

Geovisualization for Geographical Information Science

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The term 'geovisualization' describes the use of interactive graphics for exploratory analysis of spatial data sets. MacEachren and Kraak (2001) postulate that 80% of all data currently collected have a spatial component. In response to the masses of data that are currently being collected, new ways of representing those data and interacting with representations and the new forms of data that are available to us to address a range of social issues the International Cartographic Association Commission on Visualization and Virtual Environments (CoVVEs) recently undertook a multi-disciplinary effort to define a research agenda. Four areas of priority were identified for additional research.

Representation : What kinds of representation are appropriate for particular combinations of use, user, data, phenomena and task? Can we incorporate appropriate semantic information into our data sets and build theory that formalises our knowledge? Can we extend our theory to include new display technologies and applications?

Cognition : What works and doesn't work. and when? We need empirical evidence. Can we adopt or develop methodologies that allow us to judge whether visualization works when interactive software applications have so many more parameters than traditional maps and the desired outcomes (knowledge derivation) are indeterminate?

Geocomputation / Databases : How can we best combine methods for computationally processing digital information with those for visualizing it? How can we develop databases to ensure that data is accessed quickly enough to permit interactive graphics as data types become more complex and data sets become larger?

Interfaces : Is interaction with spatial data sets achieved most successfully by using particular (spatial?) metaphors? Can we develop appropriate and effective interfaces for collaborative visualization and to suit the wide range of users of visualization and tasks to which it can be applied?

The geographic information science group (GISG) at City University is responding to these developments in a number of ways:

Firstly an architecture has been developed that supports distributed digital libraries. It enables data and metadata searches between applications and databases across the Internet. The metadata structure used is appropriate for geographic data and geo-referenced multimedia and the communications mechanism returns metadata and data across a network enabling geographic applications to download, cache and incorporate data from remote sources.

Secondly software is being developed to take advantage of this architecture by querying remote databases for relevant data, arranging these data into appropriate intellectual structures and providing interactive geographic views that are suitable for exploring the information. Software applications have been developed for use in research and teaching.

Thirdly appropriate interactive views are being developed to summarise and analyse the new forms of data that are being collected and take advantage of new communication mechanisms. These include methods for the analysis of patterns at a variety of scales in data that track personal

locations and the provision of time/space context dependent information in the field using the wireless devices and communications protocols.

This contribution demonstrates some of these techniques and their relationship to the call for multidisciplinary research. It includes example software and new interactive views that are being prototyped for geovisualization.