GEOGRAPHICAL INFORMATION SYSTEM (GIS)

3-0-2-0-11

Introduction: What is GIS? Applications of GIS, Examples of use cases, Components of GIS, Brief History of GIS, Elements of GIS: Geospatial data, Data acquisition, data management, data display, data exploration and data analysis; Future of GIS. Geospatial data; data types: Spatial and non-Spatial, Vector and Raster data types; Elements of raster and vector data types; vector and raster data models and encoding; advantages and disadvantages of raster data model; advantages and disadvantages of vector data model; Integration of raster and vector data models in GIS; Geo-referencing; Transformation models using GCPs; accuracy analysis; Resampling: Nearest Neighbour, Bilinear, Bicubic; Advantages and Disadvantages of each resampling approach; Map to Image registration, Image to Image registration. Geospatial data acquisition: raster data and vector data acquisition; Metadata; Importing data in GIS; Raster to vector data conversion (digitization): Manual approach, Semi-automatic approach, Automatic approach, Errors in digitization: Topological errors; rasterization of data; Management of attribute data. Coordinate reference systems, Projection Systems and Coordinate Transformations. Database models: Flat, Hierarchical, Network, Relational, Georelational (Shape file and coverage); Primary and Foreign Key; Database Normalization and rules; Relationships in database: One to one, one to many, many to one, many to many; Joins and Relates; Hybrid Data model (Geodatabase); SQL: Language structure, queries by attribute, queries by geography. Spatial interpolation: multi-linear regression, density map, Delaunay Triangulation and Theissen polygons, Kriging. Vector data operations: Buffering and Overlay, Raster data operations: Display, Local operations, Reclassification, Overlay, Neighbourhood operations, Zonal operations, Global operations. Least cost path analysis, Network analysis, Viewshed and Watershed analysis, Geocoding