

CS 557 - Shaders

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Final Project Report – Brick Wall Rendering

Copy of Accepted Proposal

For the final project, I am proposing to develop a shader-based rendering for creating realistic brick walls in computer graphics. The primary objective is to achieve a visually compelling representation of various materials such as brick, cracks and mortar, complete with realistic lighting, texture mapping, and depth perception. Using GLSL shaders, I will implement vertex shader to handle transformations and lighting calculations, which includes calculation of light vectors, eye vectors and texture coordinates. Additionally, the fragment shader will process textures, compute the lighting effects based on ambient, diffuse and specular lighting components, blend multiple textures and height mapping for added depth.

I will integrate texture mapping techniques to apply detailed brick textures, including diffuse, normal, and roughness maps. Additionally, I will implement height mapping to add depth and variation to the brick wall surface, making it look more realistic. I will also add noise to the brick-wall which will introduce imperfections that mimic real-world surfaces which looks like having cracks.

This project will dynamically allow the user to adjust the lighting parameters, texture variations, noise amplitude and noise frequency using sliders in glman.

Description of what I did:

In my final project, I used a number of different texture maps for developing a shader-based rendering of realistic brick wall. I needed number of texture maps to bring in my graphics display of height, wall covered in dirt and dust, cracks and mortar and brick wall albedo. I applied all of these on a QUAD, which was best to display the graphics here. I had to be careful when drawing multiple textures on a same Quad, which is why the bias and height for base texture and cover texture is brought into the picture here. This will enable us to see as if the

“texture rising above or out of the surface”. If not done like this, there will be no clear graphics effects of mortar, dirt and dust or height on the brick walls, as it would completely overlap each other.

3 Major textures being used:



Brick Albedo

Dirt & Dust

Height

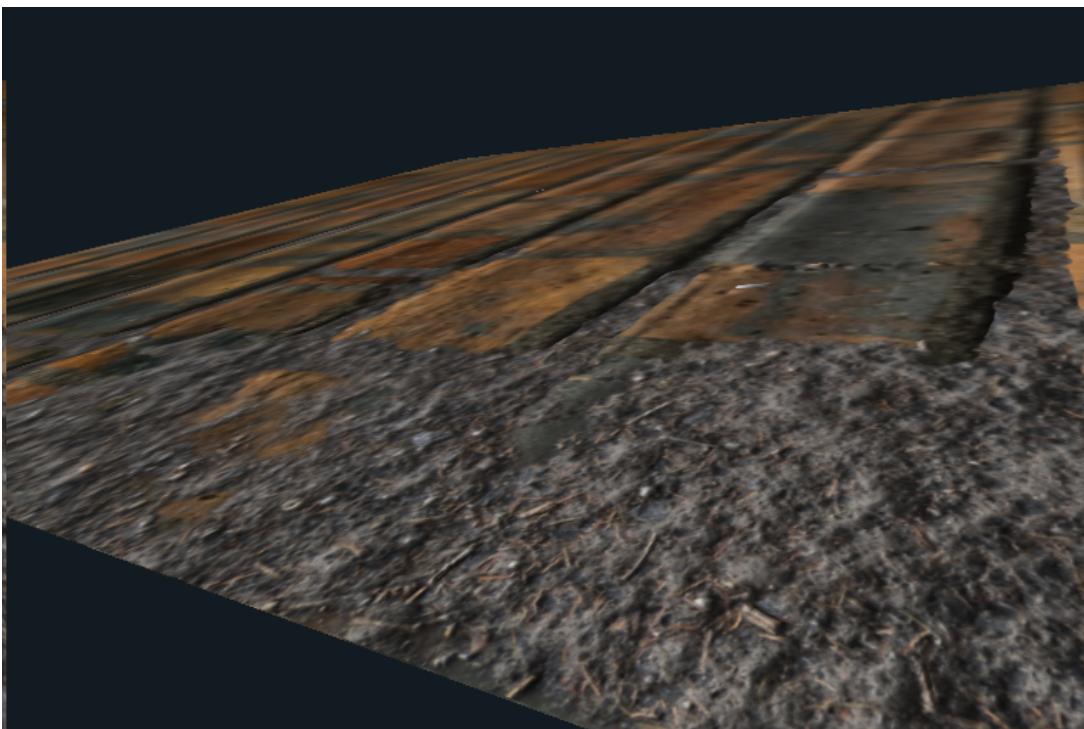
The next thing after applying appropriately the textures is to have a light source which will help us to see these visual effects on the brick walls. The light when moves will easily highlight different details of the wall. The position of the light is controlled by the user through sliders.

