

## CS405 Project 3

Ada Boran Yilmaz

30789

### Task 1:

I modified the draw method in the SceneNode class so that each node's transformation matrix was multiplied by its parent's matrix. This ensures hierarchical transformations. For example, if the Sun rotates, all child nodes will rotate around it. The updated method takes the parent's model view projection and model matrices, multiplies them by the node's local transformation (from TRS), and then passes these updated matrices down to the node's children.

### Task 2:

In the fragment shader, I added calculations for diffuse and specular lighting. Inside the restricted section of code, I used the surface normal (transformed in the vertex shader), a light direction vector and a view direction vector to compute how much light each pixel receives. The diffuse part uses the dot product of the light and normal vectors, while the specular part is calculated by reflecting the light vector around the normal and then taking the dot product with the view direction to create a shiny highlight.

### Task 3:

I inserted a new node for Mars in the HTML file. Mars is created with the same sphere geometry as other planets, but we apply a different texture. We set its translation to -6 on the X-axis relative to the Sun, scale it to 0.35, and place it as a child of the Sun node in the scene graph. In the renderLoop, we rotate Mars around its Z-axis at 1.5 times the Sun's rotation speed, creating a new planet that orbits independently but remains attached to the Sun's transformation.