TileGen – An open source software for applying cartographic generalisation to tile-based mapping

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The visualisation of maps in the internet has received an enormous impulse since the method of tile-based visualisation is applied to web maps. This technique facilitates a fast and efficient display of scale- and slidable maps in web browsers which are intuitively usable even for inexperienced users and is by now the most common and widely used method of web mapping.
The development of base technologies (e.g. standards, server technologies) is primarily focused on improving performance while cartographic aspects, like geometrical accuracy or legibility, are assigned to secondary relevance. Cartographic generalisation is currently scarcely deployed in practical implementations of tile-based mapping especially because the automatic methods for processing, serving and updating map tiles restrict the feasibility for that. On the one hand the abstract, text based definition of symbolisation parameters (e.g. SLD- & SE-standard) imply the formalisation of cartographic knowledge on why, when and how to generalise. On the other hand generalisation operators for spatial transformations can only be processed automatically within the fully automated process flow of tile-based mapping. In result, the most available tile-based maps can only be used with low graphical requirements, especially because none of the available open source software products contains any possibility for explicitly defining the appliance of cartographic generalisation. However, recent developments aim at providing automatic generalisation functionalities via Web Processing Services (WPS). These Web Generalisation Services are well suitable for the integration to tile-based mapping as generalisation operators can be applied generic but also shared and developed in cooperation.
TileGen is an open source software that addresses these issues by supporting the definition of symbolisation parameters but also by combining the open source rendering library Mapnik, most frequently used for rendering map tiles, with the Web Generalisation Service WebGen-WPS. Basically, TileGen helps to apply schematic transformations by providing the map author with an immediate preview of the specified map parameters. That supports the design process for tile-based mapping in relation to the manual definition of user-oriented symbolisations. Additionally, TileGen offers an automatic detection of topological problems within the final map visualisation by providing an interface for collecting ancillary information (e.g. density, minimum distance) on certain feature types. A concrete example of detecting and avoiding minimum distance violation will demonstrate how the combination of information retrieval and map preview supports the design process of tile-based maps.
Moreover, TileGen provides a user interface for integrating spatial transformations to automatic tile-based mapping by requesting generic algorithms of Web Generalisation Services. TileGen acts like an analysis tool in this relation. It enables the map author to apply different spatial transformations and to prove their usability by integrating and viewing the resulting geometries within the map preview immediately. That allows the map author to observe the effects of the applied spatial transformations on the final map visualisation permanently. Afterwards, the approved functionalities can either be applied to pre-process geometries, for storing them as multiple forms of representation, or the corresponding request of the external generalisation service can be saved within a specific configuration script. This script, adapted to Mapnik, can be exported and integrated to the process flow of tile-based mapping, whereby different spatial transformations are applicable on-the-fly within the automatic rendering of the single map tiles. An example on the appliance of a line smoothing algorithm, requested from WebGen-WPS, will demonstrate the resulting process flow of tile-based mapping with integrated automatic spatial transformations.