Fractal Dimension of Paths

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Abstract

The goal is to explore the use of fractal dimension and to find how it might (or might not) be used in a nontraditional application. The results will show if a correlation exists between the fractal dimension the length of paths between any two points on a coordinate plane. This will be accomplished by generating all paths between points of a data set, calculating the fractal dimension of each path, and analyzing the results.

Background

Researchers have used fractal dimension to demonstrate the fractality of plants, coastlines, and other objects. Other studies have focused on the relationship between fractal dimension and complexity. For example, in 1995, Corbit and Garbary showed that fractal dimension of some species of algae is directly related to algae development and complexity (as algae develop, they grow to be more complex). Many researchers test the correlation between fractal dimension and some property of an object. For example, a study was done on fractal dimension of fractures in metal vs. tested strength of metal.

Procedure and Methods

First, a set of coordinate points will be acquired. Coordinates of major cities in Northern America will most likely be used. An image-generation program, coded in Processsing, will take these coordinates and create images of every possible path between any 2 selected cities. Then, a method to calculate fractal dimension must be implemented in C. The method most used in computer science is the Minkowski-Bouligand dimension, also known as the box-counting method.