CS 405 Project 1

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Introduction

This report outlines the methodology employed in completing two tasks for a WebGL project. The project involved enhancing a 3D scene with advanced texturing and lighting features. Task 1 focused on modifying the setTexture function to support non-power-of-2 sized textures, while Task 2 entailed implementing basic lighting, including ambient and diffuse light, in the scene.

Task 1: Texture Handling

Objective

The goal was to modify the existing setTexture function to allow textures of non-power-of-2 dimensions to be applied to 3D objects in the scene.

Methodology

The existing setTexture function was initially designed to handle textures with dimensions as powers of 2. To extend its capability, the function was updated to include additional texture parameters for non-power-of-2 textures. Specifically, when the texture dimensions are not powers of two, the texture wrapping mode was set to GL_CLAMP_TO_EDGE, and the minification and magnification filters were set to GL_LINEAR. This adjustment ensures proper handling of NPOT textures in WebGL.

Task 2: Basic Lighting

Objective

The aim was to incorporate ambient and diffuse lighting into the scene, enhancing the visual realism.

Methodology

For the implementation of lighting, the constructor, setMesh, draw, enableLighting, and setAmbientLight methods, as well as the fragment shader, were modified. The modifications included the initialization of lighting variables, updating the setMesh method to handle normal vectors for lighting calculations, adjusting the draw method to include light uniforms, and implementing lighting controls through the enableLighting and setAmbientLight methods.

Implementation

Constructor:

Initialized lighting variables, including light position and ambient light intensity.

setMesh:

Updated to handle normal vectors necessary for lighting.

draw:

Incorporated lighting calculations and passed necessary uniforms to the shader.

enableLighting:

Enabled or disabled lighting based on a boolean flag.

setAmbientLight:

Adjusted the ambient light intensity in the scene.

Fragment Shader:

Modified to compute ambient and diffuse components based on the vertex normals and light position.