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Title: Project A: Rubik's Cube with Orbiting Tetrahedron Jointed Chain

User's Guide:

Goal
My goal for this project was to realistically animate a Rubik's cube (modeled after a real life Rubik's cube which will be shown below!) as well as an assembly with multiple joints to fill that requirement. The jointed assembly is a chain of five tetrahedrons that orbit around the Rubik's cube while also swaying on its own.

Instructions
- Click and drag the mouse vertically to change the vertical orientation of the Rubik's cube
- Hold the "q/Q" key to shrink the orbiting tetrahedron chain
- Hold the "e/E" key to grow the orbiting tetrahedron chain
- Slide the slider to change the radius of the orbit
- Click the buttons labeled "Side 1 Rotation..." and "Side 2 Rotation..." to toggle the rotation of the two sides that are rotating vertically.
- Click the button labeled "Cube Rotation..." to toggle the horizontal rotation of the cube as a whole

Results:

First I used a cube model to create a Rubik's cube assembly. The overall assembly is made up of 3 individual 3x3 grids of cubes which can all rotate on their own.

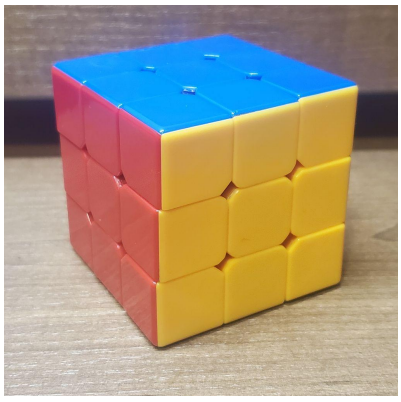
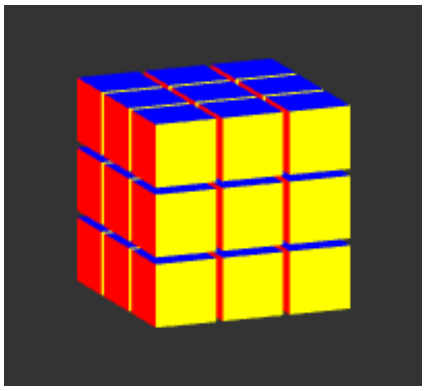

