ALTERNATE REPRESENTATIONS OF GEOGRAPHIC REALITY

Auto Carto 10
Panel Discussion

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THE DEBATE

Geographic information systems (GIS) are based on models of geographic reality. The functionality and utility of a GIS depends on a useful and correct data model. Data modeling involves the abstraction of reality as a number of objects or features, then defining these objects, their interrelationships, and behavior precisely.

The real world of geographical variation is infinitely complex and often uncertain, but must be represented digitally in a discrete, deterministic manner. Sometimes it is possible to define discrete features or objects in more or less rigorous fashion, but more often the digital representation is an abstraction of reality.

GIS databases present two very different views of reality. In one, geographical variation is represented by a set of layers, each of which records the pattern of one variable over the study area. If there are n layers, then n separate items of information are available for each and every point in the area. The variation in any one layer may be represented in numerous ways, including a raster of point samples, a set of nonoverlapping polygons, an irregular set of point samples, or a TIN.

In the second approach, we think of the world as a space populated by objects of various kinds - points, lines, and areas. Objects have attributes which serve to distinguish them from each other. Any point in the space may be empty, or occupied by one or more objects. GISs that take the layer view of the world often allow the user to populate a space with objects, but then insist that they be forced into the layer model.

416

However, much of the recent work on object-oriented design for geographic databases has emphasized the syntax of geographic features and deemphasized the need for defining useful spatial query, display, and analysis operators. It may be more important to design the data model around what geographic objects do, rather than what they are.

One contention is that the purpose of a GIS is not only to store and query a static schema of entities and relationships, but also to build new entities and relations dynamically. Why, therefore, define, capture, and store relationships which can be computed as needed? More importantly, why define and capture relationships between entities for which there is no clear functional requirement? Perhaps the goal of GIS data model design should be to develop the simplest model that works.

The layer/object debate is becoming as important to the current GIS industry as the earlier raster/vector debate, and carries a fundamental message. Whereas the raster/vector debate was over how to represent the contents of a map in a database, the layer/object debate is over how to represent and analyze the multivariate complexity of geographic reality.

The panelists will present a wide variety of views on the layer/object debate from the perspectives of academia, industry, and government. Each has been involved in the design, development, and use of geographic information systems and geographic databases. The commentary will help the audience to clarify their thoughts on this important topic.