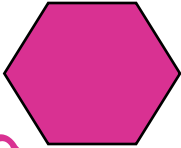


GIS

Management 

(Basic concepts of Geographic Information Systems)

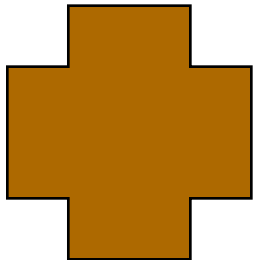
Prof. Prafulla Kumar Panda

Centurion University of Technology and Management

Contact:9438269572

E-mail: prafullapanda@cutm.ac.in

Analysis



Centurion
UNIVERSITY

Decisions

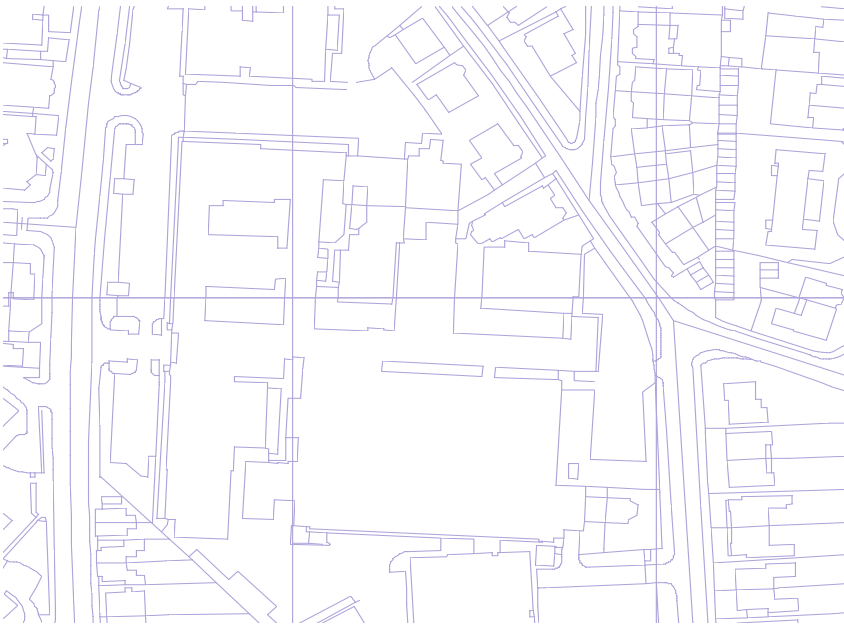


Characteristics of spatial data

- **Location**

- **Description:** Kingston
University, Penrhyn Road Centre
- **Post Code:** KT1 2EE
- **Grid Reference:** 518106.72 168530.37
- **Latitude/Longitude:** 0° 21' 55.38"W, 49° 36' 17.62"N

Characteristics of spatial data



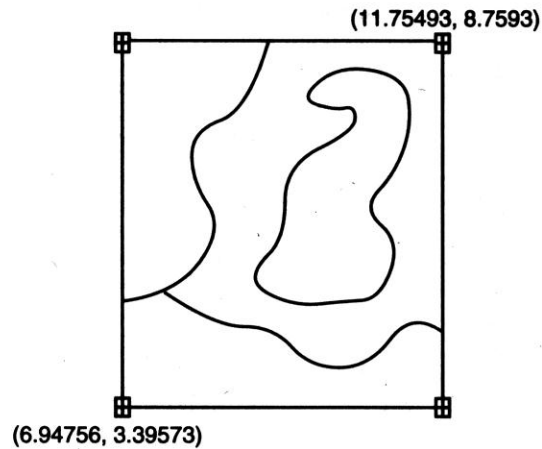
Geometry

- The shape of a building or county
- The course of a river, the route of a road
- The shape of the landscape, relief

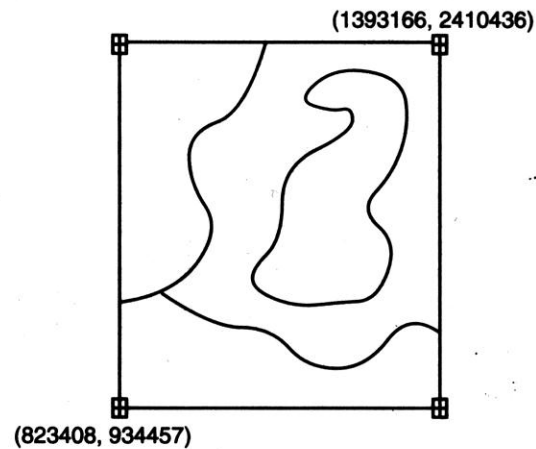
Geo-referencing data

- Capturing data
 - Scanning: all of map converted into raster data
 - Digitising: individual features selected from map as points, lines or polygons
- Geo-referencing
 - Initial scanning digitising gives co-ordinates in inches from bottom left corner of digitiser/scanner
 - Real-world co-ordinates are found for four registration points on the captured data
 - These are used to convert the entire map into a real-world co-ordinate system

