CSCI 4110 Assignment One

Terrain Generator

Due: October 11, 2019

Introduction

The purpose of this assignment is to construct a 3D terrain that you can fly over. The input to this program is a short file that describes the basic features of the terrain. Your program will then fill in the details of the terrain and allow the user to fly over the terrain using either mouse of keyboard controls. The interaction should be smooth and give the user the ability to completely explore the terrain. Use shaders to realistically colour the terrain so it looks like a planet (use our own planet as a model).

Input Data

The terrain is represented by a height field. We can assume that one corner of the height field is located at the origin, therefore two required inputs are the size of the height field in the x and y directions. We also need to resolution of the height field, the number of grid points in the x and y directions. This will be the size of the final height field.

A low resolution height field is used to give the overall structure of the terrain. The input required for this is the number of grid points in the x and y direction followed by the z value for each of the grid points. Note that this low resolution height field covers the same area as the high resolution one that your program will construct. The minimum size of the input grid is 2x2 giving the z values at the four corners of the grid. You will probably want more points than this.

Height Field Generation

Since the final height field has a much higher resolution than the input grid we need some way of generating new height values. In class I presented a fractal algorithm for terrains. Use this algorithm to fill in the missing points in the height in the terrain. The fractal dimension can either be part of the input file or passed as a command line parameter to your program.

Random Number Generator

We need N(0,1) random numbers for the fractal terrain algorithm. The C++ standard library has a normal random number generator that can be used for this purpose. A description of it and a sample program can be found at
http://www.cplusplus.com/reference/random/normal_distribution/.

Shaders

Your terrain should look realistic, so you need to construct shaders that produce a realistic appearance. Things to consider are how appearance changes with elevation. At the highest elevation there can be snow and at the lowest elevation there could be water. In between there can be various types of vegetation. You don't need to model plants and trees, but consider appropriate textures and colours for different parts of the terrain.

Report

There should be a short, one or two page report describing how you constructed the terrain, the techniques that you used and any special features of your program. Submit the source code for your program and whatever is required to produce it (make file or Visual Studio project for example). Include any special libraries that have not been used in the laboratories. All of this should be packaged as a zip file and submitted through Blackboard.