Geographic Database Systems: Issues and Research Needs

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Geographic information systems (GISs) have been a growth market for the last 15 years. The user communities include domain scientists and professionals in such areas as city planning and land use planning, resource allocation, vehicle navigation, emergency management, archeology, marine applications, and geology. The design of GISs is based on Geographic Information Science, a multi-disciplinary field that includes contributions from geographers, cartographers, engineers, mathematicians, computer scientists, and more recently cognitive scientists and psychologists.

This tutorial will give an overview of database issues related to geographic information systems. GISs are typically very large software systems dealing with highly structured geographic data and complex spatial relationships. Since data collections are shared for a variety of purposes, multiple conceptual perspectives must be supported. This implies that frequently dramatic conceptual changes must be supported.

Three particularly important areas of geographic information science will be covered:

- The cognitive foundations, which will give answers to question about what spatial concepts are necessary and how GIS users interact with them through GIS user interfaces.
- The formal models in GIS, including spatial data models and spatial reasoning methods.
- The computational implementations, being concerned with storage of and access to complexly structured spatial objects, spatial relations, and spatial processes.

The tutorial will review the state of the art in these three areas and discuss research needs that are of particular concern to the database community. We will close with an overview of the multi-disciplinary GIS research community, covering its conferences, journals, principal players, funding agencies, and the University Consortium for Geographic Information Science.

PODS '96, Montreal Quebec Canada
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