Example of geo-referencing



After TRANSFORM
(coverage in real-world coordinates)

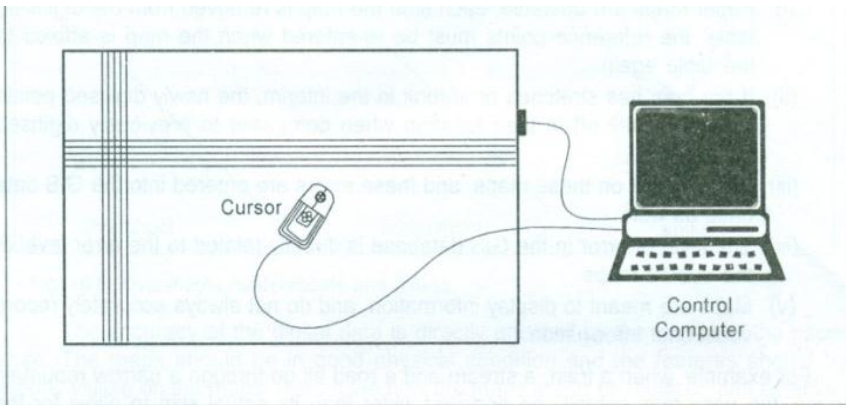


Source: ESRI (1997)



Digitizing

- Tablet digitizing



- Heads-up digitizing

Often “drawing” features over an orthophoto base

Examples of Applied GIS

- **Urban Planning, Management & Policy**
 - Zoning, subdivision planning
 - Land acquisition
 - Economic development
 - Code enforcement
 - Housing renovation programs
 - Emergency response
 - Crime analysis
 - Tax assessment
- **Environmental Sciences**
 - Monitoring environmental risk
 - Modeling stormwater runoff
 - Management of watersheds, floodplains, wetlands, forests, aquifers
 - Environmental Impact Analysis
 - Hazardous or toxic facility siting
 - Groundwater modeling and contamination tracking
- **Political Science**
 - Redistricting
 - Analysis of election results
 - Predictive modeling
- **Civil Engineering/Utility**
 - Locating underground facilities
 - Designing alignment for freeways, transit
 - Coordination of infrastructure maintenance
- **Business**
 - Demographic Analysis
 - Market Penetration/ Share Analysis
 - Site Selection
- **Education Administration**
 - Attendance Area Maintenance
 - Enrollment Projections
 - School Bus Routing
- **Real Estate**
 - Neighborhood land prices
 - Traffic Impact Analysis
 - Determination of Highest and Best Use
- **Health Care**
 - Epidemiology
 - Needs Analysis
 - Service Inventory

What GIS Applications Do:

manage, analyze, communicate

- make possible the **automation** of activities involving geographic data
 - map production
 - calculation of areas, distances, route lengths
 - measurement of slope, aspect, viewshed
 - logistics: route planning, vehicle tracking, traffic management
- allow for the **integration** of data hitherto confined to independent domains (e.g property maps and air photos).
- by tying data to maps, permits the succinct **communication of complex spatial patterns** (e.g environmental sensitivity).
- perform complex **spatial modelling** (*what if* scenarios for transportation planning, disaster planning, resource management, utility design)

