Project Proposal and Design Document

Volcanic Ocean Floor

Introduction

The project is focusing on the creating a vivid underwater volcanic scene by OpenGL, involving flooding and shining lava, actively growing and bursting bubbles, and a variety of marine creatures. The lighting effects will be carefully adjusted to simulate the interaction between hot volcanic water and the surrounding environment, making the scene as realistic as possible. The challenge lies in balancing graphical detail with performance, leveraging OpenGL shaders to achieve dynamic visual effects.

Key Features

- **Marine life**: The scene would include various deep-sea creatures such as clams, mussels, tube worms, and species like the hair shrimp, and special volcano fishes, including Hawaiian spikefish, Diplacanthopoma. Each organism will have unique animations, making environment feel more alive.
- **Emissive lava**: The volcano will emit glowing, emissive lava that radiates heat and light, which will be simulated by emissive lighting in OpenGL. Which will not only make it appear as if it is glowing, but also illuminate nearby objects and cast realistic shadows.
- **Transparent bubbles**: The bubbles will be rendered by blending techniques in OpenGL to achieve transparent and realistic bubble effects.

Advanced Features

- **Intelligent marine behavior**: Marine creatures will have basic AI to avoid the lava flow.
- **Particle smoke**: Smoke particles will rise from the volcano, creating a volume of smoke particles.
- **Dynamic bubble simulation**: Bubbles will slowly grow over time and bursting dynamically.
- **Volcano lava flow**: The volcano will constantly emit lava and the flowing lava will be simulated using animated texture mapping. The flow will appear dynamic, and spread across ocean floor.

Scene Design

The scene will consist of a main volcanic structure at the ocean floor, continuously erupting lava. The glowing lava will illuminate its surroundings, with bubbles forming on the surface. Smoke will rise from the volcano, adding to the realism. Marine creatures will be scattered around the scene, swimming and crawling near the rocks, while carefully avoiding the dangerous lava flows. Rocks of different shapes and sizes will be placed to give the environment more depth and realism.

The visual representation below demonstrates the planned scene layout, with the key elements like the volcano, lava flows, marine life, and bubbles.