A5 Animation Documentation
Name: Francis Sun

Brief Description of the video

This video demonstrated the planetary movement in the solar system. In addition, a Comet made of ice crashes into the earth.

Feature Implemented

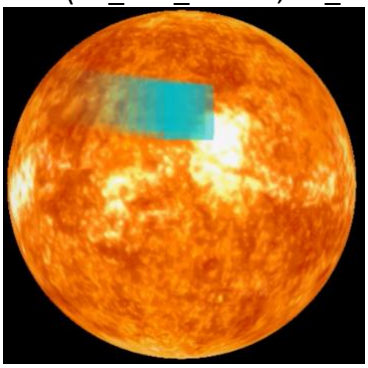
1. Texture Mapping

Textures have been applied to all of the Sun, the Earth, and the Moon. This feature was implemented by importing textures into OpenGL and apply it in the Fragment Shader.

(Earth, Moon, and Sun)

2. Transparency

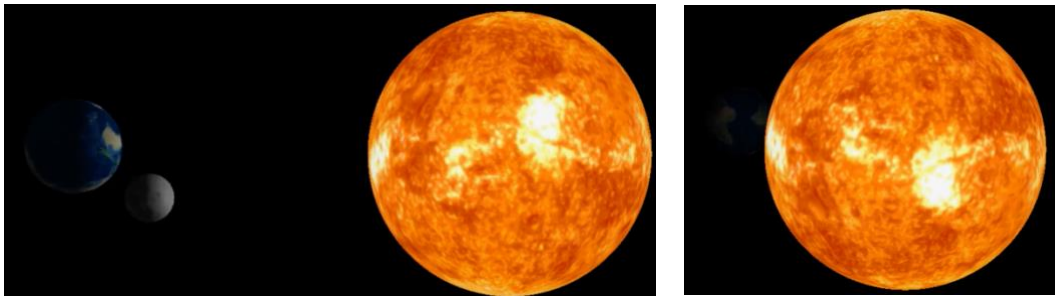
When the Comet is in front of the Sun, the texture of the Sun behind the Comet is visible. This feature was implemented by setting the alpha channel of the texture of the Comet and applying blend.
(glEnable(GL_BLEND); glBlendFunc(GL_SRC_ALPHA, GL_ONE_MINUS_SRC_ALPHA);)



This Comet made of ice has transparency.

3. Participating Media (fog)

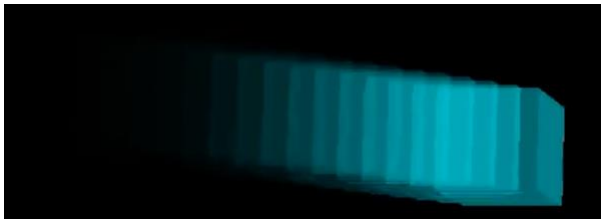
There exists black fog in the Universe in this video. (Even through the universe in reality is in a vacuum) This fog can be observed by focusing on the Earth with the special attention paid its visibility; the visibility of the Earth when it is on the left of the Sun is higher than when it is almost behind of the Sun. This feature was implemented by dynamically changing the alpha channel of the texture based on the distance from the Earth to the camera and applying blend.



Due to the fog, the Earth in the left screenshot has a higher visibility.

4. Motion Blur

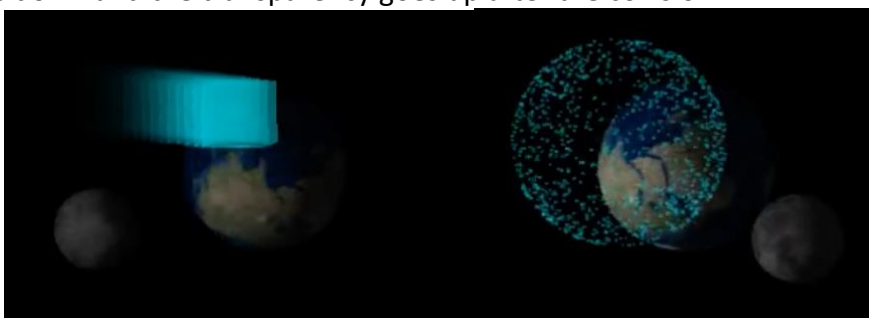
Motion blur is applied to only the Comet. This feature was implemented by rendering the current frame of the Comet and the previous 19 frames with respect to its position and alpha value.



The cube Comet with motion blur.

5. Particle System

When the Comet hits the Earth, an explosion will happen. This feature was implemented by emitting 500 particles in randomized direction at the position of the collision. The speed goes down and the transparency goes up after the collision.



6. Synchronized Sound

Since the universe is not vacuumed in the video scene, when the Comet passes through the camera and hits the Earth, the sweeping sound and the explosion sound are played. This feature was implemented by video editing.

Video Production

This video consists of 900 frames which are generated by OpenGL. Then, the 900 PNG frames are converted to an Mp4 file using ffmpeg as recommended in Piazza. This sound is added using Adobe Premiere.

Employed Assets (All of the assets are permitted in non-commercial use)

1. Model of Earth: obj file, diffuse and bump texture
   URL: https://free3d.com/3d-model/earth-photorealistic-2k-927613.html
2. Model of Moon: obj file, diffuse and bump texture
   URL: https://free3d.com/3d-model/moon-photorealistic-2k-853071.html
3. Model of Sum: obj file, diffuse texture
   URL: https://www.cgtrader.com/free-3d-models/aircraft/other/models-of-sun-and-earth-and-moon
4. Model of Comet and particle: obj file
   cube.obj from CS 488 Winter 2021 Assignment 3
5. ASSIMP: Open Assets Import Library (for importing models)
   URL: https://github.com/assimp/assimp
6. STB Image: Public Domain Image Loader (for reading texture and extracting to image)
   URL: https://github.com/nothings/stb
7. Sound Effect: Fast Sweep Transition
   URL: https://mixkit.co/free-sound-effects/swoosh/
8. Sound Effect: War Field Explosion
   URL: https://mixkit.co/free-sound-effects/explosion/

Referenced Tutorial

1. Learn OpenGL: Texture Mapping, Transparency, Participating Media, Particle System
   URL: https://learnopengl.com/
2. Take Screenshot in OpenGL: Extract to PNG
   URL: https://vallentin.dev/2013/09/02/opengl-screenshot