

# PHYSICS PRACTICAL SHEETS

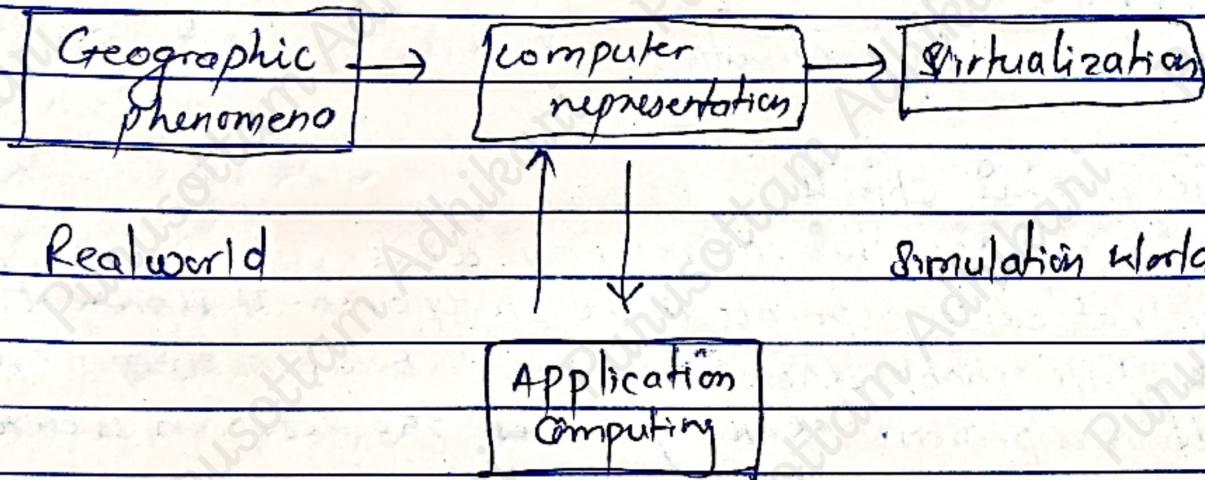
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Chapter 3

1. What is Geographic phenomena? Describe with its types.



Geographic phenomena exist in real world. It is the events that take place in geographic space and time. It is defined as something which is of interest in GIS application that have following characteristics :-

- (i) It can be named or described
  - (ii) It can be geo-referenced
  - (iii) It can be assigned a time interval at which it is present
- It implies the computerized representation of the geographic data. The representation is based on types of available data and type of data manipulation needed.

e.g. consider a water mngt system. The object of study can be River, ground water level, irrigation level and soon. These objects can be named geo-referenced and provided with time interval at which they exist. So these objects are termed as geographic phenomena.

Types of geographic phenomena

- (i) Geographic fields
- (ii) Geographic objects

Geographic field:-

It is a geographic phenomena whose value at every point in the study area can be determined. If  $(x,y)$  represents the study area then  $f(x,y)$  represents the value of geographic field at that point. It can be discrete or continuous. Changes in the field is gradual. Continuous field can be differentiated. The natural geographic phenomena are generally geographic fields eg temperature, elevation.

Geographic objects :-

It is a geographic phenomena whose value is determined only at certain points in the study area. It represents well distinguishable discrete entities. In between geographic objects there is presence of empty spaces. The position is determined by combination of one or more parameter such as location, shape, size and orientation. Artificial geographic phenomena are generally geographic objects eg building, road.

d. Write advantage and disadvantage of Raster data model.

Raster model makes use of raster data. It is based on pixels and consists of a regular grid structure of rows and columns. This model attempts to divide the real world into a regular grid of identically shaped cells.

Advantage:-

- ① Better for storing image data
- ② A powerful format for statistical and spatial analysis.
- ③ easy and efficient overlaying
- iv) simple data storage structure
- v) same grid cells for several attributes

Disadvantages ① Dataset can be large, storage space can be problem

- ② N/w analysis is difficult
- iii) loss of info when using large cells
- iv) insufficient projection transformation
- v) difficult in a representation of topology connections.

