easier to determine that the rotation axis was actually the Z-axis. The total angle of rotation was clearly 360 degrees. Since there were 10 teapots, it was concluded that each teapot was rotated 360 / 10 = 36 degrees more than the previous one. Moreover, the teapots were translated along the X-axis to give it the distinctive circular motion. Once these transformations were identified, it was just a matter of continuously generating 10 consistently transformed teapots. This was easily done with a for-loop that gradually increased the rotation as it generated more teapots so that the mid-point teapot was upside down and on the other side of the X-axis.

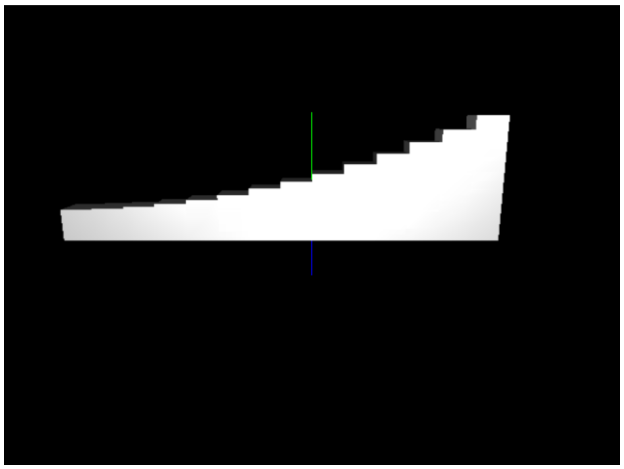
The result of recreating scene 1 is as follows. The scene is simple enough that the recreation most likely uses the same procedure of generating the scene as the original.



Tackling the second scene was slightly more complicated. It was obvious that there were 15 cubes that were scaled vertically and transformed more and more the farther to the right (positive X) they were. Instead of taking this approach, the way the scene was recreated was instead by overlapping multiple cubes vertically at each “step” from left to right. This was more tedious to implement since it involved pushing and popping a matrix within a matrix. The first matrix translated to the right based on how far the for-loop was. The second matrix was nested in the first one and translated vertically to stack the cubes above of each other. The second matrix was also contained in a for-loop that, like the first

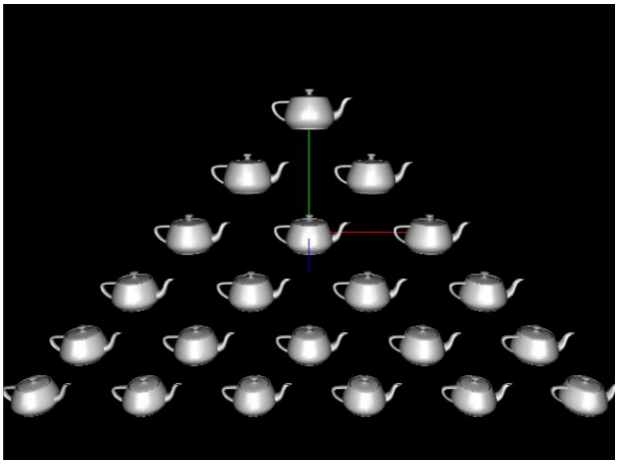
one, translated vertically based on how far the inner for-loop was. In this way, the smooth and curvy staircase look from the original scene was achieved.

The result of recreating scene 2 is as follows. The result was pretty well-executed, considering a different method was most likely used for generating the original scene. Some clear differences is that the initial steps on the original scene were more prominent than in the recreation.



Tackling the third scene followed somewhat similar logic to the second scene. There were 6 rows of teapots, so there must be an for-loop with 6 iterations. The pyramid starts from the top and goes down. So, the for-loop begins at x=0, y=1 to appear centered. Then, at each iteration, a matrix is pushed, and the scene is translated to the more to left (negative X) based on how far in the for-loop is. Then, an inner for-loop pushes another matrix and slowly translates towards the right (positive X), placing a teapot at each iteration. In this way, the pyramid configuration of teapots was achieved.

The result of recreating scene 3 is as follows. The result is almost identical to the original scene, so it seems like the procedure used to generate the recreation was extremely similar to the procedure used in the original scene.



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The final scene, which was up to creativity, was simply trying to re-create a simple articulated hand that is open-palmed. This proved rather challenging, since each portion of a finger seemed to require a matrix pushed. The root of the hand must be the palm, since all the fingers are connected to the palm. Then, each finger was independently added. For each finger, every subsection of the finger (of which there were three) required a matrix pushed and manipulated to be translated and rotated to appear more natural. A way to think about it is that each matrix frame was essentially a “node” for the finger, with the root node being the palm, and five branching children (thumb, and 4 fingers). For each fingers, more child nodes were required for the three subsections, with each subsection requiring an additional nested matrix. Lastly, once the articulated hand was created, three triangles were added above it, to seem as if the hand was presenting the triangles to the viewer.

The results of the final scene are as follows. Retrospectively, the articulated hand could use many improvements to make it seem less blocky. However, since cubes were used as the primate to generate all the joints, the resulting hand looks very blocky. Moreover, more rotations could have been incorporated to make the hand seem slightly more natural. Although difficult to see from the picture, the fingers are slightly rotated upwards, as if loosely grasping the triangles above it.