OPTIONAL PROJECT: SHORTEST PATHS IN LARGE POLYGONS

Παράδοση: July 1 2023

Description

The purpose of this project is to implement a simple application that can be used to plot a minimum–length path inside a large polygon.

In particular, you must implement the following codes:

- Implement the DCEL data structure.

- Implement a function that can triangulate a simple polygon. Your function must run in time at most $O(n \log n)$, where n is the number of vertices of the polygon. The triangulation must be output as a DCEL.

- Implement a function, which, given a triangulated polygon as input, generates the shortest path between two points inside the polygon. The shortest path should be returned as a polyline.

- For your dataset, it should be possible for you to use the Shoreline datasets. For this purpose, you should write code that can access the Shoreline datasets, given as ArcINfo Shapefiles, and generate polygons in a suitable form to be given to your triangulation routines.

- You should execute your code on various polygons and various pairs of points, and plot the performance of your algorithms, as a function of both the size of the input and the size of the output.

Resources

Shoreline dataset is a datasset of the shore lines of earth, found at `https://www.ngdc.noaa.gov/mgg/shorelines/data/gshhg/latest/`

GIS software for visual dataset inspection. An excellent option is QGIS (`https://www.qgis.org/it/site/`).

Spatial libraries Exist in Python (the `shapely` module), Java (Java Topology Suite), and C++ (several: GEOS, CGAL, …)

Deliverables

1. The code to your solution, together with build scripts. Any dependencies should be listed in the build script.

2. The performance graph and report on the performance of your solution.

Good Luck and remember KISS and RTFM