COSC 4370 - Homework 4

Name: Jacob Rangel

PSID: 1997560

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https://replit.com/@theofficialjaco/Homework-4#main.cpp

1 - Problem

The objective of this assignment was to implement texture mapping in OpenGL, extending the rendering capabilities to include textures applied to geometric primitives. The task involved transferring UV data to OpenGL buffers, binding textures during the rendering loop, and integrating corresponding shader code to visualize the textures on objects.

2 - Method

The implementation of texture mapping required a systematic approach to understand the underlying principles and procedures. This involved studying UV mapping techniques and how texture coordinates are associated with vertices in a 3D model. Additionally, understanding OpenGL's texture handling mechanisms, including texture creation, binding, and sampling, was crucial. The provided tutorial on texture mapping served as a valuable resource to guide the implementation process.

3 - Implementation

The implementation process commenced with the modification of the existing OpenGL setup to accommodate texture mapping functionalities. This involved defining UV coordinates for the vertices of the rendered object within the main function and transferring this data to OpenGL buffers alongside vertex positions. The UV data was correctly associated with vertices to ensure proper texture mapping.

Subsequently, modifications were made to the rendering loop to bind the texture and apply it to the rendered object. Proper synchronization between the application code and shaders was ensured to correctly sample the texture in the fragment shader. The vertex and fragment shaders were adapted to incorporate texture coordinates and utilize them to access texels from the bound texture.

Furthermore, adjustments were made to handle texture loading and binding efficiently, ensuring compatibility with different image formats and OpenGL texture parameters. Error handling mechanisms were implemented to detect and rectify any issues related to texture loading or rendering.

4 - Results

The successful implementation of texture mapping in OpenGL enabled the visualization of textures on geometric primitives, as demonstrated by the rendered scene. The rotating textured cube showcased the application of UV mapping techniques to project 2D textures onto 3D objects accurately. The rendered textures exhibited seamless integration with the geometry, enhancing the realism and visual appeal of the scene.

4.1 – Textured Cube Rotation