3D Cube Animation and Transformation Report Akay Kanbir 27750

# Task 1: Using ChatGPT to Generate the Transformation Matrix

For the first task, I used ChatGPT to create a transformation matrix based on specific instructions. The transformation involved:   
- Translating the cube by 0.3 units along the X-axis and -0.25 units along the Y-axis.  
- Scaling it by 0.5 on both the X and Y axes.  
- Rotating the cube by 30 degrees on the X-axis, 45 degrees on the Y-axis, and 60 degrees on the Z-axis.  
  
After entering these details into ChatGPT, it gave me a matrix. I took this matrix and inserted it directly into the getChatGPTModelViewMatrix() function in utils.js. After applying the matrix, the cube was successfully transformed as expected. ekran görüntüsü, metin, yazılım, multimedya yazılımı içeren bir resim

Açıklama otomatik olarak oluşturuldu

# Task 2: Manually Calculating the Transformation Matrix

In this task, I was required to manually create the same transformation matrix that ChatGPT gave me in Task 1. Here's how I did it step by step:  
  
1. \*\*Translation\*\*: To move the cube by 0.3 units along the X-axis and -0.25 units along the Y-axis, I needed to modify the fourth column of the matrix. Translation is straightforward: you change the fourth column to the amount you want to shift the object. The Z-axis remains unaffected since we’re not translating along Z.  
  
2. \*\*Scaling\*\*: Scaling shrinks or enlarges the cube. In this case, I needed to scale it by 0.5 on both the X and Y axes. This is done by modifying the diagonal values of the matrix. Scaling affects the cube's size, making it smaller since it’s scaled by half on both axes.  
  
3. \*\*Rotation\*\*: For rotation, I had to apply three separate rotations along the X, Y, and Z axes. Each of these rotations required me to calculate the sine and cosine of the angles (30 degrees, 45 degrees, and 60 degrees). I applied these rotations step by step:  
- Rotation around X-axis (30 degrees)  
- Rotation around Y-axis (45 degrees)  
- Rotation around Z-axis (60 degrees)  
  
4. \*\*Combining the Matrices\*\*: The final step was to combine all the individual transformations. Matrix multiplication is not commutative, so the order of multiplication is important. I first multiplied the scaling and rotation matrices, and then I applied the translation matrix.  
After combining these matrices, I got the same result as the matrix provided by ChatGPT. I compared both matrices, and they matched perfectly. The cube's transformation after this

manual process was exactly the same as in Task 1. ekran görüntüsü, bilgisayar, multimedya yazılımı, yazılım içeren bir resim

Açıklama otomatik olarak oluşturuldu

# Task 3: Animating the Cube

In Task 3, I used ChatGPT to help animate the cube. The animation was supposed to make the cube transition smoothly between two states:  
  
1. First 5 seconds: The cube moves from its initial position (identity matrix) to the transformed position (the matrix from Task 2).  
2. Next 5 seconds: The cube returns from the transformed position back to its initial position.  
  
The animation worked on a loop, so after 10 seconds, the cube restarted the transition. This gave the effect of the cube 'breathing' in and out, smoothly transforming and returning back to its original shape.  
  
The logic behind the animation is based on linear interpolation (lerp). I used a time-based function to control the blending between the initial state (identity matrix) and the transformed state (Task 2’s matrix). Over the first 5 seconds, the interpolation factor t moved from 0 to 1, which caused the cube to transform gradually. Over the next 5 seconds, t moved from 1 back to 0, causing the cube to return to its original state.  
  
This cycle repeated every 10 seconds, and the result was a smooth, continuous animation of the cube transitioning between its two states.

Gpt link: https://chatgpt.com/share/670d9bfd-8b34-800c-9259-e9885250546c