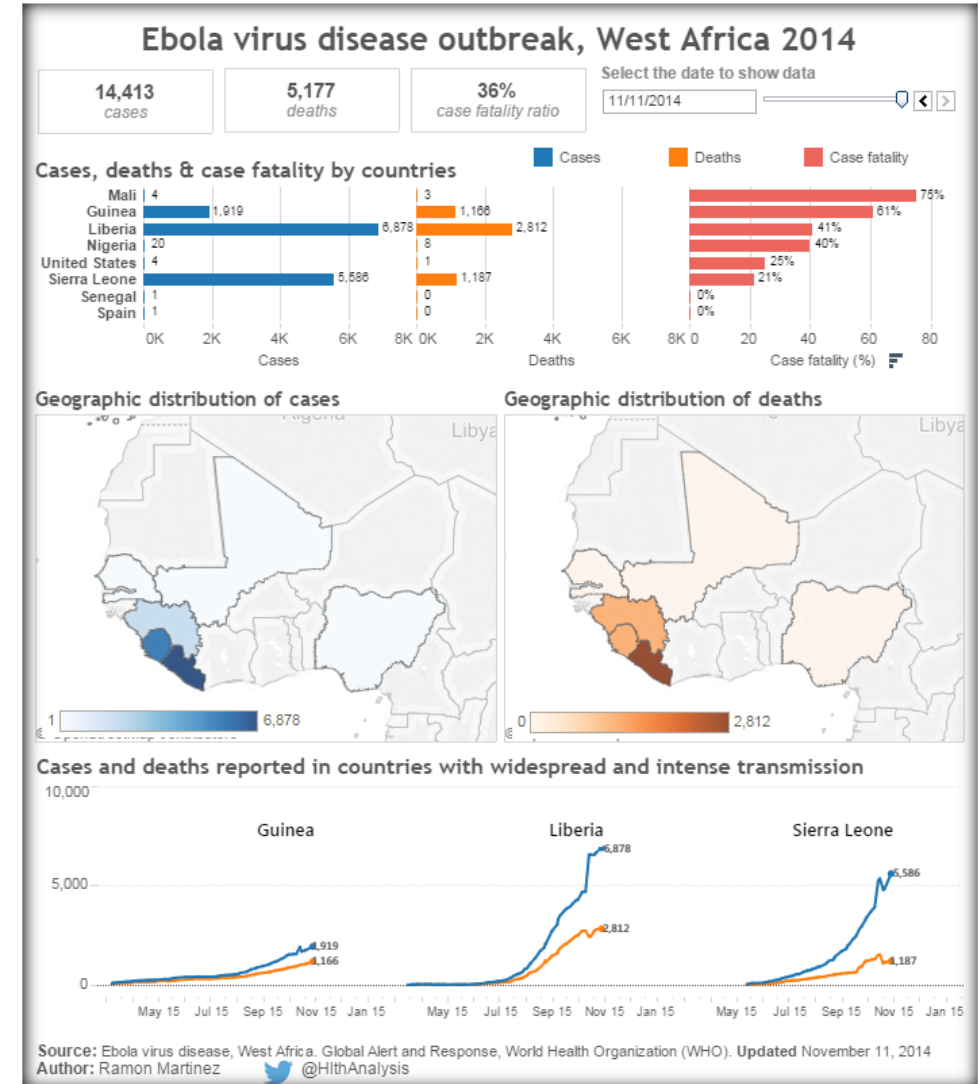
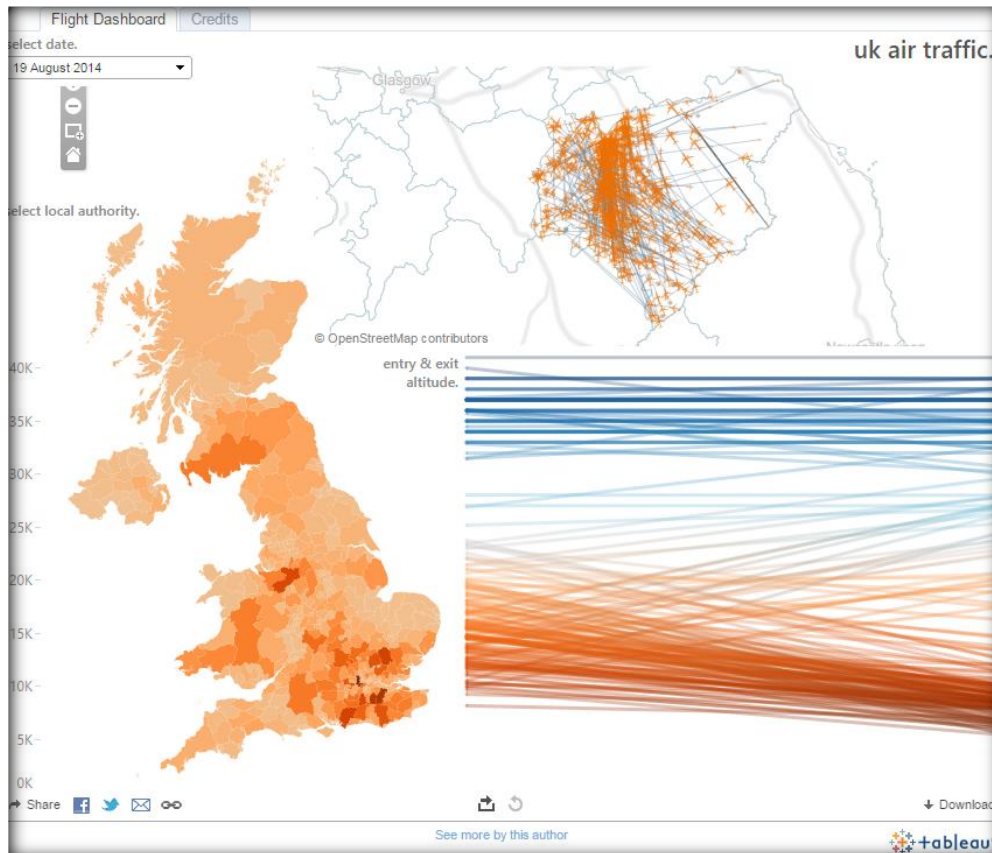


