

Chapter III

Spatial Databases and Data Infrastructure

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Introduction

The emergence, in recent years, of digital libraries and of Internet-based communication applications have led some researchers to propose that the emerging data infrastructure of the Internet and the capabilities of digital libraries can be used to organize and ease data-mining digital geospatial data across the Internet. Digital geospatial data interoperability, the target of major efforts by standardization bodies and the research community since the 1990s, “has been seen as a solution for sharing and integrating geospatial data, more specifically to solve the syntactic, schematic, and semantic as well as the spatial and temporal heterogeneities between various real world phenomena” (Brodeur, Bédard, Edwards, & Moulin, 2003, p. 243). Some researchers point to the problem that many GIS systems are singular in nature, are generally isolated, and lack interoperability, due in part to the computer architecture upon which they are based (Lutz, Riedemann, & Probst, 2003). This chapter will discuss the emergence of a national spatial digital infrastructure vis à vis the development of a national telecommunications infrastructure. Federal poli-

cies, standards, and procedures will be reviewed that assist in the management and production of geospatial data. Several examples of current geospatial libraries will be examined. The chapter will conclude with a short implications section on what are necessary next steps and future trends.

Characteristics of Spatial Data

As discussed earlier in Chapter II, geographic data is comprised of variables that represent real-world phenomena. These can be natural such as climate regions, topographic features, vegetation zones, and other natural processes. They can also refer to entities and objects that represent manmade activities such as buildings, roads, bridges, cable networks. In representing real-world phenomena, researchers use various abstract models that can represent some or many characteristics of the phenomena under consideration. Having been recorded by the individual researcher or captured by mechanical means, the data representing different aspects of the phenomena are often arranged in layers. The layering of information is representative of the cognitive process. Individuals tend to perceive information about the particular space they occupy by mentally processing inputs from a variety of senses, thereby building up a mental image or map of the area. The layering or thematic ordering of a particular place is thus rendered.

Other attributes of real-world phenomena are its spatial characteristics (geometry) and its temporal (time) characteristics. The definition of space is integrated with not only the cognitive processes associated with human perception, but also of cultural values as well. Culture affects the value and rendering of a conceptual map of particular place. Other factors helping to define space are found in various classical and contemporary concepts in mathematics, such as Euclidian notions of geometry and measurement. Contemporary ideas of quantum mechanics further add to the concepts of space in the environment by blurring the boundaries of Euclidean geometries. The concept of space in models representing real-world phenomena are also conceptualizations of the space of data features. It has been noted that “spatial information is always related to geographic space, that is, large-scale space. This is the space beyond the human body, space that represents the surrounding geographic world. Within such space, we constantly move around, we navigate in it, and we conceptualize it in different ways” (Kainz, 2004, p. 30).

The most common form of model used for representation of real-world phenomena is the map. Maps are two-dimensional depictions of a particular aspect usually rendered on paper or other print media. Maps can be general, thematic, and even topographic in nature. Statically depicted phenomena are bound within the parameters of scale and accuracy of the data captured or recorded for depiction. Map scale determines the spatial resolution of the information. The larger the scale, the more

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