# ENHANCED ONLINE GENERALIZATION ALGORITHM

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With the wide spread of GIS applications on the web, the need to produce maps in real time was mandated. Not all applications need the same Level Of Detail (LOD) and also not all users of one application need the same details. For one dataset, the user needs only what is sufficient to display the result of his query. Storing the different Levels Of Detail (LODs) in the server side causes update and flexibility problems. The alternative is using online generalization algorithms. Online generalization is used in web applications to produce multiple resolutions from the master dataset in real time. Doing this process online is not trivial task because it must be fast, must maintain the original topology in the generalized data, and must maintain the visual impression of the original dataset.

In this paper, we present proposed rule-based generalization algorithm that can be used for on-the-fly map generalization. It covers the limitations of already published algorithm by different authors. The proposed algorithm uses two generalization operators (line simplification and selection operators). The line simplification algorithm uses Visvalingam and Whyatt simplification algorithm to rank the vertices for removal. Despite the applied algorithm is able to extract low level of detail, it does not preserve the topology in different levels of detail. Hence, it was necessary to refine its performance by proposing a number of rules to maintain the consistency of topology and guarantee no self intersections will occur after removing any vertex during simplification. The proposed rules prevent self intersections in lines and polygons boundaries during simplification. The proposed rules keep the original topology (touch, disjoint, cover,

intersect, overlap) in the generalized data. Also they prevent the new intersections in the map. As well as, they prevent creation of gaps in polygons. The proposed rules are categorized into three types: Selection, Self Intersection, and Topology rules. Selection rule is used to determine the removal possibility of the feature. Self intersection rules are used to prevent the removal of the vertices that will cause self intersection. Topology rules are used to prevent the removal of vertices that produce invalid topology.

The prototype that implements the proposed algorithm was developed in java and JTS version 1.8 (Java Topology Suite) was chosen as environment for generalization. All experiments are done by desktop computer with 3 GHZ and 1 GB RAM. And the datasets are stored as text files. Each feature is stored by the feature ID and the geometry of the feature in Well-Known Text (WKT) format. Different datasets were used in testing process. The proposed prototype was used to generalize three different datasets. One of them contains area features only, other contains linear features only, and the third is topological data set and contains three types (polygons, lines, points). ArcGIS 9.1 was used to perform topology and self intersections checks. The performance of the proposed algorithm with these datasets is reported.

The performance of the proposed algorithm gives it the potential of further exploitation in real time applications, e.g., it can be used in progressive vector transmission framework and adaptive zooming because of the possibility of easy refinement process that is provided by the used increments encoding.