CS-AD-216: Foundations of Computer Graphics

Assignment 8, Due: November 20

Instructions:

- Assignments can be submitted in groups of at most three. The purpose of groups is to learn from each other, not to divide work. Each member should participate in solving the problems and have a complete understanding of the solutions submitted.
- Submit your assignments as a zip file (one per group).

Problem 1 (30 points)**.**

In this assignment, you will implement a sky box (cube mapping), a terrain (height field), and reflection mapping (or environment mapping).

- To implement a sky box, use a cube with the image `cubemap.jpg` as the texture on it.
- To implement a terrain, use a height field i.e a square grid with heights assigned to each of the vertices. Use the image `heightmap.jpg` as a height map. Make the height of a vertex in the grid proportional to the brightness of the corresponding point in the image. You can use any of the R, G or B components as the brightness. The construction of the terrain grid can be done offline and stored in a file.
- Use the image `moss-diffuse.jpg` as the diffuse map on the terrain.
- Use the image `moss-normal.jpg` as the normal map on the terrain.
- Load the tea pot model in `teapot.js` and place it somewhere above the terrain.
- Implement reflection mapping on the surface of the tea pot.

Note the image `cubemap.jpg` already contains a portion of the landscape. You will need to place the terrain appropriately so that this part of the texture is not visible.

Also note that when you move your camera around in the scene, the teapot and the terrain should move relative to the camera but the sky box should remain still since it represents scenery at a distance. This can be achieved by making the sky box cube very large but that is very inefficient. An efficient way is to keep the cube small and always move it so that its center is at the camera location. To avoid the cube from obstructing the view, you can disable writing into the depth buffer when drawing the cube. Effectively then it appears that the cube is very large. To disable writing into the depth buffer, you can use `gl.depthMask(false)` and to enable it again use `gl.depthMask(true)`.

Do not use the virtual trackball in this assignment. Moving around in the scene should be done using the camera controls.

Before attempting this exercise, please make sure you fully understand the example code in the following folders in the ***CODE*** *directory:* `Height Fields`, `Texture Mapping (minimal)`, `Load Model`, `Normal Mapping`.

Please also make sure that you have the latest versions of all the files in the ***Common*** *folder.*