Methodology for Automating Cartometric Evaluation of Urban Topographic Maps in Brazil

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Extended Abstract

Brazilian official maps for the urban areas must be at 1:2,000 scale and maps at smaller scales are no produce by cartographic generalization. This requires a methodology for producing maps at different scales by cartographic generalization that can be appropriate for the Brazilian landscape. The cartographic generalization process can include cartometric evaluation. This evaluation can be helpful to define which features should be generalized and which operators should be applied (McMaster & Shea 1992). This paper presents a method for developing cartometric evaluation for an urban topographic map at 1:5,000, derived from a 1:2,000 scale.

Some of the cartometric evaluation components are the geometric conditions, the spatial and holistic measures. Nowadays these aspects are understood as constraints, restrictions, map specifications, generalization guidelines, tolerance values, cartographic rules, representation problems and graphic parameters (Mustiere 2005, Stoter et al. 2009, Tailender 2011). In addition, constraints are used to evaluate the generalization process quality and may indicate is the generalized features (Stoter et al. 2009). The following aspects must be considered when a map is produced by generalization: the features characteristics and the relationships between them, the representation problems, the graphic parameters for each problem and the order for applying the generalization operators.

The cartometric evaluation is automatically performed with the support of an expert system. The first results were achieved with a system that was developed using the ModelBuilder application and the ArcGIS software and are related to evaluation of buildings, parcel limits, streets and roads. This system detects representation problems by performing geometric measures on some features with the aid of spatial analysis tools of this GIS software. As a result, new data layers are generated and they store the features that show



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Our goal at the moment is to develop an expert system to perform the cartometric evaluation and the spatial transformations on QGIS. The proposed method includes six steps: (1) identification of the representation problems on the map when its scale is reduced, (2) formalization of those problems, (3) definition of the graphics parameters related with each representation problem, (4) definition of the generalization operators, (5) formalization of the rules that describe each problem and operator, (6) design and implementation of the expert system.

The system generates a new data layer that contains the features that have representation problems. The system indicates which generalization operator must be applied based on the cartometric evaluation results. Another data layer stores the features already generalized. The new layers are automatically added to the screen viewer.

The automation of cartographic generalization is a challenge, partly due to the subjective decisions taken during the process. The cartometric evaluation clearly shows this subjectivity. Two cartographers can identified different representation problems in the same map and this will lead to two different generalized maps. The formalization of the components of this evaluation can make this process more holistic and less dependent of human control and influence, and thus more efficient.

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