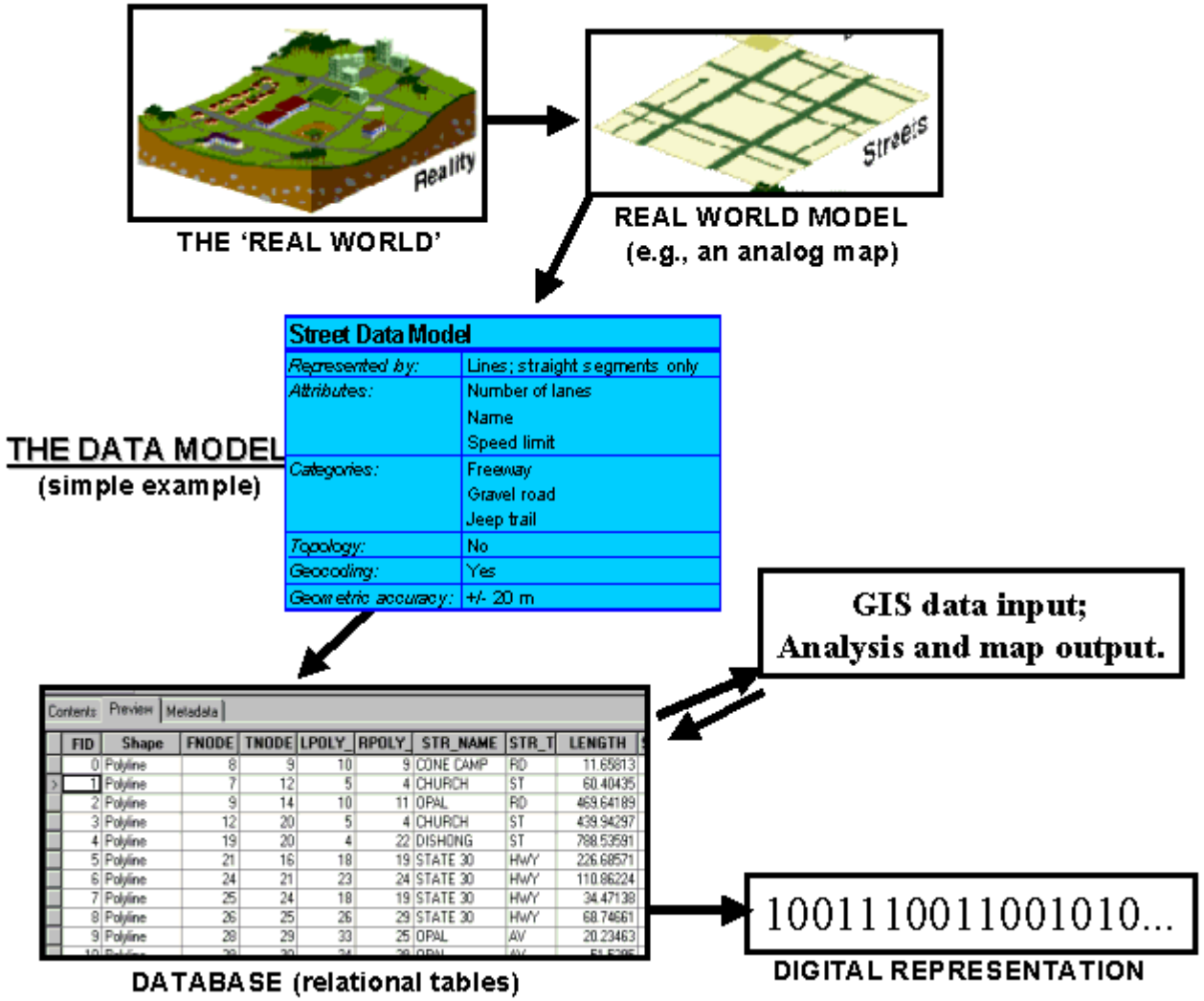
DATA MODELING

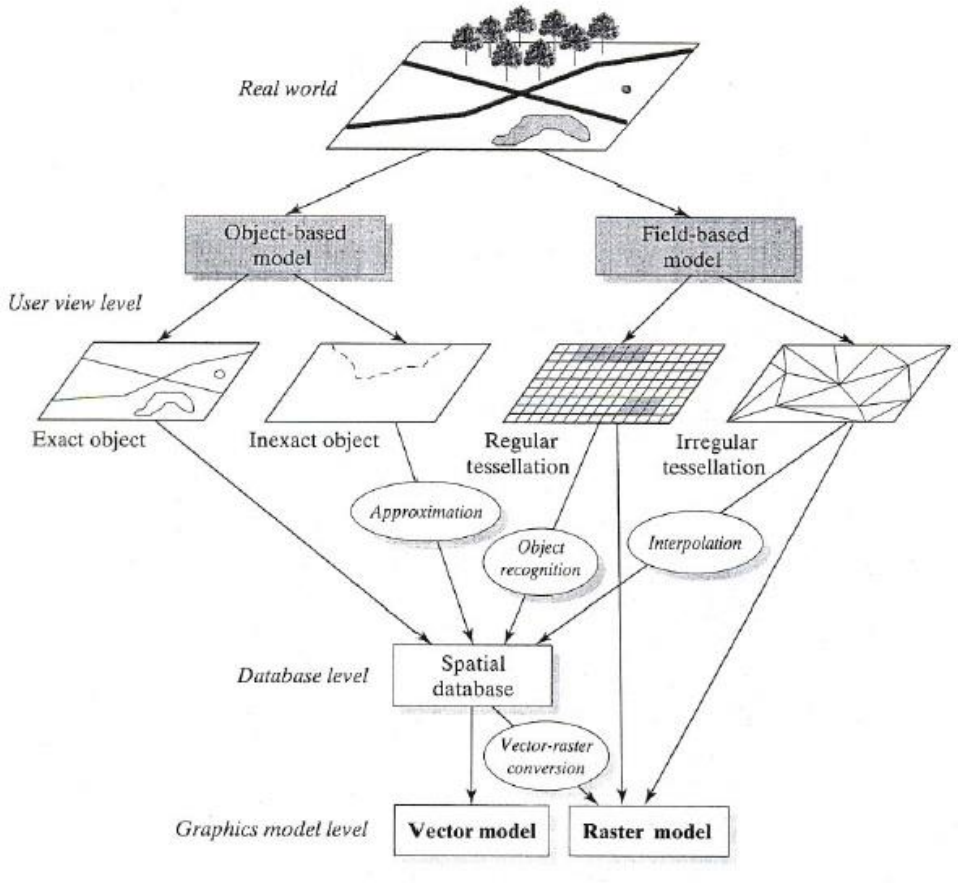
Data Abstraction from human oriented to computer oriented.

- Real World
- Conceptual Data Model
- Data Structure
- File/Database Structure



CONCEPTUAL DATA MODEL

- Object or Entity based
  - Collection of discrete objects with spatial reference : building, tree, river, ...
  - Vector Data Model
- Field based
  - Geographic phenomena that vary continuously throughout space example elevation, temperature, soil pH
  - Raster Data Model