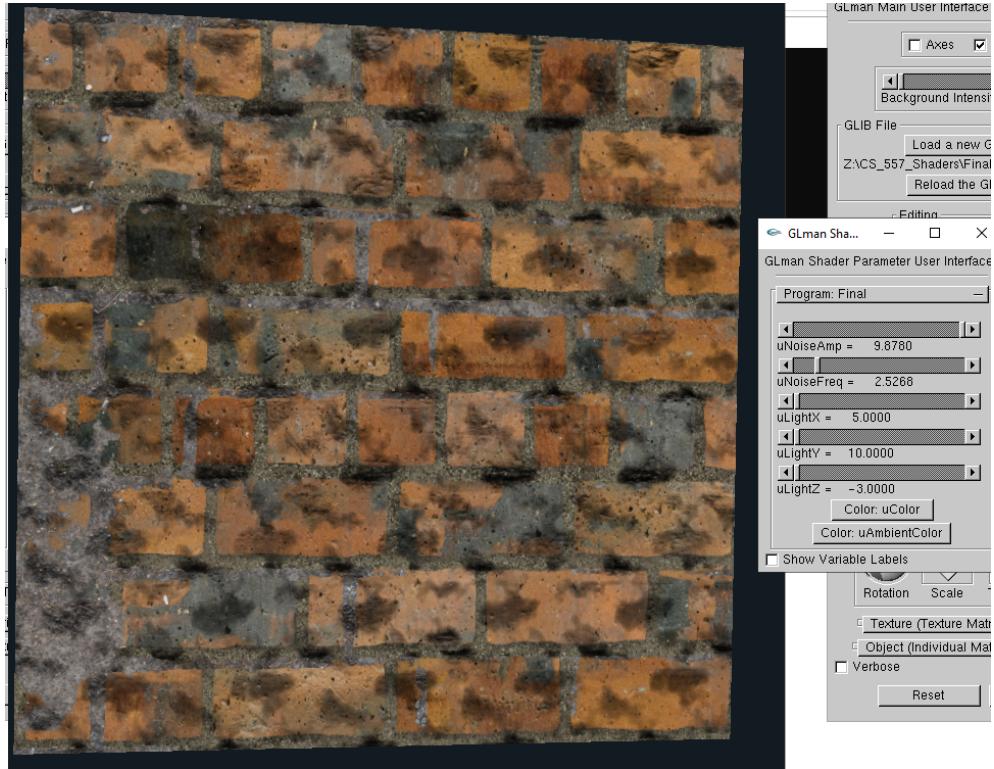
After getting through these 2 steps, I thought that the project could still be worth full points and has satisfied the requirements. But I also wanted to bring in something more that I learned in this class and that is the concept of Noise introduction in our graphics. I brought in Noise Amplitude and Noise Frequency into my project which is also controlled by the user through sliders. I have to say that deciding to bring in Noise into this project was a good decision as it intensified my graphics and its details to a higher extent. When I put noise on the brick walls, it gives a highly intensified display of bricks being rough, being out of the plane surface, having bumps on the entire wall. Noise added more details to my brick wall display and made it look more realistic.

Additionally, I also added for user to select the color of his/her choice in the sliders to just playfully see the brick wall effects in different colors.

Thus, I accomplished all the goals that I set in the accepted proposal for my final project, and I am happy to have ended my term with this project.

Screenshots:







Kaltura Link:

https://media.oregonstate.edu/media/t/1_95koal5k