Geometry Simplification (using Python)


Arielle Simmons

Background


- I work at Tableau. GIS Data Engineer



How much detail is too much detail?



0.00068px² / 74.34%



93px² / 0.85%

<http://bost.ocks.org/mike/simplify/>

Visvalingam's algorithm

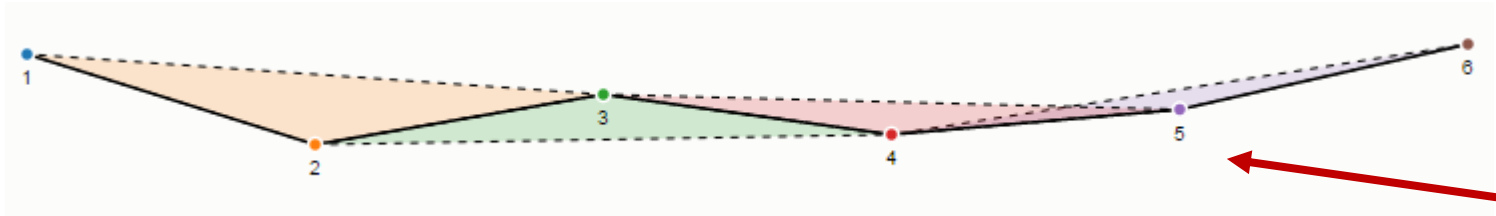
- Unlike Douglas-Peucker uses an area threshold rather than a distance threshold
- Visvalingam's : “progressively removes points with the least-perceptible change” by computing the area of triangles. The point with the smallest triangle is the point removed.



