Chapter : 6

Spatial Information Technology

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1. Choose the right answer from the four alternatives given below

(i). The spatial data are characterised by the following forms of appearance:
(a) Positional
(b) Linear
(c) Areal
(d) All the above forms.

Answer: (b) Linear

(ii). Which one of the following operations requires analysis module software?
(a) Data storage
(b) Data display
(c) Data output
(d) Buffering

Answer: (d) Buffering

(iii). Which one of the following is disadvantage of Raster data format?
(a) Simple data structure.
(b) Easy and efficient overlaying.
(c) Compatible with remote sensing imagery.
(d) Difficult network analysis.

Answer: (d) Difficult network analysis.

(iv). Which one of the following is an advantage of Vector data format?
(a) Complex data structure.
(b) Difficult overlay operations.
(c) Lack of compatibility with remote sensing data.
(d) Compact data structure

Answer: (d) Compact data structure

(v). Urban change detection is effectively undertaken in GIS core using:
(a) Overlay operations

(b) Proximity analysis
(c) Network analysis
(d) Buffering

Answer: (b) Proximity analysis

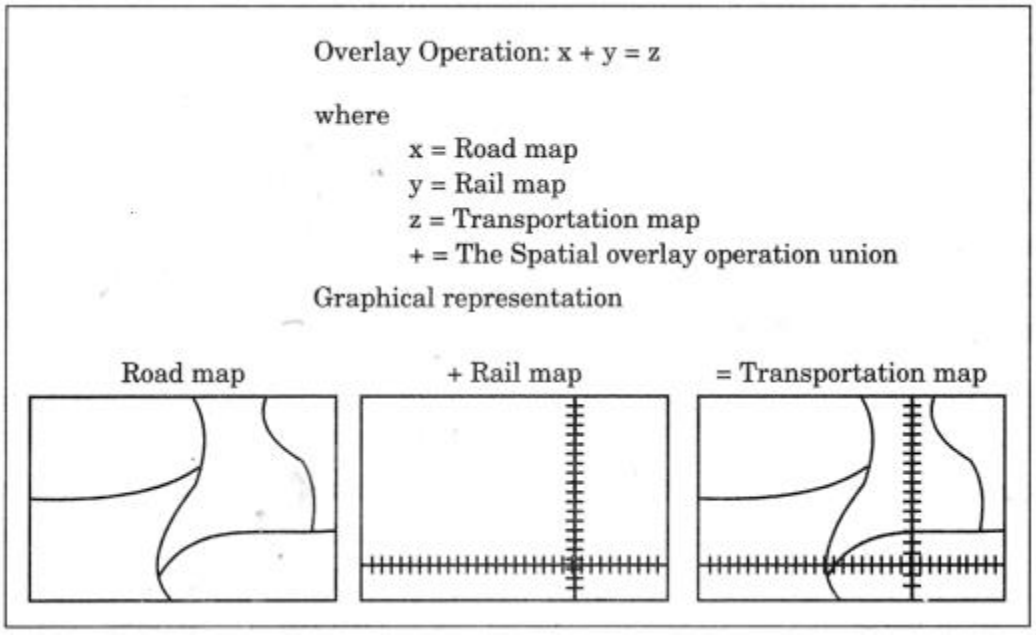
2. Answer the following questions in about 30 words:

(i). Differentiate between raster and vector data models.

Answer: Raster data represents a graphic feature as a pattern of grids of squares, whereas vector data represents the object as a set of lines drawn between specific points.

(ii). What is an overlay analysis?

Answer: Overlay Analysis Operations is the hallmark of GIS. An integration of multiple layers of maps using overlay operations is an important analysis function. In other words, GIS makes it possible to overlay two or more thematic layers of maps of the same area to obtain a new map layer similar to the sieve mapping, i.e. the overlaying of tracing of maps on a light table to make comparisons and obtain an output map.



(iii). What are the advantages of GIS over manual methods?

Answer: GIS possesses inherent advantages of separate data storage and presentation.

It also provides options for viewing and presenting the data in several ways.

The important advantages of GIS are given below:

- Users can interrogate displayed spatial features and retrieve associated attribute information for analysis.
- Maps can be drawn by querying or analysing attribute data.
- Spatial operations (Polygon overlay or Buffering) can be applied on integrated database to generate new sets of information.
- Different items of attribute data can be associated with one another through shared location code.

