Fractals: 3D

Jon Graven, Rohan Shah, Sean Abraham

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Abstract

A fractal is a geometric, self-similar shape which can be generated though its recursive defintion. Our project is centered on rendering fractals in 3-space in the CUBE through use of Aszgard.

1 Introduction

Famous examples of fractals include the Mandelbrot Set, the Julia Set, the Sierpinski Gasket, and the Menger Sponge among others. The Mandelbrot Set and Julia Set are 2-dimensional fractals; the Sierpinski Gasket and Menger Sponge are 3-dimensional. We will attempt to extrapolate the Mandlebrot Set and Julia Set into 3-dimensional space and recreate these fractals in the CUBE.

2 The Math and the Method

2.1 The Julia Set and Mandelbrot Set

Our fractals will be based on the equation $z_{n+1} = z_n^k + c$ where k will vary from 2 to 3, $z = a + bi$ and $c = f + gi$. For the Julia Set, the c value will be varied, whereas for the Mandelbrot Set the initial z value will vary. For the Julia and Mandelbrot Sets, we will rotate the fractal after rendering it 2-dimensional space. Also, the fractals will be colored according to a scheme that is to be determined. The coloring scheme will likely depend on the number of iterations.

2.2 The Sierpinski Gasket and the Menger Sponge

As both the Sierpinski Gasket and Menger Sponge are already fractals in 3-space, our main focus is developing an efficent method of rendering these fractals. The method we are considering employing is bottom-up processing. Starting with the smallest building block we will iteratively build up to create our fractal. Again, the coloring scheme will be later determined, but will relate to the iteration level of a given surface.

3 Goals

Our finished product will include the following

1. The Mandelbrot and Julia 2D fractals
2. The Mandelbrot and Julia 3D fractals
3. The Menger Sponge
4. The Sierpinski Gasket
5. Interfacing with the CUBE and wand