Figure 1: Real Life Rubik's Cube vs. My Model

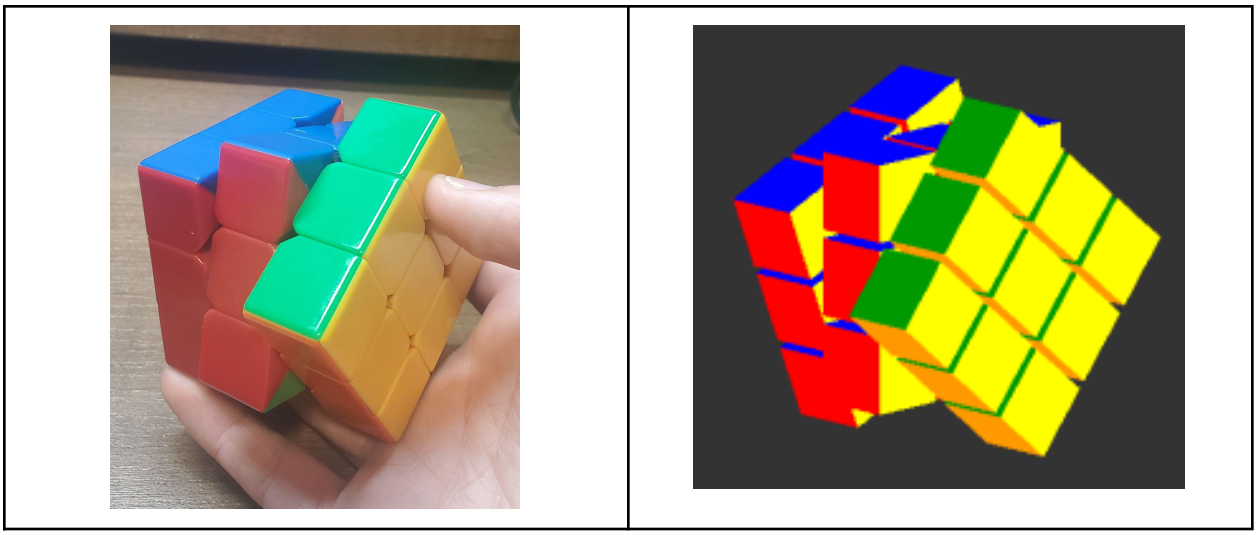

Figure 2: Real Life Rotated Rubik's Cube vs. My Model

Next I created a tetrahedron chain. This is 5 tetrahedrons stacked on top of each other, with the tip of each one acting as a joint between it and the one above it. Each tetrahedron is affected by the rotation of the ones below it as well as its own, creating a sequential joint effect.

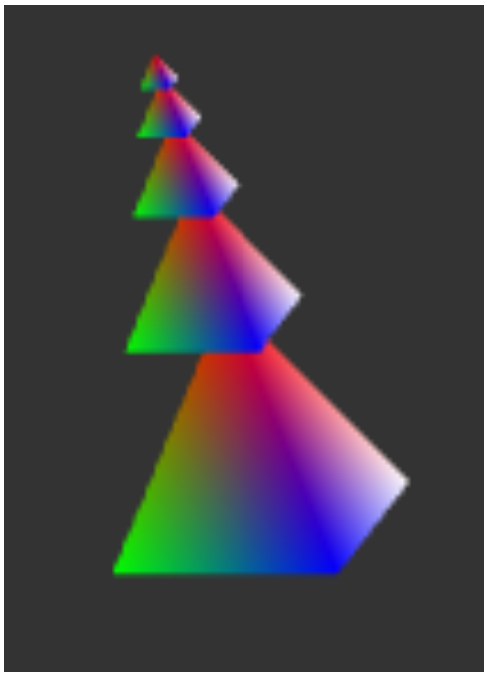

Figure 3: Tetrahedron Chain

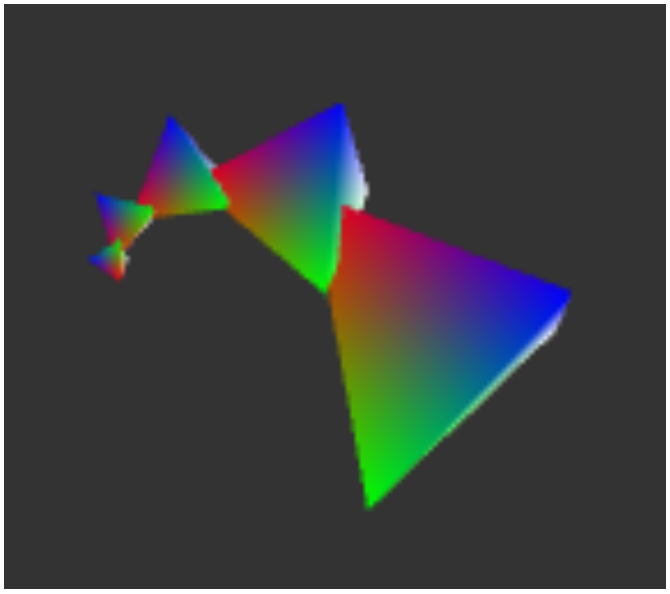

Figure 4: Tetrahedron Joints in Action

Lastly, I added on screen instructions and GUI controls. There are buttons to control the Rubik's cube, a slider and keyboard inputs for the tetrahedron chain, and mouse drag to further interact with the Rubik's cube.

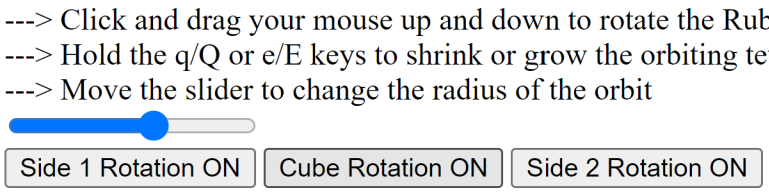

Figure 5: Instructions and GUI controls