(iv). What are important components of GIS?

Answer: The important components of a Geographical Information System include the following:

- Hardware
- Software
- Data
- People
- Process

The different components of GIS are shown in figure given below:

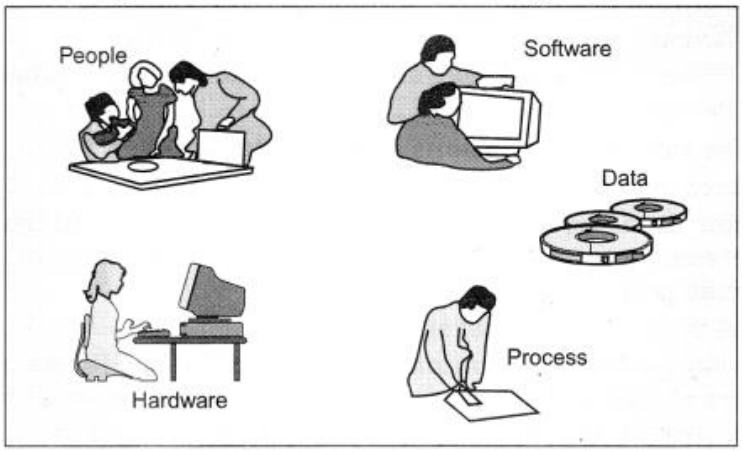


Fig. Basic Components of GIS

(v). What are different ways in which spatial data is built in GIS core?

Answer: Spatial Data Input is the spatial database into a GIS. It can be created from a variety of sources. These could be summarised into the following two categories:

1. Acquiring digital data sets from Data Suppliers: The present day data supplies make the digital data readily available, which range from small-scale maps to the large-scale plans. For many local governments and private organisations, such data form an essential source and keep such groups of users free from overheads of digitising or collecting their own data.

2. Creating digital data sets by manual input: The manual input of data to a GIS involves four main stages.

    - Entering the spatial data.
    - Entering the attribute data.
    - Spatial and attribute data verification and editing.
    - Where necessary, linking the spatial to the attribute data.

(vi). What is Spatial Information Technology?

Answer: It refers to the features arid the phenomena distributed over a geographically definable space, thus, having physically measurable dimensions. In other words, the Spatial Information Technology relates to the use of the technological inputs in collecting, storing, retrieving, displaying, manipulating, managing and analysing the spatial information.

3. Answer the following questions in about 125 words:

(i). Differentiate between raster and vector data formats. Give example.

Answer:

Basis	Raster Data Format	Vector Data Format
Meaning	Raster data format represents a graphic feature as a pattern of grids of squares.	Vector data represents the object as a set of lines drawn between specific points.

Suitability	The Raster file formats are most often used for the following activities: • For digital representations of aerial photographs, satellite images, scanned paper maps, etc. • When costs need to be kept down. • When the map does not require analysis of individual map features. • When backdrop' maps are required.	The Vector files are most often used for: • Highly precise applications • When file sizes are important. • When individual m; features require analysis. • When descriptive information must be stored.
Advantages	• Simple data structure • Easy and efficient overlaying • Compatible with satellite imagery • High spatial variability is efficiently represented • Simple for own programming • Same grid cells for several attributes	• Compact data structure • Efficient for network analysis • Efficient projection transformation • Accurate map output
Disadvantages	• Inefficient use of computer storage • Errors in perimeter and shape	• Complex data structure • Difficult overlay operations

