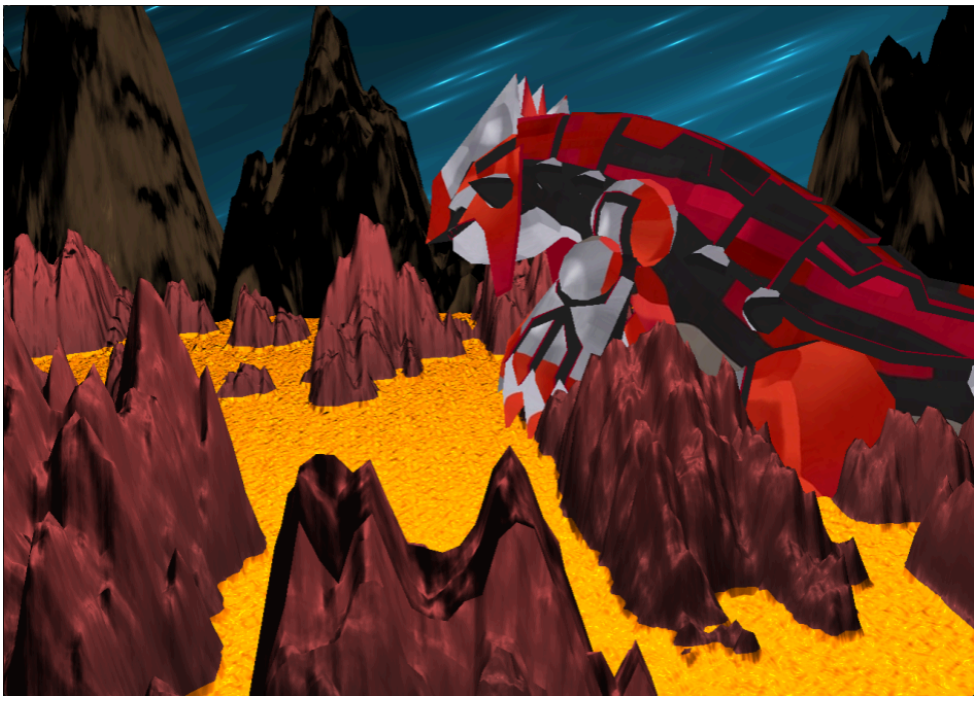
Project Theme: Groudon's Explosive Birth
Team Member: Waiyuk Kwong, Zhihui Chen, Yuanhong Zhou

Part I: Image Overview

Sketch Image



Actual Image

For our final project, We introduced Groudon, a Legendary Pokémon. Our project depicts Groudon standing in lava, looking out at the mountains in the

distance, standing under a shooting star. We used translation and rotation of a model, texturing, Perlin noise and particles' rendering skills for our final project

Part II: Technical Implementation Details

1. Model and Texturing: Found an obj model of Groudon, then bind texture color and texture normal for it. After being able to place Groudon into the scenes, we adjusted rotation, scaling, and translation matrix to initial construction of vision.
2. Mountains and Lava: To create the magma field, we utilized perlin noise. We first implemented the perlin_noise function, which provides the texture for the terrain, the noise_octave then simulates more complex mountainous features. Within the height function, we specified a threshold. If the height is below the lavaLakeLevel, it's adjusted to simulate a lava lake. Then inside the shading_terrain function, we combined the computed normal, Phong shading results, and the emissive properties based on terrain height. If the heights below a lava lake level, it assigns a glowing lava, or rock otherwise.
3. Stars and sky: For stars and sky, we used the skills of Particle' rendering. In the file of stars.frag, we first create a method called rotationMatrix for particles' direction. Then we changed the renderParticle function to make the particle's shape as an ellipsoid. Then we adjust the particles' radius (in order to make it like a shooting star so we make it longer and bigger than its usual shape). Finally, we modify the renderStars function, we change the parameter t to make each particle flicker faster, and more like shooting stars.

Part III: Solved Challenges

1. The problem came in the first place is that we are not able to find a usable obj model with texture. All models that run in the project have no color. Therefore, we have to find the model and texture independently. We end up making some adjustments to the texture so it works visually correct on the model.
2. The second challenge we faced was figuring out how to create the magnum field. Dr.Zhu suggested that we could create a

threshold inside the height function to distinguish the mountains and the lava. We then realized that matrix transformation could not be applied to the magma field. We figured out that there was a conditional directive in the volcano.vert that sets the z-coordinates so that the z-coordinate won't be adjusted.

3. The third challenge we faced was the sky. We wanted each particle to cross the sky like a shooting star but didn't know how to make it look like a shooting star. So we found a similar picture and asked the professor on the piazza, and through the professor's explanation, we learned that we need to change the shape of the particles so that they look like "tails", and then speed up the time to achieve the effect of a shooting star. We also encountered the problem of the orientation of the meteors. After making the particles elliptical, the particles flashed horizontally, so we had to adjust the direction of the particles. So we checked the previous assignment of Angry Bird and combined it with online resources to write a help function to rotate the particles, and then applied it to the particles to get the meteor effect.

Part IV: Contributions

Waiyuk Kwong:

- Final Report
- Final Presentation demo and slides
- 3D Model and Texturing (Geometry and Texture)

Zhihui Chen:

- Final Report
- Final Presentation demo and slides
- Mountain and lava part (Perlin Noise)

Yuanhong Zhou

- Final Report
- Final Presentation demo and slides
- Particle and sky part (Background)