CO-413

EVALUATION OF PROPERTIES TO DETERMINE THE IMPORTANCE OF INDIVIDUAL ROADS FOR MAP GENERALIZATION

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Road data is a type of infrastructural geographical data and all roads in a given area form a network. Study of road networks has been a topic of interest to many groups of people such as transportation engineers, traffic administrators and geographers. In geographical information science, many researchers have paid much attention to the importance of individual roads for various applications such as traffic flow analysis and road network generalization.

Road network generalization which is caused by scale change aims to abstract the representation of road networks by reducing details. When the map scale is reduced, the available space on map to represent the same amount of information is also reduced. Therefore, it's essential to determine which roads are still needed to be represented on map. A series of operators, such as selective omission, simplification, and displacement may be involved. Among these operators, selective omission which is defined as a processing of selecting more important roads is one of the most essential ones.

This paper introduces three types of properties and gives a comparative analysis of different properties to determine the importance of individual roads for selective omission of road networks. These properties include one geometric property (i.e. length); three topological properties (i.e. degree, closeness and betweenness) and one thematic property (i.e. road class). Two representative selective omission approaches, stroke-based selection and mesh density-based elimination, are used to generalize road networks. For each approach, different properties are respectively used to determine the importance of individual roads. The road network of Hong Kong Island is used as study area for testing and two measures, similarity and connectivity, are employed to evaluate the selections. Results show that,

When the stroke-based selection approach is implemented, length property performs best in distinguishing the different importance of all the strokes, but performs worst in preserving the connectivity of the retained network; Both betweenness and closeness perform best in preserving the connectivity of the retained road network, and betweenenss performs better than the other two topological properties in determining the importance of strokes.

When the mesh density-based elimination approach is implemented, length and three topological properties have similar performances in determining the importance of strokes and degree property seems to perform a little better than others. Also, the connectivity of the retained network can always be preserved by using this approach.

In future work, other possible properties will be investigated and also other measures are needed to give a more reasonable evaluation of these properties.