3. Write down advantage and disadvantage of vector data model.

vector is based on objects like point, line and area.  
every point has a unique location. An object shape is represented by dots which are located at location column shape of object changes. Resolution is independent of details present.

#### Advantages

- (i) compact data structure - need less space for storing data
- (ii) Accurate Graphic output
- (iii) Since most information eg printed version maps are in vector form no data conversion is required.
- (iv) Exact geographic location of data is maintained
- (v) Easily make a connection between topology and now, efficient for now analysis.

#### Disadvantages

- (i) location of each vertex needs to be stored explicitly
- (ii) It has a complex data structure
- (iii) difficult overlay operations.
- (iv) high spatial variability is inefficiently represented
- (v) spatial analysis and filtering within polygons are impossible.

4. Explain the concept of spatial relationships and topology.

Topology deals with spatial properties that do not change under certain transformation. A simple example will illustrate what we mean. Assume you have some features that are drawn on sheet of rubber. Now fold the sheet and pull on its edge, but do not tear or break it. The feature will change in shape and size. But some properties however do not change.

Topology refers to the spatial relationships between geographic element in data set that do not change

under continuous transformation. These relationships are invariant under continuous transformations such properties are called topological properties and the transformation is called a topological mapping.

5. How can you convert data in GIS.

Mechanism for converting GIS data from one format to another and is standard functionality in GIS package.

Two types of conversion

(i) Rasterization

(ii) vectorization

Rasterization:- conversion of vector data into Raster and is simple conversion method.

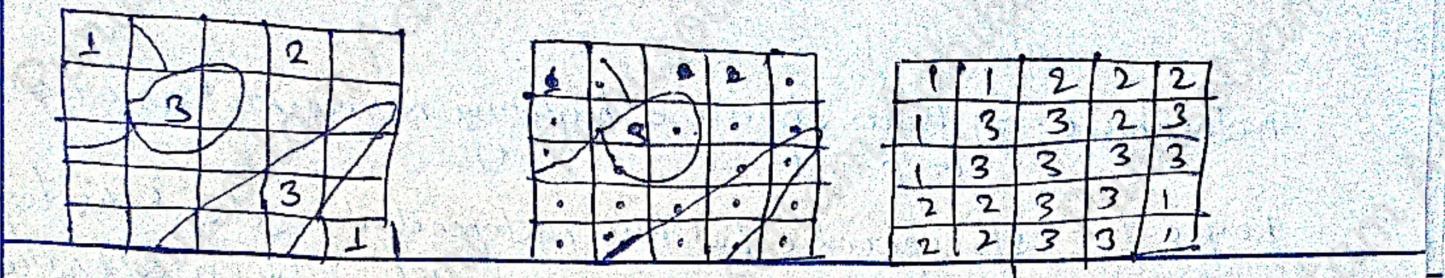
Basic steps:-

- (i) Set up a raster with a specified cell size to cover area extent of vector data and assign value as 0 initially
- (ii) changes value of cell corresponds to its entity 1 for point, 2 for line and 3 for polygon
- (iii) Fills interior of entity outline with entity value.

