In this lab session, students will learn create a terrain by generating a terrain heightmap using a fractal terrain generator (diamond square).

1   Specific Learning Goals

After completing this worksheet, students should know and be able to:

1. Generate procedurally, using the fractal theory, a 2D terrain, i.e., the floor of a 3D world.

2   Further Reading

Prior to completing the exercises in this lab class students should see the information available at:

- `http://stevelosh.com/blog/2016/02/midpoint-displacement/`, a tutorial on diamond square.

3   Programming Exercises

Exercise 1 — Loading a terrain heightmap

Based on the geometric data structure and geometric file loader of your project #1, output a terrain from a file retrieved from the web.

Exercise 2 — Generating a terrain heightmap using diamond square

Based on the geometric data structure of your project #1, generate a heightmap using to the diamond square algorithm.

References

[1] A tutorial on diamond square (1 of 4)
     `http://www.gameprogrammer.com/fractal.html#diamond`.

[2] A tutorial on diamond square (2 of 4)
     `http://www.lighthouse3d.com/opengl/terrain/index.php?mpd2`.

[3] A tutorial on diamond square (3 of 4)
     `http://www.paulboxley.com/blog/2011/03/terrain-generation-mark-one`.

[4] A tutorial on diamond square (4 of 4)
     `http://stevelosh.com/blog/2016/02/midpoint-displacement/`.

[5] Terragen terrain generator
     `http://planetside.co.uk/?option=com_content&view=article&id=32&Itemid=150`.