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TERM PAPER
DATABASE MANAGEMENT SYSTEMS

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DBMS Requirements for Geographic Information System (GIS)

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1 Abstract

In geographic information systems (GIS) large amounts of data are stored and must be made available to multiple users. Database management systems (DBMS) were designed to facilitate storage and retrieval of large data collections. They include facilities to protect and secure data, enforce consistency of the data stored, and make data available to multiple users at the same time. These services are necessary for GIS, and GIS should therefore be built using database management systems. However, geographic information systems demand high performance and pose some very special requirements for database management. DBMS designed for commercial usage are not well suited for GIS because they cannot accommodate spatial data and cope with retrieval of map graphics. An overview of the architecture of a DBMS especially suited for spatial data handling is presented.

2 Introduction

GEOGRAPHIC INFORMATION SYSTEMS (GIS) must store large mounts of data and make them available on demand. Users have learned from their personal computer experience to demand nearly instantaneous responses even for relatively complex requests. Traditional solutions in which data are stored on disk or on magnetic tape and must be searched sequentially cannot respond fast enough to user queries and are no longer sufficient to accommodate frequent changes in the users needs. A modern GIS is expected to be able to integrate data for different topics and from different sources. The integration of multiple data sets, often visualized as multiple data layers, is expected to produce a synergistic effect and yield better information for decision making. Traditional file oriented storage cannot easily respond to this requirement either. Geographic information systems are comprised of a complex of several parts that interact. In order to build computerized GIS, we have to deal with organizational, software, and hardware problems. It must be noted that organizing the cooperation of different groups to collect data and to share the results is an especially difficult task, for which few guidelines and rules are available. Many projects fail not for technical

reasons, but for lack of organizational arrangements or because of a poor understanding of social or economic implications. Hardware problems are more easily resolved the components for storage and processing of very large amounts of data are available from various manufacturers. Prices are increasingly reasonable and the general trend is toward "zero cost hardware" (Dangermond and Morehouse, 1987). GIS software, on the other hand, is much more difficult to build than many had previously thought. The software system to manage GIS data must contain a module that provides database management system functionality. This paper deals primarily with this software component and the requirements placed on it by GIS applications.