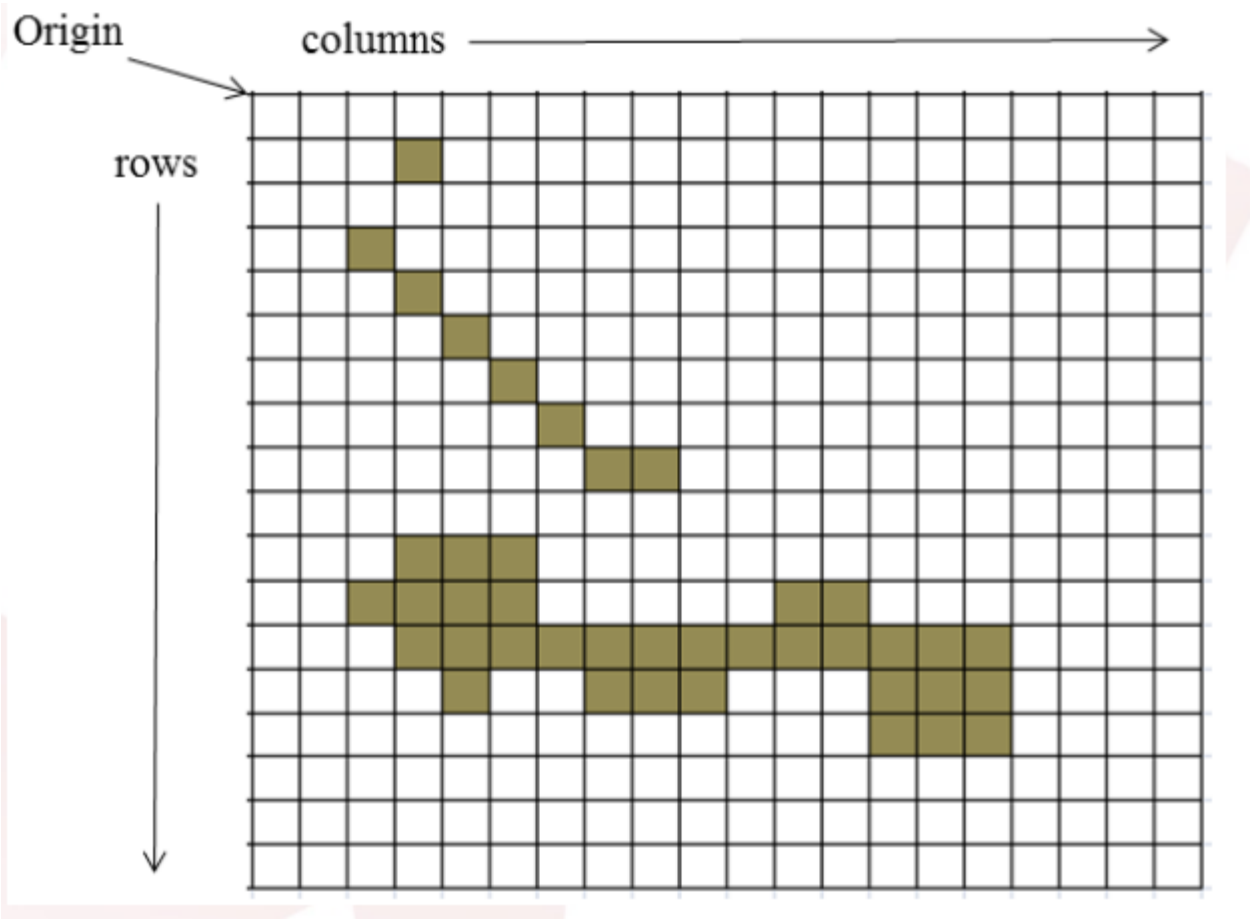


RASTER DATA MODEL

One model for representing geographic space.

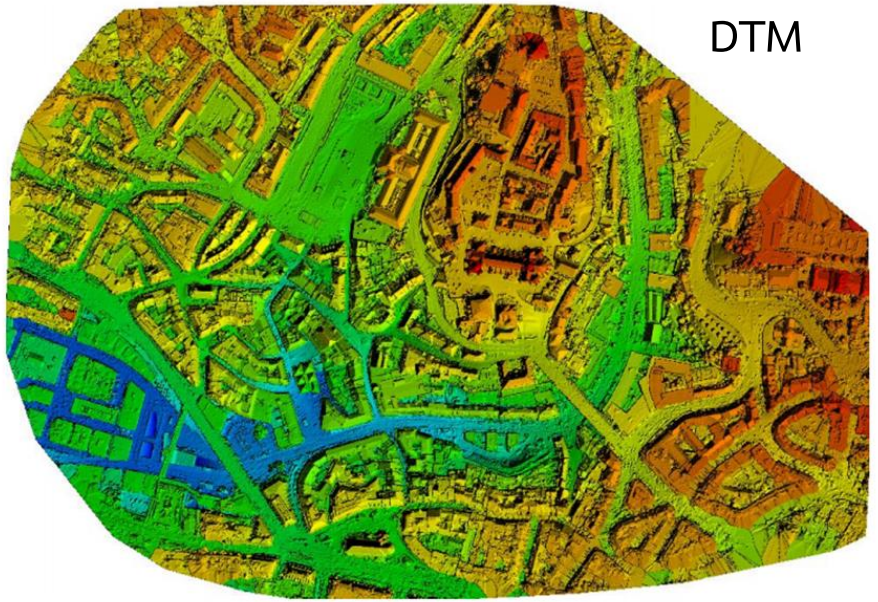
Consist of a matrix of homogenous grid cells and georeferencing with cartesian coordinate of the top left of grid cell and its grid size.

