

DATA TYPES

SPATIAL DATA

Spatial data (mapable data) of geo-referenced data is commonly characterized by the presence of two fundamental components.

- (i) The physical dimension or class i.e., the phenomena being reported.
For example : Height of the forest canopy, demographic class, rock type, regetation type details of a city etc.
- (ii) The spatial location of the phenomena
For example : Specified with reference to common coordinate system (latitude and longitude etc).

NON SPATIAL / ATTRIBUTE / A SPATIAL OR TABULAR DATA

1. There are usually data tables that contain information about the spatial components of the GIS theme. These can be numeric and/or character data such as timber type, timber volume, road size, well depth etc. The attributes are related back to the spatial features by use of unique identifiers that are stored both with the attribute tables and the features in each spatial data layer. Attributes can be either qualitative (low, medium, high income) or quantitative (actual measurements). The database allows us to manipulate information in many ways : from simple listing of attributes, sorting features by some attributes, grouping by attributes, or selecting and singling out groups by attributes.

DBMS (DATA BASE MANAGEMENT SYSTEMS)

The data bases used in GIS are most commonly relational. Nevertheless, Object Oriented data bases are progressively incorporated.

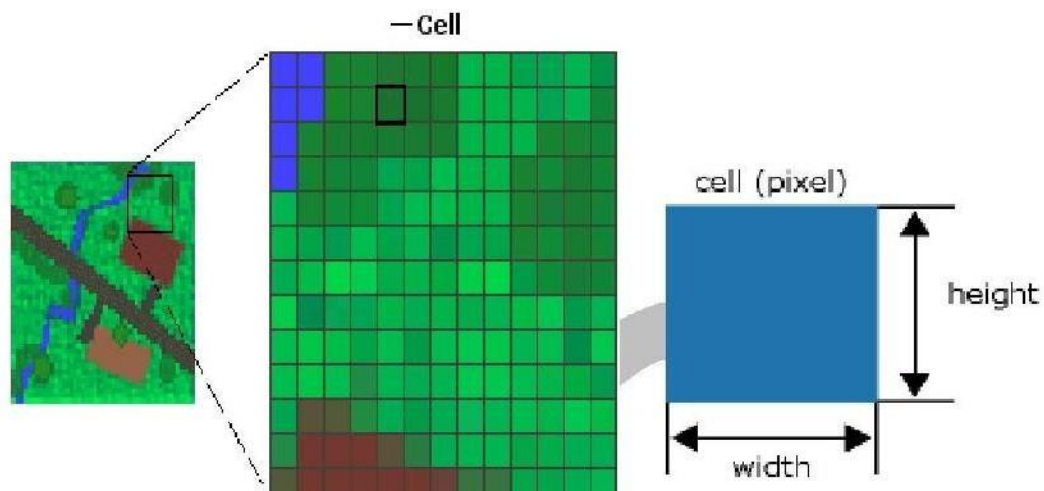


Fig 4.6 DBMS

Hierarchical database

A **hierarchical database** is a kind of database management system that links records together in a tree data structure such that each record type has only one owner, e.g. an order is owned by only one customer. Hierarchical structures were widely used in the first mainframe database management systems. However, due to their restrictions, they often cannot be used to relate structures that exist in the real world. Hierarchical relationships between different types of data can make it very easy to answer some questions, but very difficult to answer others. If one-to-many relationship is violated (e.g., a patient can have more than one physician) then the hierarchy becomes a network.

Field - smallest unit of data

Segment - groups of fields; nodes of the tree structure

Data base record - a collection of related segments; a particular tree structure
 Data base - composed of database records

Data base description - how data base records are defined; set of assembly-language macro instructions

Root - first segment

Sequence field - one field in each segment used to order the occurrences of a given type