Formula for place coordinate define rules

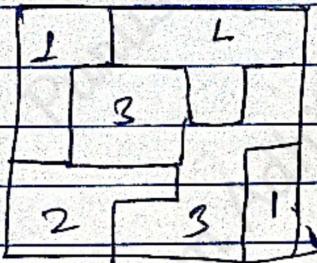
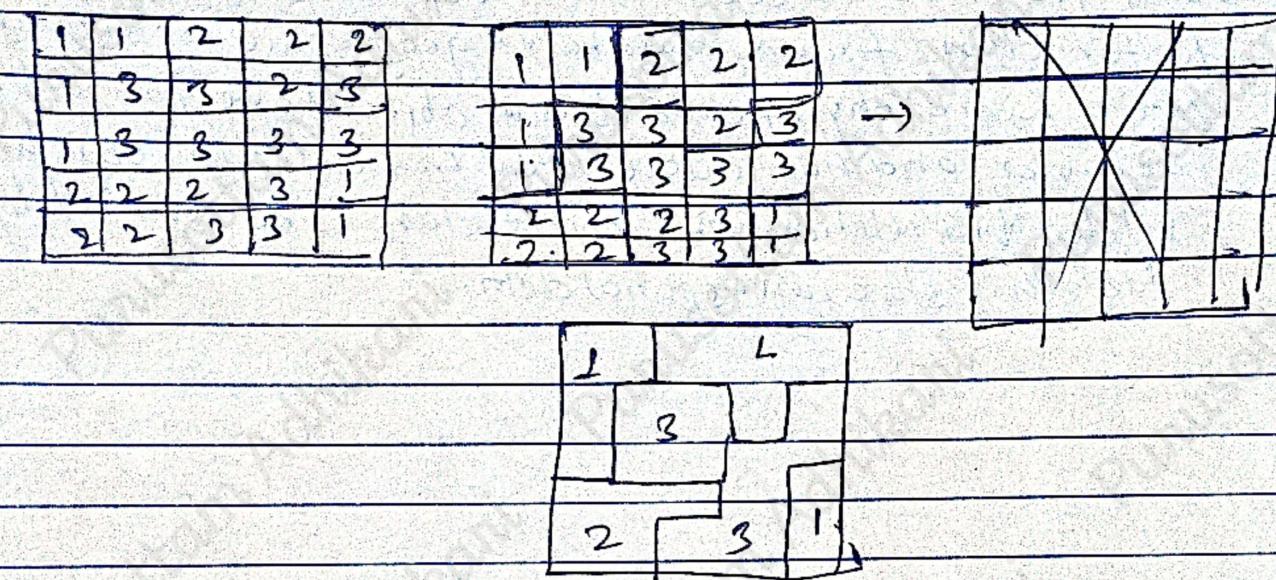
$$\text{col no} = (X - X_{\min}) / (X_{\max} - X_{\min}) N$$

$$\text{Row no} = (Y - Y_{\min}) / (Y_{\max} - Y_{\min}) N$$



Vectorization :- conversion of raster data to vector.

3 basis elements : line extraction, linethinning, Topological reconstructer



6. How can you design spatial database with geo-database.

A spatial database system may be defined as a database system that offers spatial datatypes in its data model and query language and support to spatial datatypes in its implementation providing at least spatial indexing and spatial join methods. A spatial database includes collections of information about spatial location, relationship and shape of topological geographic features and data in the form of attributes.

Step to design :-

(1) conceptual :- s/w & h/w independent, describes and defines included entities, identifies how entities will be represented

in database. e.g. house should a building represented as an area or point.

logical:- s/w specific but h/w independent, set out the logical structure of db element, determined by dbms used by s/w

Physical:- both h/w & s/w specific, requires consideration of how files will be structured for access from disk.

using geo database we includes objects and class, feature & feature class, feature database, geographic data is arranged into a hierarchy of data objects. Object have properties & behavior and has unique, dentifice cell ID. Objects are related via relationships. object class is represented by table that store non-spatial data.

## 7. Differences between Raster and vector data model.

### Raster

- i) Types of spatial data that consists of a matrix of cells organized into rows and columns in which each cell represent specific information
- ii) continuous data
- iii) Represent data in cells or in a grid matrix
- iv) simple data
- v) more space to store data
- vi) N/w analysis is difficult

### vector

- i) Types of spatial data used for storing data that has discrete boundaries
- ii) discrete data
- iii) Represents data using sequential points or vertices
- iv) complex data
- v) less space to store data
- vi) N/w analysis is easy

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