Step 1:
Measure
Areas

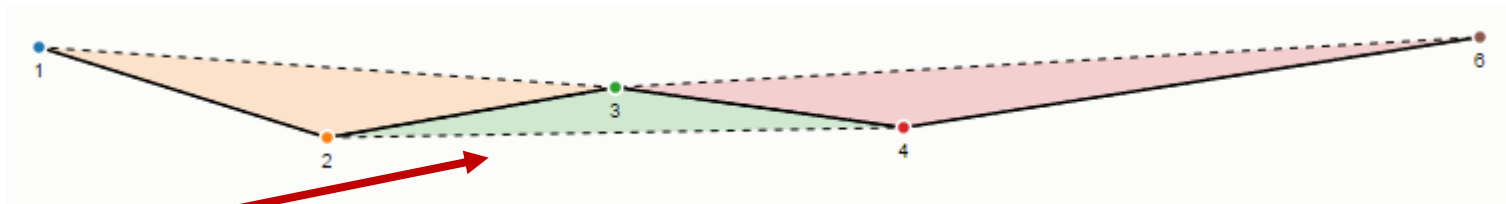


Step 2:
Identify
smallest
area



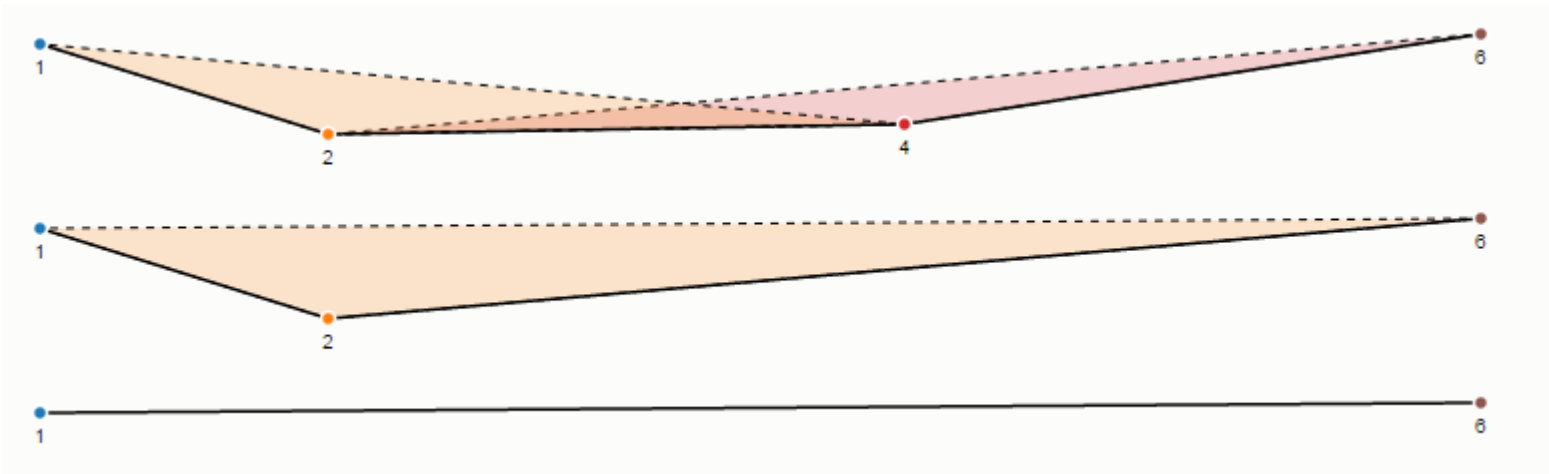
smallest

Step 3:
Delete
point, and
re-measure



smallest

Step 4:
Iterate till
the threshold
requirement
is met.



Matt Bloch - Mapshaper

- Great tool – with Visvalingam's algorithm!
- But...it uses Node.js (C++, Javascript).

mapshaper v. 0.2.13

Fork me on GitHub

Edit a file

Drag a Shapefile .shp, GeoJSON or TopoJSON file onto this window, or a file from a local folder.

