Gokul Kesavamurthy

kesavamg@oregonstate.edu

CS557 - Computer Graphics Shaders

Final Project

Description:

1. How and What I Did (Compared to the Proposal)

Originally, I proposed to create a fire and smoke simulation using a particle system combined with 3D noise for realistic turbulence. However, I ended up focusing on a glowing, sun-like sphere that gradually implodes instead of a full fire and smoke setup. In the end, my project still uses the 3D noise texture and shader techniques I planned—just in a slightly different way. Rather than animating thousands of small particles, I applied the noise to a single sphere to achieve a swirling, fiery appearance and then an implosion effect.

2. What Didn't Work and Why

I did not fully implement the particle system and realistic smoke behavior. Time constraints and the complexity of managing a large number of particles made it difficult to get these features working properly. Instead, I pivoted to a simpler but visually interesting effect on one object. This allowed me to explore noise and shading techniques in detail without the added overhead of a particle-based approach.

3. Extra Things I Added

- **Swirling Motion:** I introduced a swirl function in the vertex shader that gently rotates parts of the sphere around the y-axis, giving it a dynamic look.
- **Implosion Effect:** I made the sphere implode by pushing vertices outward in random directions and then scaling them down to zero. This creates a quick "blast" before the sphere disappears.
- **Sun-Like Color Ramp:** To enhance the fiery look, I used a color ramp in the fragment shader that transitions from deep orange/red to bright yellow/white. This gives the sphere a "burning sun" appearance.

4. Particular Cleverness

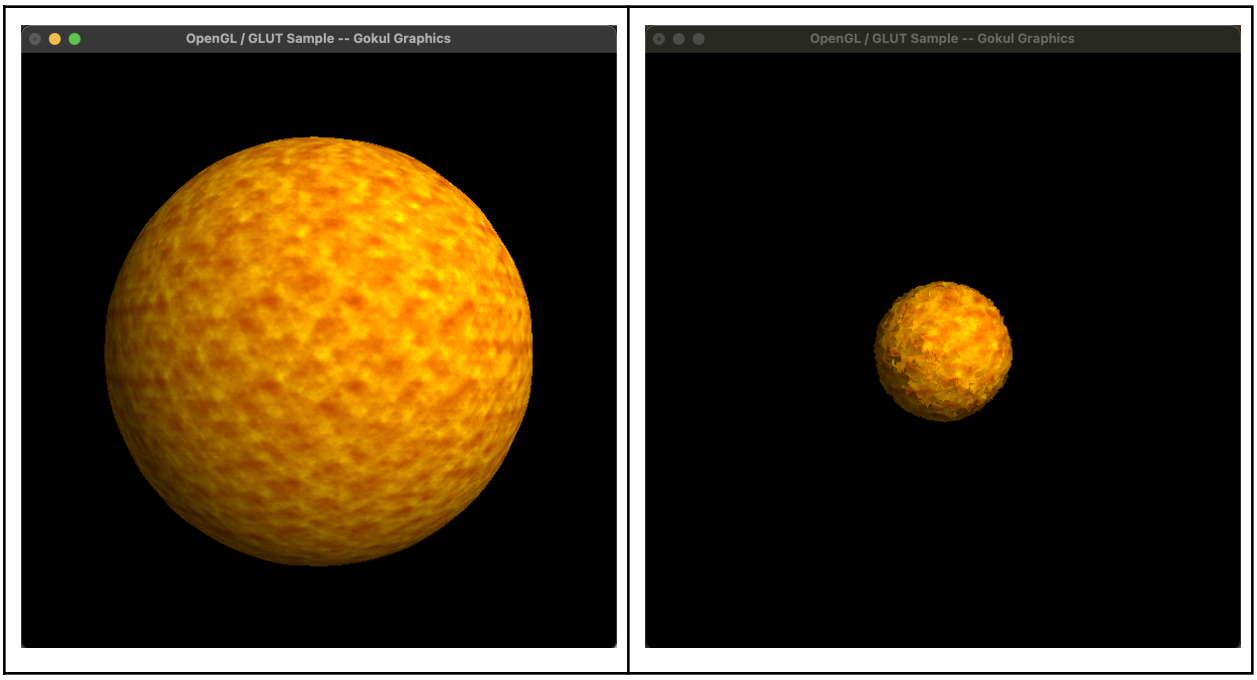
- **Multi-Octave Noise (fBm):** I used multi-octave (fractal) noise to create layered detail. This makes the glowing texture on the sphere look more natural, as if it's shifting and flickering over time.
- **Smooth Ramp for Timed Effects:** I used smoothstep functions to fade in or out certain transformations at specific times. For example, the swirling fades out and the implosion kicks in around 9.5 seconds, ensuring a smooth transition.

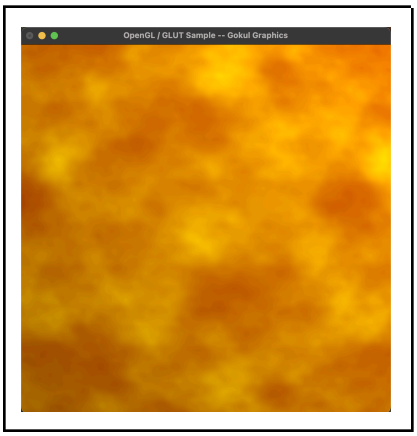
5. What I Learned

- **Shader-Based Animation:** I gained a deeper understanding of how to use GLSL shaders to animate objects over time, including how to pass in uniform variables for timing.
- **Noise Textures:** Working with 3D noise taught me how important noise scale, layering, and amplitude are for creating believable, organic patterns.
- **Time Management and Scope:** Attempting a particle system was more complex than I anticipated, so I learned to adjust my project scope and still produce a satisfying result.

Overall, even though I did not complete a realistic fire and smoke simulation, I successfully created a striking visual effect with swirling motion and a dramatic implosion, all powered by noise-based shader techniques.

Screenshot:





Video Link: https://media.oregonstate.edu/media/t/1_jw3pmjjq