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BEST PRACTICES FOR POLYGON GENERALISATION FROM MEDIUM TO SMALL SCALE IN A GIS FRAMEWORK

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The goal of this paper is to present a best practice approach for the generalisation of polygon data from medium to small scale in a GIS environment. Two issues are raised: the reassurance of topological integrity between different themes with inter-theme constraints and the generalisation of themes that are represented in a spatial database with two geometries such as polygonal units and their linear borders.

An auxiliary dataset is introduced as a structure that is used to assure consistency. It is a combined polygon theme that results from the application of the map overlay method "union" to a number of independent polygon themes with inter-theme constraints. It is created only for processing issues and does not change the original data schema. After the processing, the original themes can be reconstructed. Primarily, the auxiliary dataset can be used to solve inconsistency problems of the original datasets. If the original datasets are fully compatible, a "one to one" relationship exists between the polygons in the original themes and the polygons of the combined dataset. Otherwise, new polygons are created that correspond to each one of the problems. The identification and the appropriate handling of these polygons would create a consistent dataset. During generalisation, one of the basic requirements is the topological integrity of the generalised data set. No self-intersections within a polygon outline and no intersections of different objects should occur as a consequence of generalisation. Topological errors due to simplification can be avoided by utilizing the auxiliary dataset. In this way, inconsistency problems that will definitely be the result of more than one independent simplification procedures are avoided. Most commercial GIS software, provide simplification tools that can assure topological consistency in a dataset. Moreover, the auxiliary dataset can be used to better handle other cartographic generalisation issues such as minimum area, imposed by the limits of visual perception. Minimum area limits are applied to independent polygons, enclaves and small polygons between different themes.

Nowadays spatial databases that follow the OGC (Open Geospatial Consortium) simple features standard store separately different types of geometric primitives e.g. polygons from lines. This makes it difficult to manipulate objects comprised of different data types efficiently. Themes such as Administrative Units must be stored in the spatial database utilising objects with polygon and line geometry. The existence of two objects that store the same thematic information in the same database creates an important consistency issue during processing. Only the use of the topological relationships could assist in solving this problem. For the generalisation of themes with dual geometric primitives, it is proposed to generalise the polygons and then recreate from them the borders. The transfer of the attributes from the medium scale borders to the small scale borders, which are created by the generalised polygons, can be resolved by the use of topology to the initial and the generalised data. This is accomplished based on the fact that the topological map of nodes, edges and polygons at the medium scale and those of the generalised data are isomorphic graphs.

The above-described best practice approaches have been applied and tested in the framework of the ESDIN (European Spatial Data Infrastructure with a Best Practice Network) project. ESDIN is EuroGeographics most recent project that focuses on helping NMCAs prepare their data for INSPIRE Annex I themes and improve access to them. One of ESDIN's goal is the generalisation of the EuroRegionalMap (ERM) medium scale (1:250 000) data in order to create the EuroGlobalMap (EGM) small scale data (1:1000 000) based on rules. A number of rules developed for the generalisation of Administrative Units, Built-up Areas and Watercourse areas have been implemented in a standard GIS environment exploiting the above mentioned methods. The case study has proved that EGM can be extracted from ERM based on rules, although these datasets are created in different environments and are based on different national products. In addition to this, the value of the introduced best practices in the generalisation of polygon data has been verified.