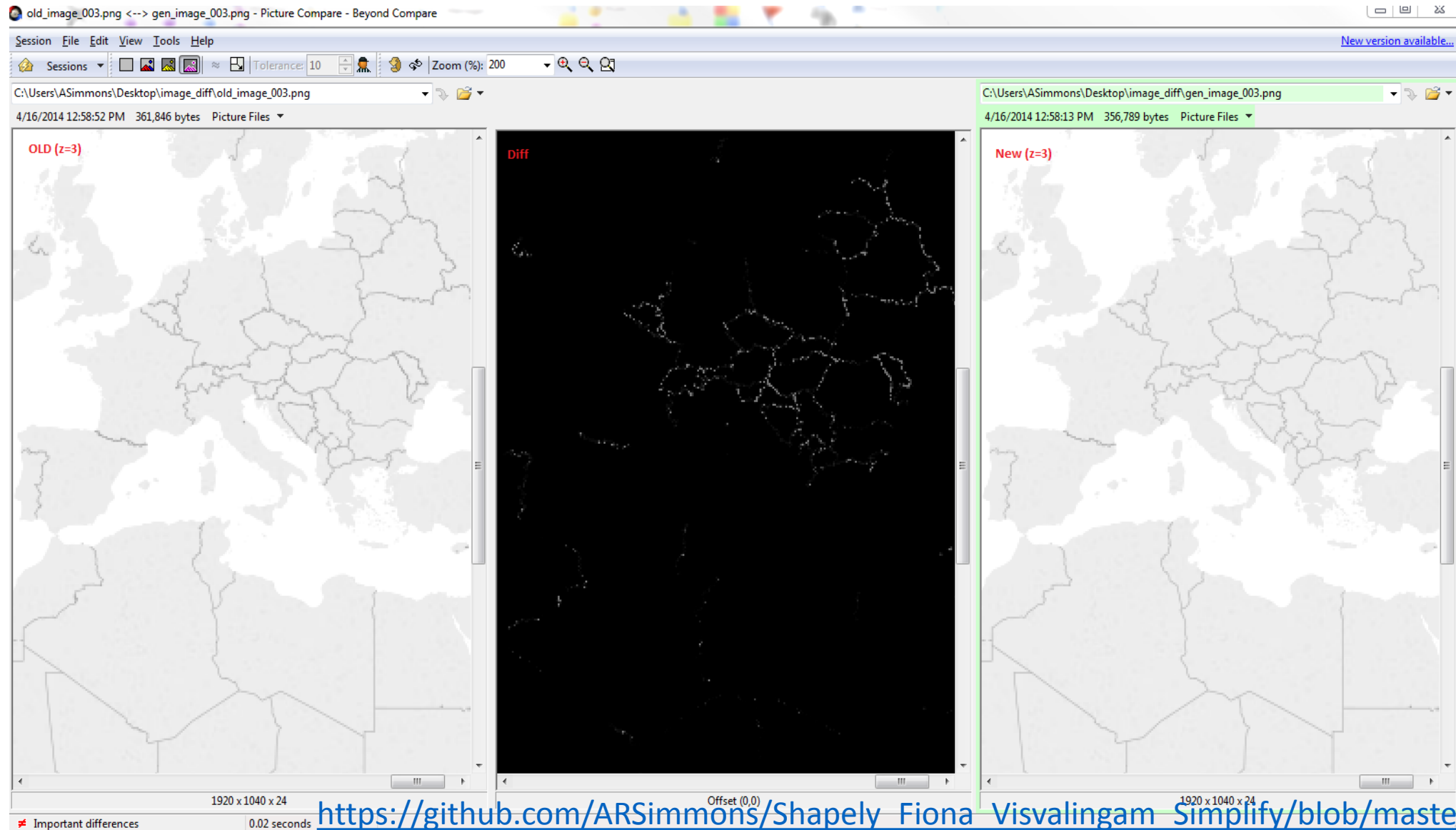
Simplification method

- ☐ Douglas-Peucker ?
- ☐ Visvalingam / effective area ?
- ☒ Visvalingam / weighted area ?

Other options

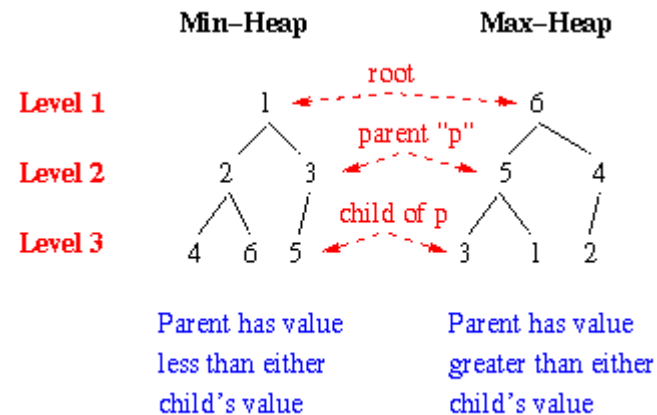
- ☒ repair intersections ?
- ☐ auto-snap (experimental) ?
- ☐ prevent shape removal ?
- coordinate precision ?

- Uses open source Python tools (Fiona, Shapely)
- Works on Polygon, Linestring, MultiPolygon, & MultiLineString

