

Geographic Information System (GIS) - Exam Notes

GIS Exam Notes

VECTOR DATA MODEL STRUCTURES

1. Object-Based Vector Data Model:

- Represents spatial data as objects with geometry (points, lines, polygons) and attributes.
- Stores both spatial and non-spatial (attribute) data together.

2. Spaghetti Data Model (Non-Topological):

- Simple, natural way to store features as separate X, Y coordinate lists.
- No shared boundaries or spatial relationships.
- Each point, line, or polygon is an independent feature.
- Pros: Easy to implement, useful in cartography.
- Cons: Redundant data, difficult for spatial analysis, lacks topology.

3. Topological Data Model:

- Stores spatial relationships using rules like:
 - a. Arc-Node: Lines (arcs) connect nodes (start and end points).
 - b. Polygon-Arc: Polygons are formed from connected arcs.
 - c. Contiguity: Adjacent polygons share boundaries.
- Reduces redundancy, supports analysis like adjacency and connectivity.

RASTER DATA MODEL

1. Raster Structure:

- Divides space into grid of rows and columns (cells).
- Cells represent values for surfaces (elevation, land use, etc.).

2. Raster Data Compression:

a. Run Length Coding:

- Stores repeating pixel values as (length, value) pairs.

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- Useful due to spatial autocorrelation (nearby cells have similar values).

b. Quad Tree Coding:

- Divides raster into quadrants until all cells in a quadrant have the same value.

3. Object-Based Raster Model:

- Stores spatial and attribute data in one system.
- Each spatial object has attributes and methods (like in OOP).

TIN AND GRID DATA MODELS

1. TIN (Triangulated Irregular Network):

- Represents terrain with triangles formed between irregularly spaced points.
- Higher resolution in complex terrain.
- Applications: DEMs, DSMs, DTMs, CAD, hydrology, urban planning.

2. GRID Data Model:

- Regular grid of equally-sized cells.
- Each cell has a value (elevation, land cover, etc.).
- Best for uniform terrain and large datasets.

TIN vs GRID Comparison:

- Structure: TIN = triangles, GRID = fixed square cells.
- Resolution: TIN = variable, GRID = fixed.
- TIN better for detailed terrain; GRID better for continuous surfaces like weather or elevation.

REFERENCE:

- In India, MSL (Mean Sea Level) is based at Mumbai.