

Demonstration video link

<https://youtu.be/Kx8-je8Ok6c>

## Abstract

This project shows the basic implementations and understanding of textures effects, lighting, meshes, shadowing in a 3d scene using OpenGL.

**Keywords** – Texture, lighting, fire, shadow, grain and grey & contrast.

## 1.introduction

Using OpenGL, I rendered a 3D environment in this project to showcase the fundamental graphical concepts. The central feature of the scene is a plane composed of multiple objects some in motion and some stationary. These objects illustrate the basic relationship of textures and meshes while also serving as a bright example of the responsive lighting effects that have been implemented. The objects rendered observed showcase how effective the lights is diffused on their surfaces and how the shadows are cast on them.

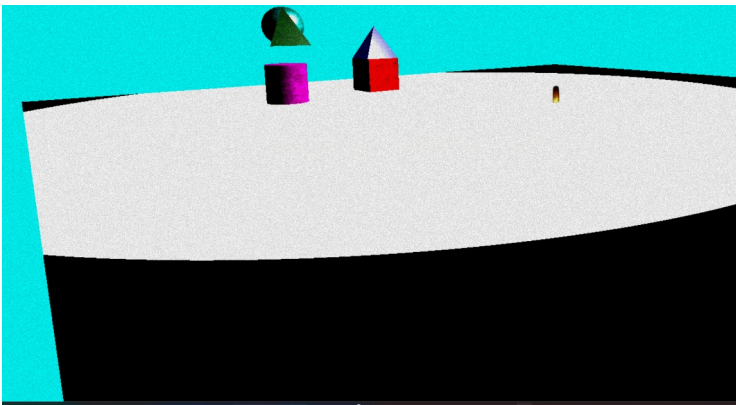


Figure 1: Scene overview – A top down view of the scene.

## 2.Implementation

In the scene the texture, lighting, fire, shadow, grain and grey & contrast effects have been implemented and will be discussed.

### 2.1 Texture

The objects in the scene have been implemented with a texture on their surfaces. To implement a texture in OpenGL, it is required need to load the texture image, generate a texture ID, bind the texture, set texture parameters, upload texture data to the GPU, and finally, use the texture in the OpenGL program by applying it to the geometry initially I wanted to add a few different textures to the objects, however I was receiving too many errors, therefore I decided to keep it simple and change the colour instead. This was done by adding a vec4 for colours.

### 2.2 Lighting

The spot light rendered in the scene permits the user to see the emissive, diffuse, specular and shininess properties that have been implemented. Initially I wanted to add multiple lights in the scene, however I decided to keep it simple and stayed with one lighting spot.

### 2.3 Fire

To Implement the fire effect in OpenGL I creating a particle system that generates a large number of small, animated particles that resemble into flames.

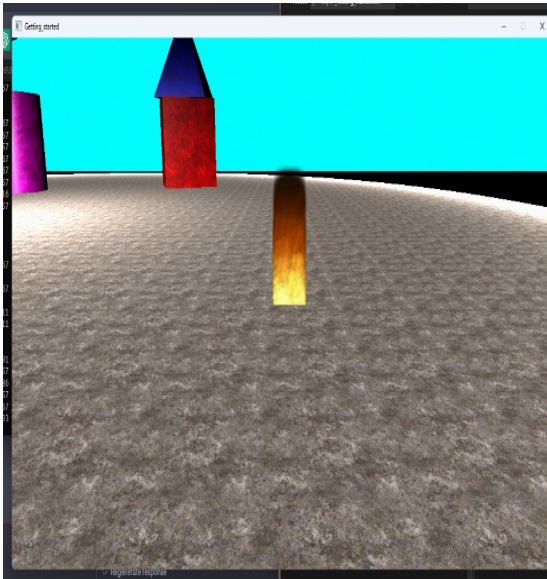


Figure 2: close up of the fire.

## 2.4 Shadows

I found that rendering shadows in OpenGL to be the most challenging aspect of this coursework, as it requires the calculation of the light source and the objects in the scene. I initially wanted to have the objects cast

a shadow on the plane, however time did not permit it, therefore I remained with the shadows being cast on the objects

## 2.5 Grain effect

I implemented a grain effect that fades in and out of screen. I found this challenging as it required a time aspect. In the end I figured it out, however it took far longer than I originally thought it would.

## 2.6 Grey and Contrast

To achieve a grey and contrast effects in the scene, I had to use post-processing to render the screen grey and then back to colour with a contrast. The brightness is then heightened after the contrast has been added. Initially I wanted to add a blur effect. However I time did not allow for it. In the end I managed to add a grey screen for void of colours and a contrast effect.

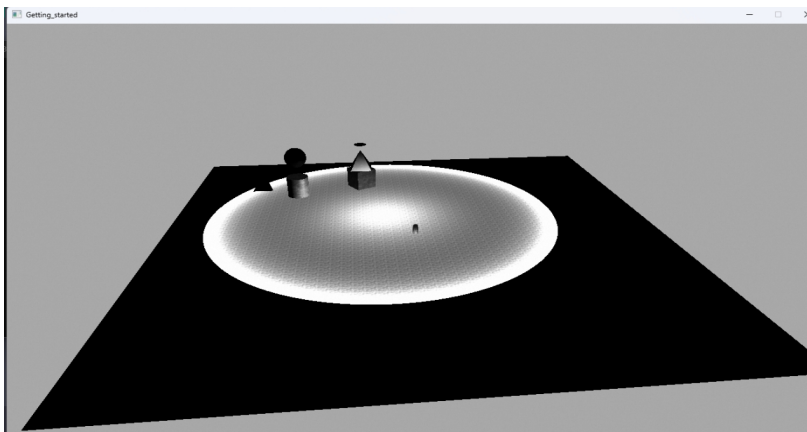


Figure 3: A grey effect void of colours in the scene

## 3 Future work

Initially I had created a skybox, however I found that it did not blend well into the scene the edges were too obvious, therefore I removed it. In the future I would like to implement a skybox to increase the immersive effects of the scene.

## 4 Conclusion

This course has given me a fundamental understanding of the immense power of graphics and the difficulties behind it. Although most of the requirements of coursework were met, I feel if I had more time and less external influences I would have added a few more textures to the scene along with a skybox.

## 5 References

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