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Raytracing tasks

Refraction and Fresnel effect: 7 marks

To achieve transparent materials and the Fresnel effect, I utilized the `RefractionAndFresnel` function in the code. Firstly, this function calculates the color of the surface itself, including ambient light, emissive light, and diffuse and specular reflection from the light source. Then, by determining whether the object is transparent, it decides whether to perform calculations for refraction and reflection.

In the case of transparency, I employ the law of refraction to calculate the refracted angle and use the Schlick approximation formula to compute the reflection and transmission coefficients. Subsequently, based on the size of the refracted angle, it is determined whether total internal reflection occurs. If the refracted angle is less than 90°, refraction calculations are performed; otherwise, total internal reflection occurs, and the diffuse color of the object is used. Finally, the colors obtained from reflection and refraction calculations are combined according to the weights specified by the Fresnel equation, resulting in the ultimate color.

Rasterisation Tasks

Skybox: 6 Marks

I wrote the initialization code for the skybox, defining the vertex data for the six faces of the box. Next, I utilized the `loadCubemap` function to load textures for each face of the skybox. This function takes a vector of strings storing the paths to the textures for each face and binds these textures to an OpenGL texture object.

During the rendering phase, I employed OpenGL's depth testing functions to ensure that the skybox is drawn after other objects in the scene. By removing the translation part of the view matrix, I ensured that the skybox is rendered relative to the camera's direction, without considering the camera's position, thus creating an effect of an infinitely distant sky.

reference: LearnOpenGL - Cubemaps