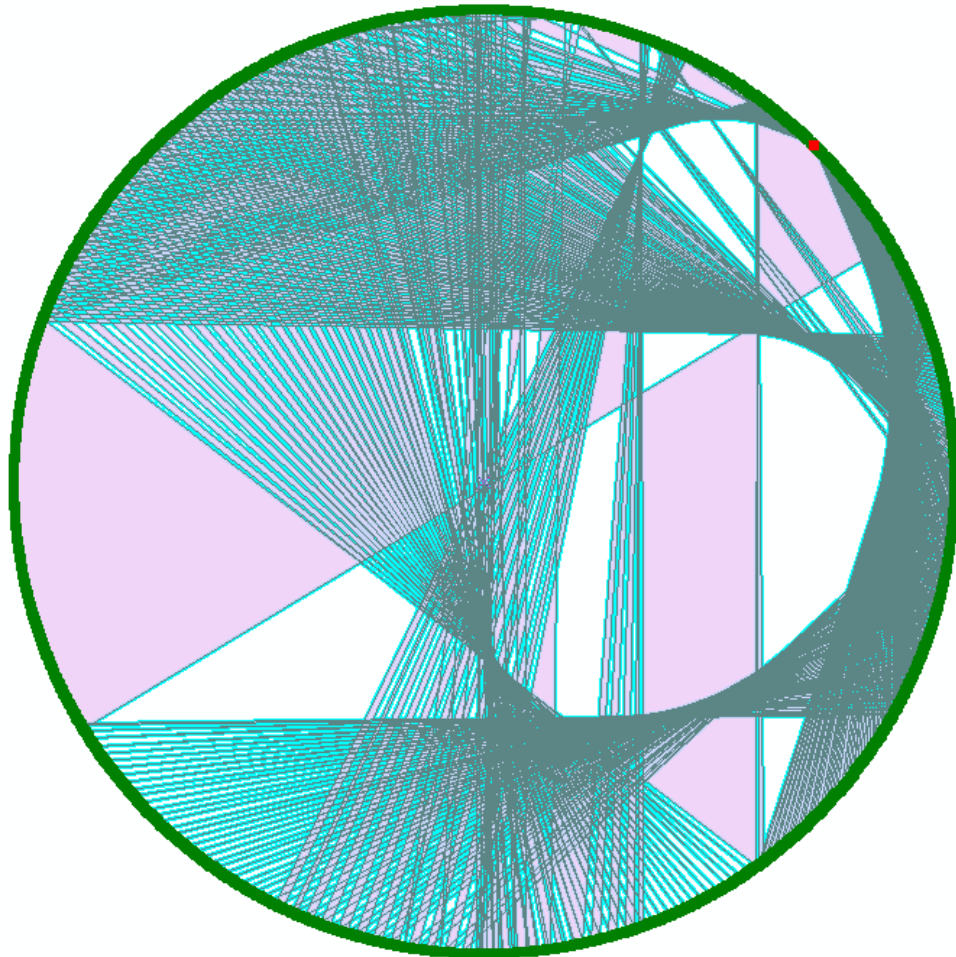


Using Heap's

- I could've used an array for storing and sorting the points...
- BUT I used a data structure called a heap.
- Heap's:
 - A tree where a parent node's value is larger than that of the children
 - Very useful if you need quick access to the largest (or the smallest) item



Heap's are great...but keep in mind what you are doing



This amazing graphic is NOT some napkin doodle.

It is actually a real shapefile...that I created by running ('in development') `simplify.py` code on a perfect circle (a circle which I expected to be deleted because I set the area threshold very high).

What Happened?

- I had put all the points into a heap (a sorted array, see: `heapify`)
- AND the heap messed up my sorting order (I didn't know which points were near each other so I could properly measure triangles)
- Solution: use a doubly-linked list

Next project: Add topology!



Table of Contents

[Team Members](#)

[Project Summary](#)

Team Members

- "Arielle Simmons" ari.ucb.fire@gmail.com
 - Data Engineer

Project Summary

Fiona (1.1+) and Shapely libraries used to simplify lines, multilines, polygons, and multipolygons by an area threshold.

The simplification algorithm is based off of M. Visvalingam and J.D. Whyatt's algorithm (1993). More details about the Visvalingam-Whyatt algorithm can be found here:

<http://www2.dcs.hull.ac.uk/CISRG/publications/DPs/DP10/DP10.html> .

Key points to note:

- As of 4/29/14 there are **NO TOPOLOGY** preserving rules in place (!!user beware!!)
- Polygons which are smaller then the area threshold CAN BE deleted
- Lines preserve their beginning and end point, thus lines CANNOT BE DELETED.
The beginning and end points of a line feature are static throughout the simplification process.
- threshold units are determined by shapefile map units.
- to run from command line: `python simplify.py <input file> <output file> <threshold>`

NOTE: THIS PROJECT IS STILL in progress as of 4/29/2014

https://github.com/ARSimmons/Shapely_Fiona_Visvalingam_Simplify/blob/master/simplify.py