**CS 405 Project 3: Scene Graph + Illumination**

**Task 1: Development of Scene Graph Drawing Functionality**

For the initial task, I focused on developing the draw function within the SceneNode class framework. The core purpose was to establish a system for transformation application and node rendering through a recursive approach. The implementation began with the computation of node-specific transformation matrices, which were then incorporated into the fundamental matrices (MVP, modelView, normalMatrix, and modelMatrix). This process guaranteed accurate implementation of spatial transformations, encompassing positional shifts, angular rotations, and dimensional scaling. Furthermore, I engineered a recursive rendering system that propagated transformed matrices throughout the node hierarchy, enabling proper visualization of the complete scene graph structure with inherited transformational properties.

**Task 2: Enhanced Lighting System Implementation**

The second task involved expanding the shader capabilities to support advanced lighting features. I introduced comprehensive calculations for managing light vectors, reflection patterns, and viewing directions within the fragment shader architecture. This enhancement facilitated the rendering of sophisticated lighting effects. The diffuse illumination component was derived through vector dot product operations between normalized surface normals and light vectors, while the specular highlights were computed by analyzing light reflection patterns and viewing angles, incorporating Phong exponentiation. The final illumination model merged these components with ambient lighting, creating a sophisticated rendering system that accurately portrayed material characteristics for both luminous and non-luminous objects.

**Task 3: Mars Integration and Dynamic Movement**

The final task focused on integrating Mars into the solar system simulation. This involved creating and configuring a Mars node as a subordinate element to the Sun node. The implementation required precise initialization of the Mars geometric mesh and configuration of its transformational attributes. A notable aspect was the implementation of Mars's rotational mechanics, which operated at 1.5 times the base rotation rate along the Z-axis. This enhancement created a more dynamic solar system simulation, accurately representing Mars's orbital characteristics while maintaining proper spatial relationships within the solar system hierarchy. The careful configuration of these transformational parameters resulted in a realistic representation of Mars's movement patterns in relation to the Sun.

Astronomi nesnesi, ay, göksel olay, gece içeren bir resim

Açıklama otomatik olarak oluşturuldu