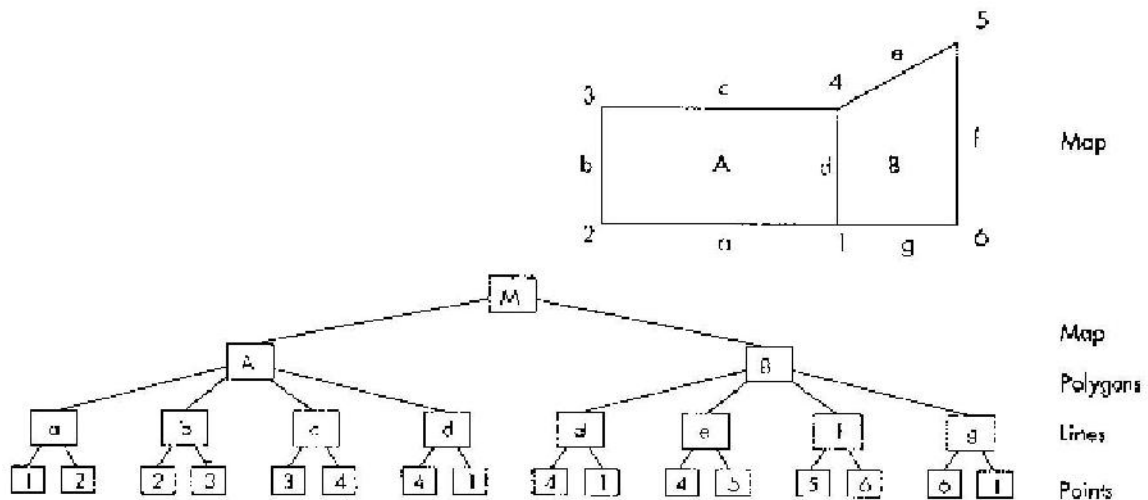


Fig 4.7 Hierarchical Data Case

NETWORK MODEL

A **network model** database management system has a more flexible structure than the hierarchical model or relational model, but pays for it in processing time and specialization of types. Some object-oriented database systems use a general network model, but most have some hierarchical limitations.

The neural network is an important modern example of a network database - a large number of similar simple processing units, analogous to neurons in the human brain, 'learn' the differences and similarities between a number of inputs.

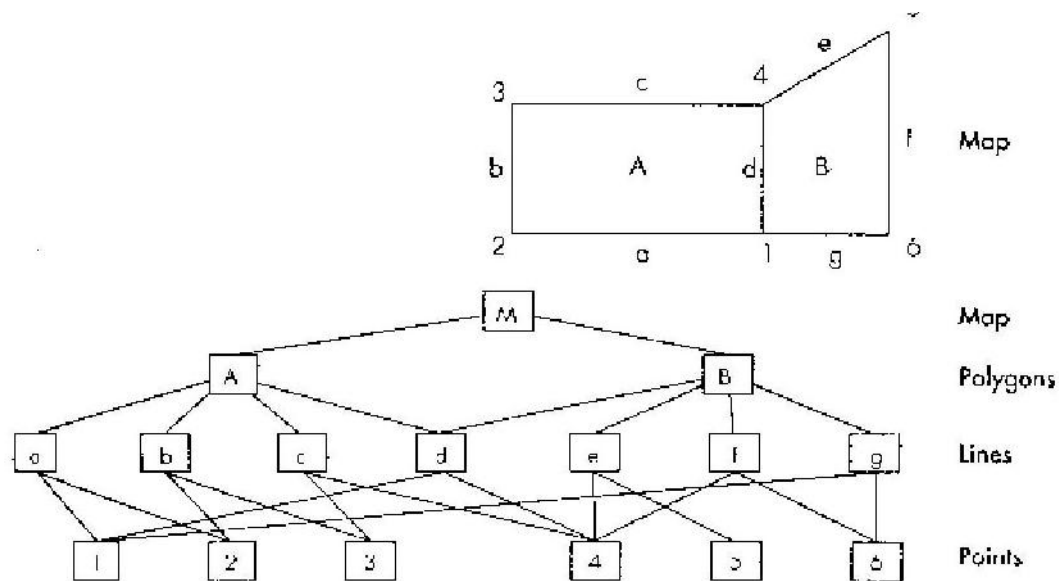


Fig 4.8 Network model

Relational data bases

In a relational data base, data is stored in tables where rows represent the objects or entities and columns the attributes or variables. A data base is usually composed of several tables and the relations between them is possible through a common identifier that is unique for each entity. Most of the relational data bases in GIS present two variables with identifiers; one of them is unique and correlative, it could be numeric or alphabetic, and the second one might be repeated and helps to organize the attribute table.

The advantages of using this kind of data base are:

The design is based in a methodology with heavy theoretical basis, which offers confidence in its capacity to evolve.

It is very easy to implement it, specially in comparison with other models such as hierarchical, network, and object oriented

It is very flexible. New tables can be appended easily.