CMPSCI 473 - Project Description
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Project Title: Random Terrain Generator

What we used for development:
Java Open Graphics Library.

Project Description:

Our program creates a random 3D terrain map. This is implemented using the diamond-square fractal algorithm. This algorithm functions by setting the value of each point to the average values around it in a square pattern or a diamond pattern. It adds a random perturbation to each average so the terrain isn't uniform.

It must first be seeded with a value in each corner, then the average for the center is calculated from this square of points and a random value is added to it. The center and corners are then used in the diamond step to calculate the average for the midpoints of each side. These steps are then repeated with the distance to move between the point and the averaged points halved. The scale of the random perturbations is also decreased, so as more of the terrain is filled in, the detail gets smaller. The size of each side must be a power of 2 plus one, so that the distance to calculate averages will eventually become 1. When it does, that's the final iteration and it will fill in all remaining height values.

This method is also known as a plasma fractal, because it is self similar on different scales. In terrains like this simulated one and in real mountains, the peaks and valleys of large mountains have a similar shape to jagged outcroppings on the sides of those mountains, down to the points on individual rocks.

The terrain is viewable in a 3D map, which can be navigated with keys and mouse. The terrain map is overlaid with a image file of the users choice, which the user must select at runtime. Users can also animate the texture of the terrain map, and switch from calculating vertex normals to having all normals point straight up.

Running our Program:

We used 4 external .jar files in our program. We used the jogl.jar, vecmath.jar and gluegen-rt.jar files from class as well as 1 additional .jar file, timer.jar, which we have included in our submission.

To run our program:
1.) Add jogl.jar, gluegen-rt.jar, vecmath.jar and timer.jar to the build path.
2.) Run using HeightmapTerrain.java as main.

Upon running it you will be prompted to select a file. The selected file will be used as the texture for the terrain so choose an image file of your choice. Valid formats are ".gif," ".jpg" and ".png",

.png files create the most interesting patterns when animated. Running too large of an image will either cause the program to run slowly or make it crash entirely. Using image files smaller than 1024x1024px yields good results.

Users can look around the scene using the mouse. Use the arrow keys to navigate the map. Zooming in and out can be done with “comma/s” and “period/w” respectively. Switch rendering modes with the “1” key. Toggle the texture animation can be done with the “2” key. Toggling surface normals can be done with the “3” key. To randomize a new terrain press the “4” key. To select a new texture press the “5” key.