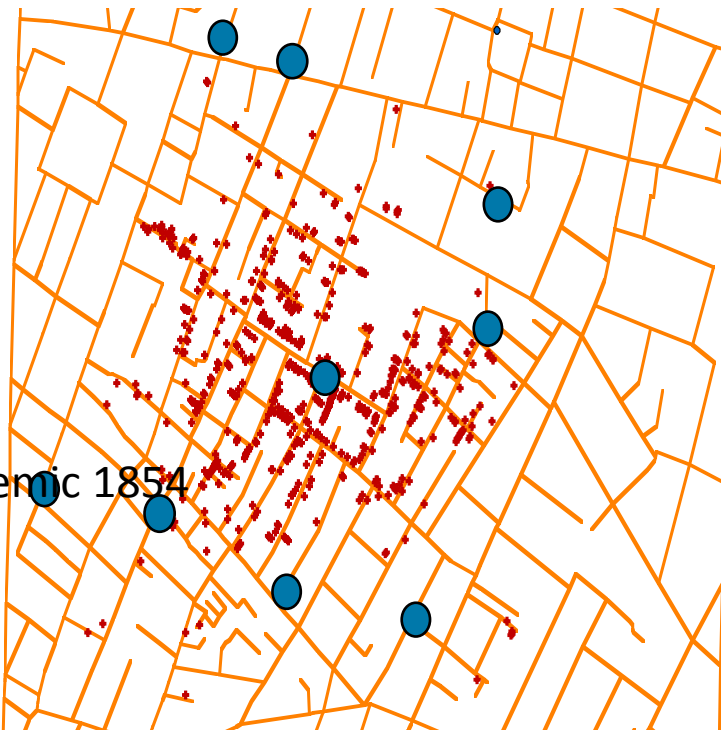
BENEFITS OF GIS

- Improves/enhances the effects of physical/environmental growth
- Higher quality analysis
- Better management of resources /Better information management
- adding new value-added services
- Perform analysis on spatial and non spatial components
- Fast recall of data
- Ability for complex analysis
- Ability to carry out “what if?” scenarios
- Recalling of non spatial data through object location
- Display of information in a different light/view
- Multiple scenario in planning can be performed easily

Why GIS is unique?

- GIS handles SPATIAL information
 - Information referenced by its location in space
- GIS makes connections between activities based on spatial proximity

GIS concepts are not new!