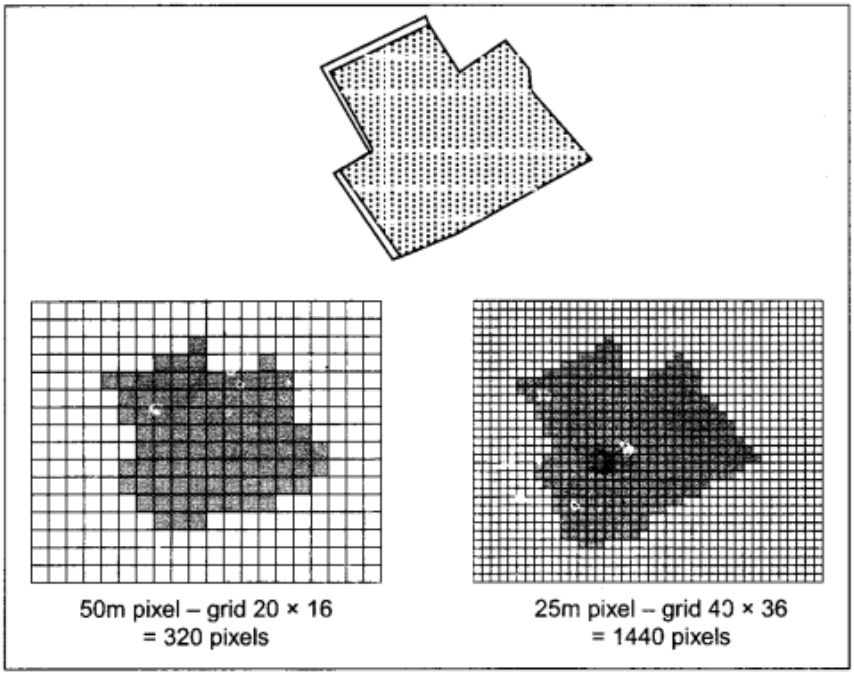


Fig. Effect of Grid Size on Data in Raster Format

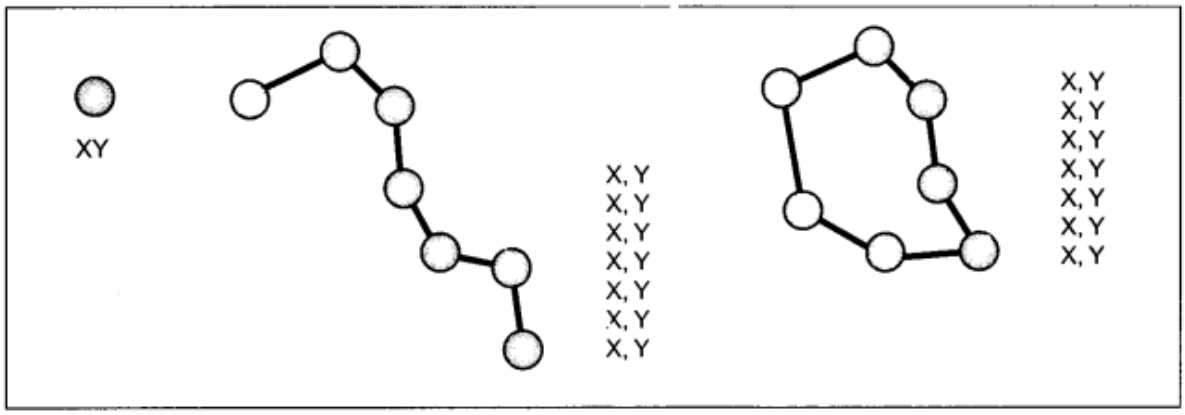


Fig. The Vector Data Model is based around Coordinate Pairs

(ii). Write an explanatory account of the sequence of activities involved in GIS related work.

Answer: The following sequence of the activities are involved in GIS related work—
1. Spatial data input: Under this data that are collected from different people are tested and it is checked whether they are as per suitability of investigator or not.

2. Entering of the attribute data: Attribute data define the properties of a spatial entity that need to be handled in the GIS, but which are not spatial. For example, a road may be captured as a set of contiguous pixels or as a line entity and represented in the spatial part of the GIS by a certain colour, symbol or data location.

3. Data verification and editing: The spatial data captured into a GIS require verification for the error identification and corrections so as to ensure the data accuracy. The errors caused during digitisation may include data omissions, and under/over shoots. The best way to check for errors in the spatial data is to produce a computer plot or print of the data, preferably on translucent sheet, at the same scale as the original. The two maps may then be placed over each other on a light table and compared visually, working systematically from left to right and top to bottom of the map. Missing data and locational errors should be clearly marked on the printout.

4. Spatial and attribute data linkages: The linkages of spatial and the attribute data are important in GIS. It must, therefore, carefully be undertaken. Linking of attribute data with a non-related spatial data shall lead to chaos in ultimate data analysis. Similarly, matching of one data layer with another is also significant.

5. Spatial analysis: The objective of geographic analysis is to transform data into useful information to satisfy the requirements of the decision-makers. It requires step-by-step procedures to arrive at the conclusion. The following spatial analysis operation may be undertaken using GIS:

- Overlay analysis
- Buffer analysis
- Network analysis
- Digital terrain model