Project 1, 2014

Set: 22nd August

Electronic submission: 4pm, 8th September

Marks: This project counts towards 10% of the marks for this subject

This project must be done individually
(Note: project 2 can be done in groups)

Aim

The purpose of this project is to get you acquainted with programming using Direct3D.

Task

In this project you will use fractals to automatically generate a 3D landscape. The landscape must demonstrate a variety of colours.

Diamond Square Algorithm

You must use the *Diamond-Square algorithm*, which is a de facto standard in fractal landscape generation. Your fractal will generate a *heightmap* which can then be used to construct the 3D landscape geometry.

The LMS page has a number of links that have simple explanations of the Diamond-Square algorithm.

Specifications and marking criteria

A project that satisfies all of the criteria listed below will receive 10 marks.

- Modelling of fractal landscape (4 marks):
  - You must automatically generate a randomly seeded fractal landscape at each invocation of the program, and correctly implement the diamond-square algorithm.
  - You must use Direct3D appropriately to draw the landscape.
  - There must be no significant problems with the polygonal representation.

- Camera motion (2 marks):
  - You must allow for arbitrary movement of the camera, including rotation and translation using the mouse and keyboard keys.

- You must allow the user to move anywhere in the world (including up into the sky), and prohibit the user from moving "underground"

- The choice of controls is left to you, however both mouse and keyboard controls must be implemented.

- You must utilise perspective projection, and choose a suitable default perspective, so that the landscape is clearly visible.

- Surface properties (4 marks):

  - The surface colour of the terrain must correspond in sensible way with the height of the terrain at any particular point (for example rocky outcrops or snow on top of mountains and grass or soil in valleys).

  - Suitable lighting must be implemented, including ambient, diffuse and specular lighting using a BasicEffect.

  - The direction of the lighting must change with time, to simulate the effect of a sun rising and setting. Rendering the sun itself is optional.

  - Your landscape must include semi-transparent water sections, which may be rendered as a plane over parts of the landscape.

  - A constant and reasonable frame refresh rate must be maintained during program execution (i.e., more than 30 frames per second)

Electronic submission

Your code *must* compile and run on Visual Studio 2012 Professional using Windows 7 or Windows 8. Sample Windows 7 and Windows 8 projects have been provided that you may modify and base your submission on.

Your projects must include a *Microsoft Visual Studio project file.*

You must create a .zip archive of all your source code and project file required to run your programs and electronically submit using the *LMS* by the due date. **Please do not submit your compiled .dll and .exe files, i.e. Please delete the /bin and /obj directories from your submission before submitting**

Your submission must include a *readme.txt* file that must (briefly) describe your implementation. Be sure to include a brief description of how you generate the terrain using Direct3D. Several paragraphs of text are sufficient and concise descriptions are preferred over long, verbose descriptions.

Important: if your code contains code from other sources (other than from the provided project files), in particular from other web sites, you have to clearly indicate this in *readme.txt*, which classes or methods are your own and which are from a different source. Remember that copying code from the Internet or from your colleagues will be considered cheating. We will be checking for similarity between submissions and with code available over the Internet.

Extensions

Requests for extensions should be directed to the lecturer for the subject, Adrian Pearce.