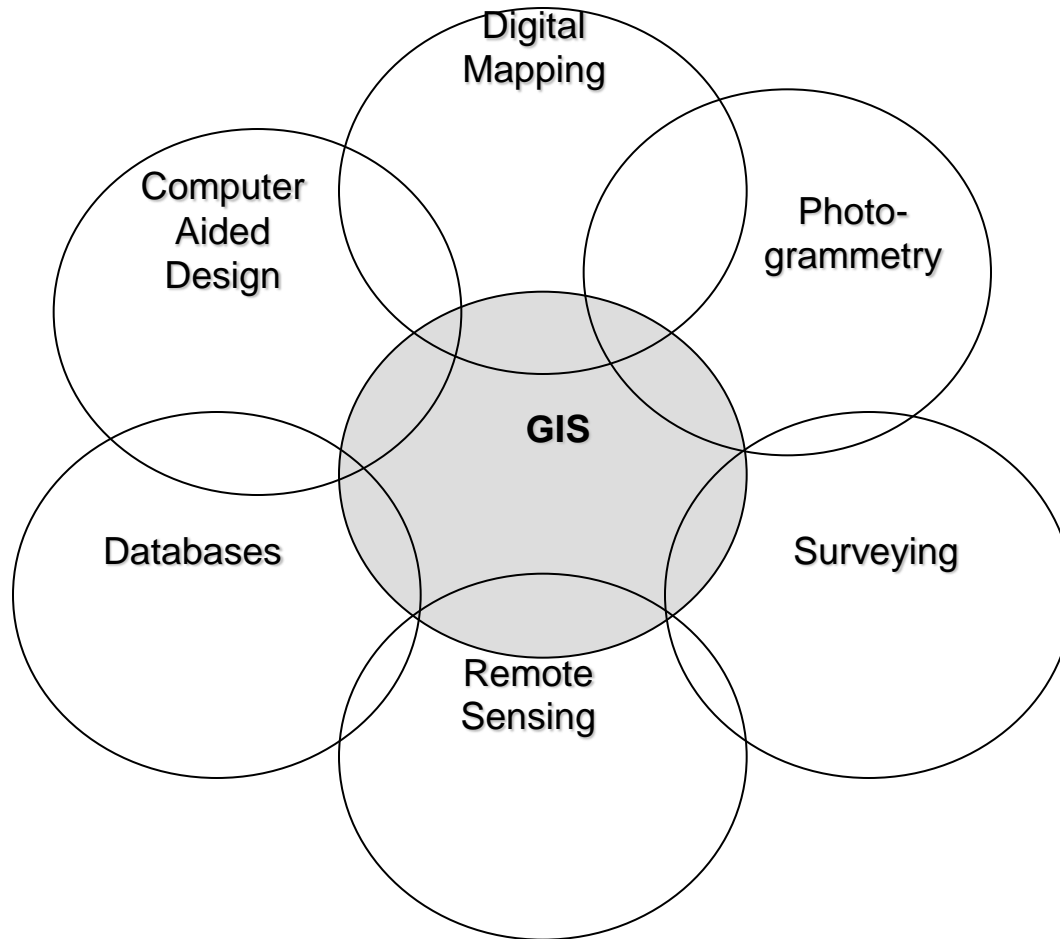


Soho

+ Cholera death

● Water pump

London cholera epidemic 1854



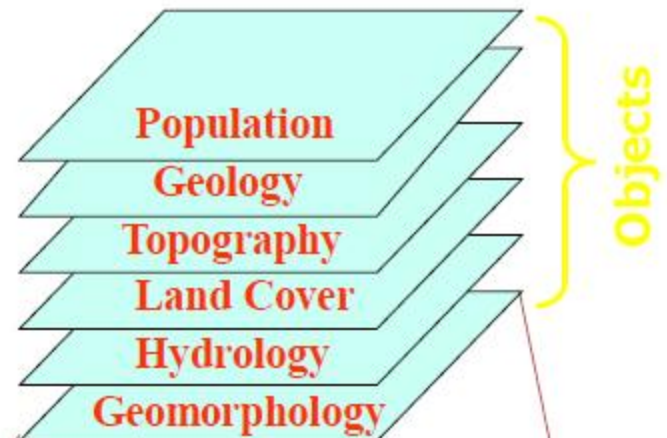
Cross-disciplinary nature of GIS

Spatio-temporal perspectives

- “Information” Science for spatio-temporal phenomenon
- **Empirical**– capture the spatio-temporal properties of lakes, cities, forests etc as accurately as possible
- **Formal**– based on properties of lines, points, area as pixels and on the constraints of the digital representation
- **Experimental**– using devices to convert graphics and other computer generated signs back into expert geographical understanding

Spatial Representation

The real world consists of many geographic entities which can be represented as a number of data layers



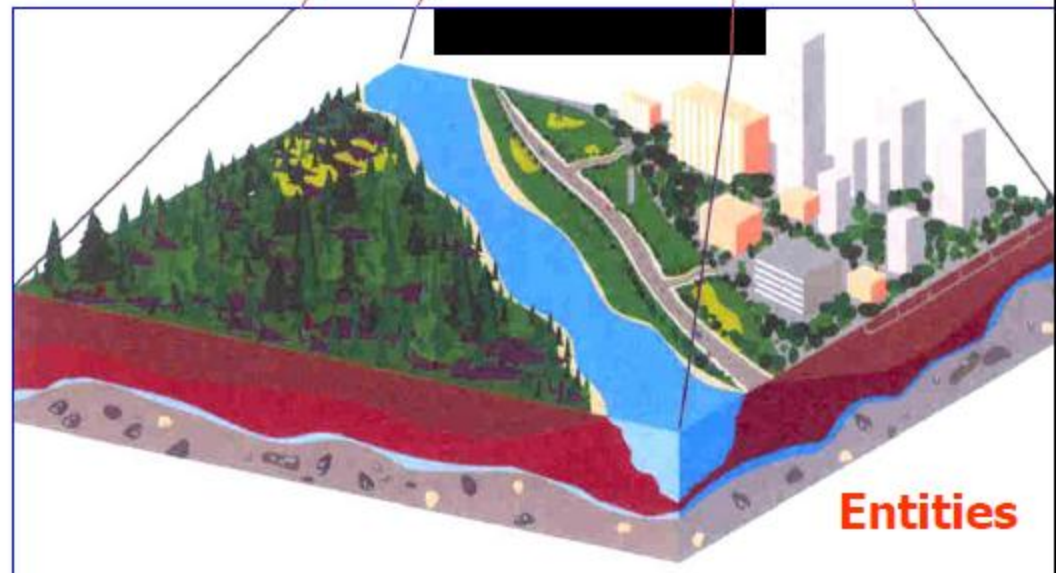
What is to be represented?

'Entities' vs. 'Objects'

Entities – things in real world

Objects – things in digital world

Digital objects and associated attributes and values represent geographical entities



Data input and verification

- **Entering spatial data**

- Manual input to a vector system

- Manual input to a grid system

- Digitizing

- Automated scanning

- **Entering the non-spatial associated attributes**

- **Linking spatial and non-spatial data**

- Special programs

- Procedures

- **Format conversion**

- **Data reduction and generalization**

- **Error detection and editing**

- **Merging of points into lines and lines into polygons**

- **Edge matching**

- **Rectification/registration**

- **Interpolation**

- **Photo-interpretation**