

Multiple resolution GIS data: reality or fantasy?

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ABSTRACT

Natural resource issues each have their own thematic, temporal and spatial resolutions that need to be addressed with data of compatible resolution. This need is often met by generalising existing data to the desired resolution. While natural resource data is most commonly managed in vector geographic information systems (GIS), the commands available in commercial GIS, such as Arc/Info, are poorly suited to the generalisation task. To address this shortcoming we have investigated a data generalisation tool that embodies the best available practice within Arc/Info.

Generalisation has more often been discussed in the literature in the context of map production, but in this work is considered part of the production of a dataset for analysis. Therefore, issues such as preservation of topological integrity are taken into account, while cartographic issues such as the relative placement of different data themes are not. Visualisation of generalised spatial data, using a map drawn at an appropriate scale, is considered as a means of analysing data and is used to assess generalisation operations.

The generalisation process has an objective of preserving critical thematic and spatial characteristics. Specifically, these objectives may include preserving overall areal proportions of feature classes, topological integrity, and feature connectivity. We develop a set of criteria that allow us to evaluate the progress of the generalisation and for each objective we implement an atomic generalisation tool that uses these criteria to control its progress. For ease of use the tools have been assembled into a single Arc/Info AML package based on Kaléidos (written by National Institute for Agronomic Research, Ministry of Agriculture and Fishery, France).

We use production of a generalised soil coverage from the New Zealand Land Resource Inventory soil class data as an example of a generalisation task. Results are compared with 1:1,000,000 soil maps produced using traditional labour intensive techniques. Expert mappers are asked to provide advice on the selection of characteristics and to assess the progress towards each objective.

We have developed an operational tool that provides objective-driven generalisation. Summary statistics indicate the extent to which the objectives are met. Finally, we identify alternatives to address shortcomings that cannot currently be met with pure Arc/Info commands.