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ESGI132 - Geometric Visualization of a Polygon Area Partitioning

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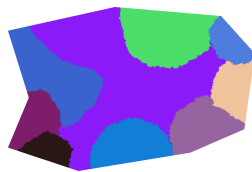
December 16, 2017

Introduction

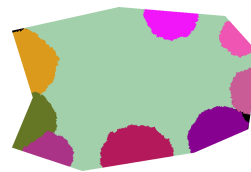
In the process of modeling sewerage networks, the main component is the drained area (catchment) from which water is collected to each conduit (pipe). If the area for a single sub-catchment is derived from a mathematical model, we have to create the geometry of that territory, Exactly, in this paper, we want to make geometric visualization for partitioning of a given living area, with respect to the known water debit, relative to each pipe. If each pipe is represent as edges and these edges formed polygon then our main goal is to make geometric visualization of a polygon area partitioning.

Proposed Solutions

1. Monte Carlo Flooding - With this algorithm the polygon will be divided in irregular shapes. The final result of the algorithm is similar to liquid foolding from different sides.



(a) Test case 1.



(b) Test case 2.

Figure 1: Monte Carlo Flooding algorithm results.

2. Percent Distributed Clustering - The given area is divided into a fine grid of pixels. The sides of the polygon are also divided into sixty line segments each. For each pixel

of the area the algorithm finds the line segment that gives the lowest value for the distance between the pixel and the line segment multiplied by 100 minus the required percentage of the area: $\text{distance} * (100 - f(x))$. The side that the line segment belongs to is the side that the area taken by the pixel will drain into.



Figure 2: Percent Distributed Clustering algorithm results.

3. Offsetting Polygon - The main idea of the offsetting polygon approach is to fill the initial polygon with smaller ones of which each side is parallel to the corresponding one of the initial polygon.

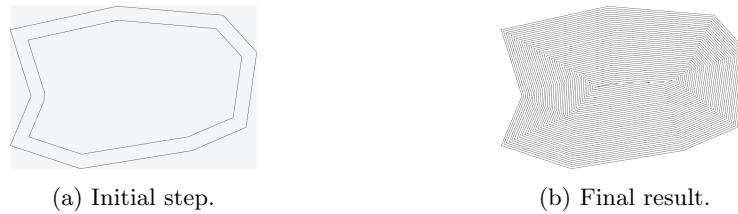


Figure 3: Offsetting Polygon algorithm results.

Conclusions

Experimental results show that usage of Percent Distributed Clustering and Offsetting Polygon can produce much better accepted results than Monte Carlo Flooding.

Acknowledgements

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