

Assignment 2

Advanced Graphics, Augmented Reality, and Virtual Reality

September 2020

1 Learning Objective

In this assignment, we will build a 3D game. In doing so we aim to get comfortable with making objects of greater complexity with OpenGL, in addition to working with many interacting objects, and understanding how applications are built with OpenGL. We also wish to familiarize ourselves to working with textures, shadows, and 3D transformations.

2 Problem Statement

In this task, you will be required to create a 3D third-person-shooter open world game - inspired by the wildly popular Player Unknown's Battlegrounds (PUBG), in OpenGL. To aid you in getting started, you can choose to build atop the simple template linked [here](#) (make sure to change the view to a perspective projection). We would recommend you use Modern OpenGL (version 3+) as given in the template, as loading textures and calculating shadows will be easier.

The objective of this game is to survive in an open world setting. You start with one gun, with a limited set of bullets. You will also be battling a few "bots", or enemies, who will shoot you when you get in their field of view. Within a limited time, your objective is to kill these bots.



Figure 1: A starting point to give you an idea of the game

1. World : A grassland with the sun beating down in the scene as the only light source. There are trees and rocks in the world placed randomly in the map made of simple primitives, and bullets cannot penetrate these objects. Apply textures to the world, trees and rocks.
2. Fog : A mist / fog that engulfs the map, and things further away are harder to see. This should be turned on and off with a button.
3. Player : A single player with some fixed health and a gun with a limited number of bullets. If the player runs out of health/bullets/time, or if the player kills all the bots, the game is over. You may import a 3D model for the player.

4. Enemies : Bots that look similar to the player, and are initially spawned randomly across the map. Bots randomly search for you in the map (as they do not know where you are), and shoot you if they see you (You may limit their field of view to say, 10 metres). Bots die upon being shot.
5. Scoreboard : Keeps track of the time remaining, player health, remaining bullets and remaining bots always visible on the screen.
6. Visuals : The camera should be a third-person-view, and will follow the player. If the player turns, the camera should turn along with the player. All objects in the world should project shadows around them, that are created by the sun. Aim to create realistic lighting in your scene (for example, a tree will have a bright side and a dark side).

Other objects, and complexities can be added as well. For this assignment, we'll focus more on the visual aspect of the game. Be sure to implement proper and accurate collision detection. Bonus points will be given by the TA if something impressive is added, like realistic textures/objects or more intelligent bots that use strategy to survive. This can be carried forward to other Assignments only. Don on your Thinking Hat :)

3 Hints and Resources

1. Following OOP principles might be very helpful as your game scales. When you create objects in the world, make them as objects in the program (as classes) with all the parameters and methods needed for drawing, motion etc. built into the object along with a method to draw themselves.
2. To improve game performance, you could attempt a mechanism to only render those objects that in the field of view of the player.
[Texture Mapping](#).
[Shadow Mapping](#).

4 Marking Scheme

- World : 20 points
- Player and Enemies : 25 points
- Fog: 5 points
- Lighting + Shadows : 25 points
- Scoreboard : 10 points
- Gameplay : 15 points

5 Submission Guidelines

The assignment can be written in C++ or Python. You should provide a simple single-page quick start guide outlining the game controls, and any additional features. Also provide build instructions for your game. Please submit all your files in a roll numbered zip on Moodle on or before 11.59 PM September 13, 2020. Keep in mind the late day policy, and use them wisely.

Best of luck!