

Combining Range Queries and Line Simplification

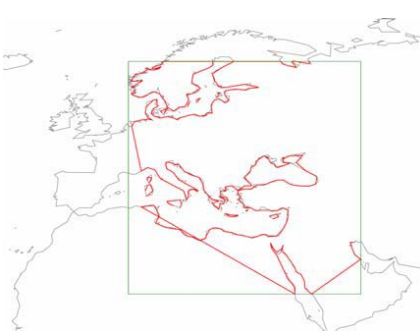
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Abstract

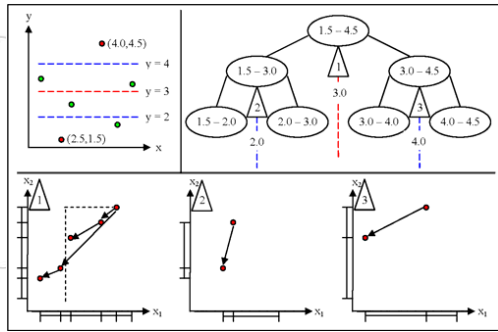
This poster presents a method for combining rectangle queries with automated line simplification on massive data sets.

Asking for data representing a specific area and have it displayed with an appropriate resolution is the basic operation of a GIS, but a satisfactory solution to this problem is yet to be developed. Today generalization of large digital maps is performed by preprocessing different levels of detail and store the data several layers. This leads to difficulties when updating the data, as every layer has to be updated, and the layers require a lot of storage space. The method presented here is an attempt to solve this problem by combining rectangle queries with line simplification on-the-fly. The basis is a generalization method presented by Zhilin Li and Stan Openshaw, which have been integrated in a new data structure for solving rectangle queries.

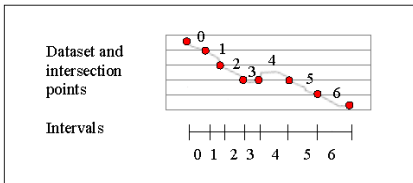
The new data structure is a two dimensional binary tree. It combines a regular binary tree containing ranges on the y-coordinate of the points, with a priority search tree (PST) organizing the points according to their x-coordinate in the other dimension. The nodes in the PST contain points that are made from the intervals along the x-axis retrieved from the original data set. A new "stair-case shaped" search has been developed for the PST, instead of the traditional bucket search. This stair-case shaped search on the x-coordinates is then combined with a simple "range search" on the y-coordinates. The result is an efficient orthogonal range search combined with an approximation of the result based on the grid-method developed by Li and Openshaw.



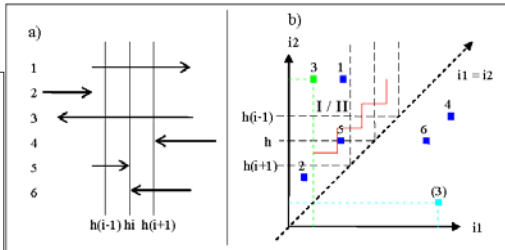
Example of output.



The tree structure.



Selecting intersecting points.



Converting intervals to 2D points.