

GIS DATA TYPES

GIS technology utilizes two basic types of data. These are:

- 1) Spatial data:** describes the absolute and relative location of geographic features.
- 2) Attribute data:** describes characteristics of the spatial features. These characteristics can be quantitative and/or qualitative in nature. Attribute data is often referred to as tabular data.

SPATIAL DATA MODELS

- 1) Vector**
- 2) Raster**
- 3) Image**

VECTOR

All spatial data models are approaches for storing the spatial location of geographic features in a database. Vector storage implies the use of vectors (directional lines) to represent a geographic feature.

RASTER

Raster data models incorporate the use of a grid-cell data structure where the geographic area is divided into cells identified by row and column. This data structure is commonly called raster.

IMAGE

Image data is most often used to represent graphic or pictorial data. The term image inherently reflects a graphic representation, and in the GIS world, differs significantly from raster data.

Advantages of vector data model

- Data can be represented at its original resolution and form without generalization.
- Graphic output is usually more aesthetically pleasing (traditional cartographic representation);
- Since most data, e.g. hard copy maps, is in vector form no data conversion is required.

- Accurate geographic location of data is maintained.
- Allows for efficient encoding of topology, and as a result more efficient operations that require topological information, e.g. proximity, network analysis.

Disadvantages of vector data model

- The location of each vertex needs to be stored explicitly.
- For effective analysis, vector data must be converted into a topological structure.
- Algorithms for manipulative and analysis functions are complex and may be processing intensive. Often, this inherently limits the functionality for large data sets, e.g. a large number of features.
- Continuous data, such as elevation data, is not effectively represented in vector form. Usually substantial data generalization or interpolation is required for these data layers.
- Spatial analysis and filtering within polygons is impossible

Advantages of raster data model

- The geographic location of each cell is implied by its position in the cell matrix. Accordingly, other than an origin point, e.g. bottom left corner, no geographic coordinates are stored.
- Due to the nature of the data storage technique data analysis is usually easy to program and quick to perform.
- The inherent nature of raster maps, e.g. one attribute maps, is ideally suited for mathematical modeling and quantitative analysis.
- Discrete data, e.g. forestry stands, is accommodated equally well as continuous data, e.g. elevation data, and facilitates the integrating of the two data types.
- Grid-cell systems are very compatible with raster-based output devices, e.g. electrostatic plotters, graphic terminals.

Disadvantages of raster data model

- The cell size determines the resolution at which the data is represented.
- It is especially difficult to adequately represent linear features depending on the cell resolution. Accordingly, network linkages are difficult to establish.
- Processing of associated attribute data may be cumbersome if large amounts of data exists. Raster maps inherently reflect only one attribute or characteristic for an area.
- Since most input data is in vector form, data must undergo vector-to-raster conversion. Besides increased processing requirements this may introduce data integrity concerns due to generalization and choice of inappropriate cell size.
- Most output maps from grid-cell systems do not conform to high-quality cartographic needs.