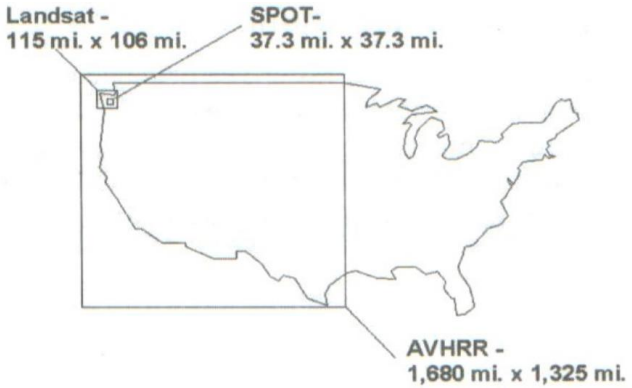
Raster Data Sources : Satellite imagery, Digital Elevation Model, Aerial photograph



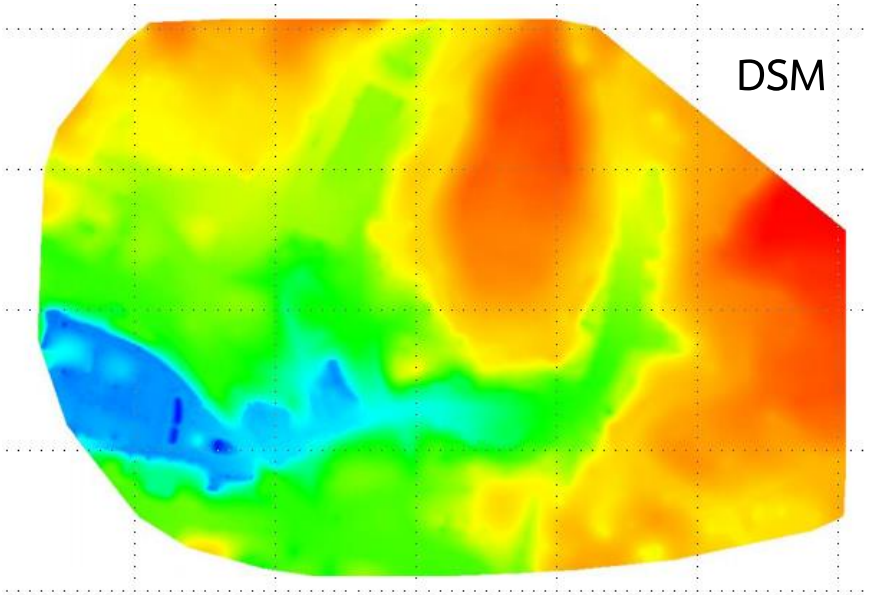
RASTER DATA SOURCE

Aerial image





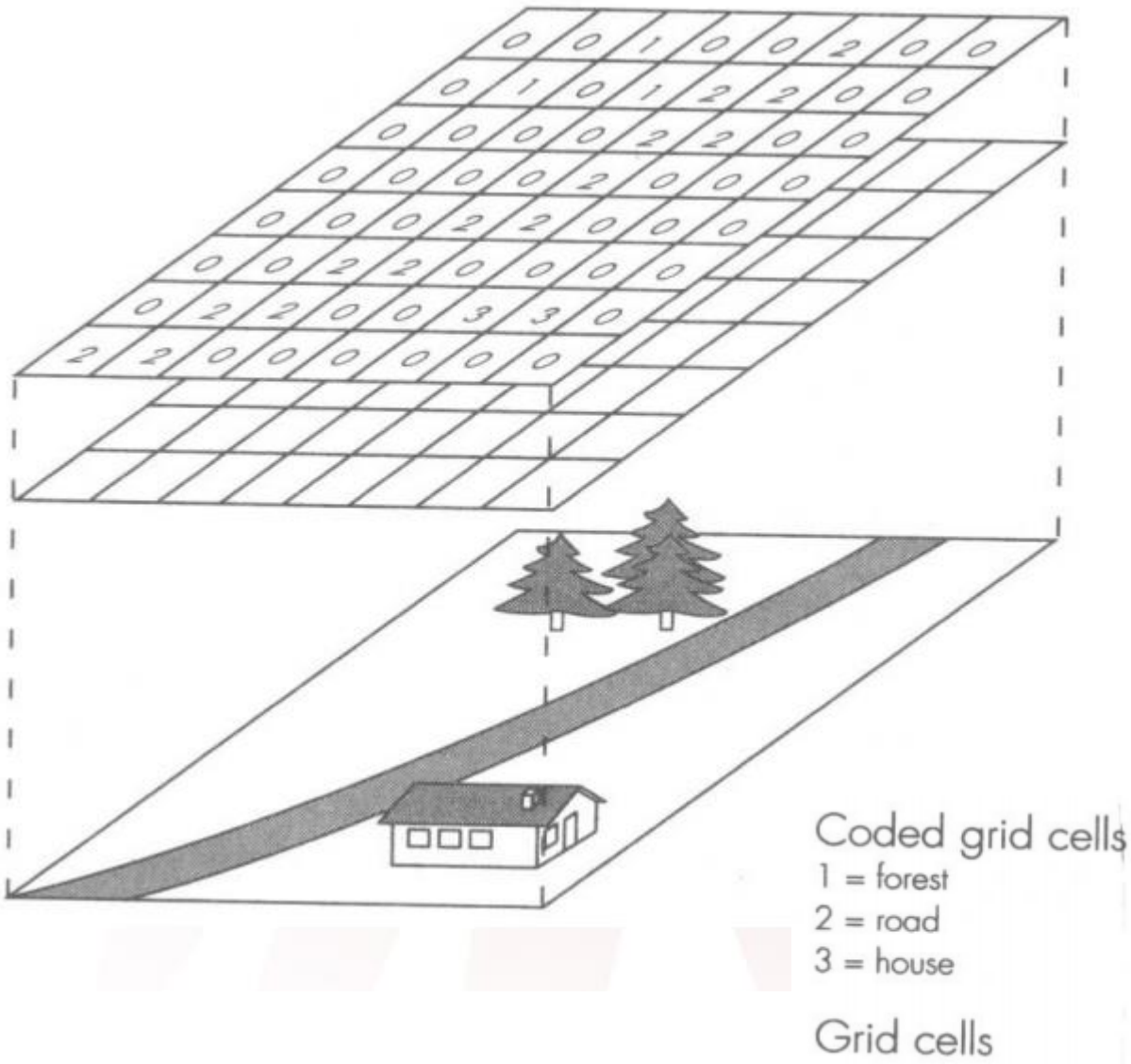
Satellite image



RASTER DATA MODEL

- Simple data structures
- Advantage in many kinds of spatial analysis or mathematical modeling
- Location-specific manipulation of attribute data is easy.

- Large data volumes
- Large grid cells --> reduces resolution (loss of information)

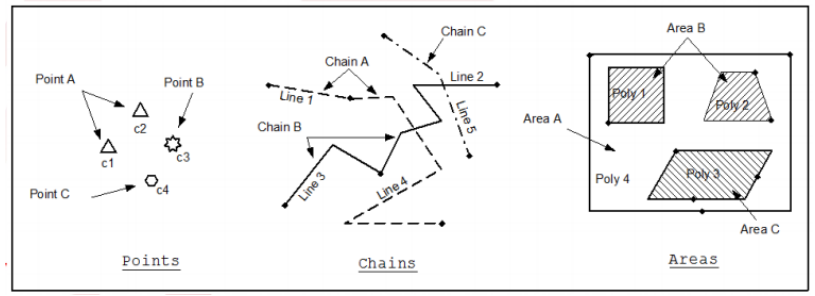


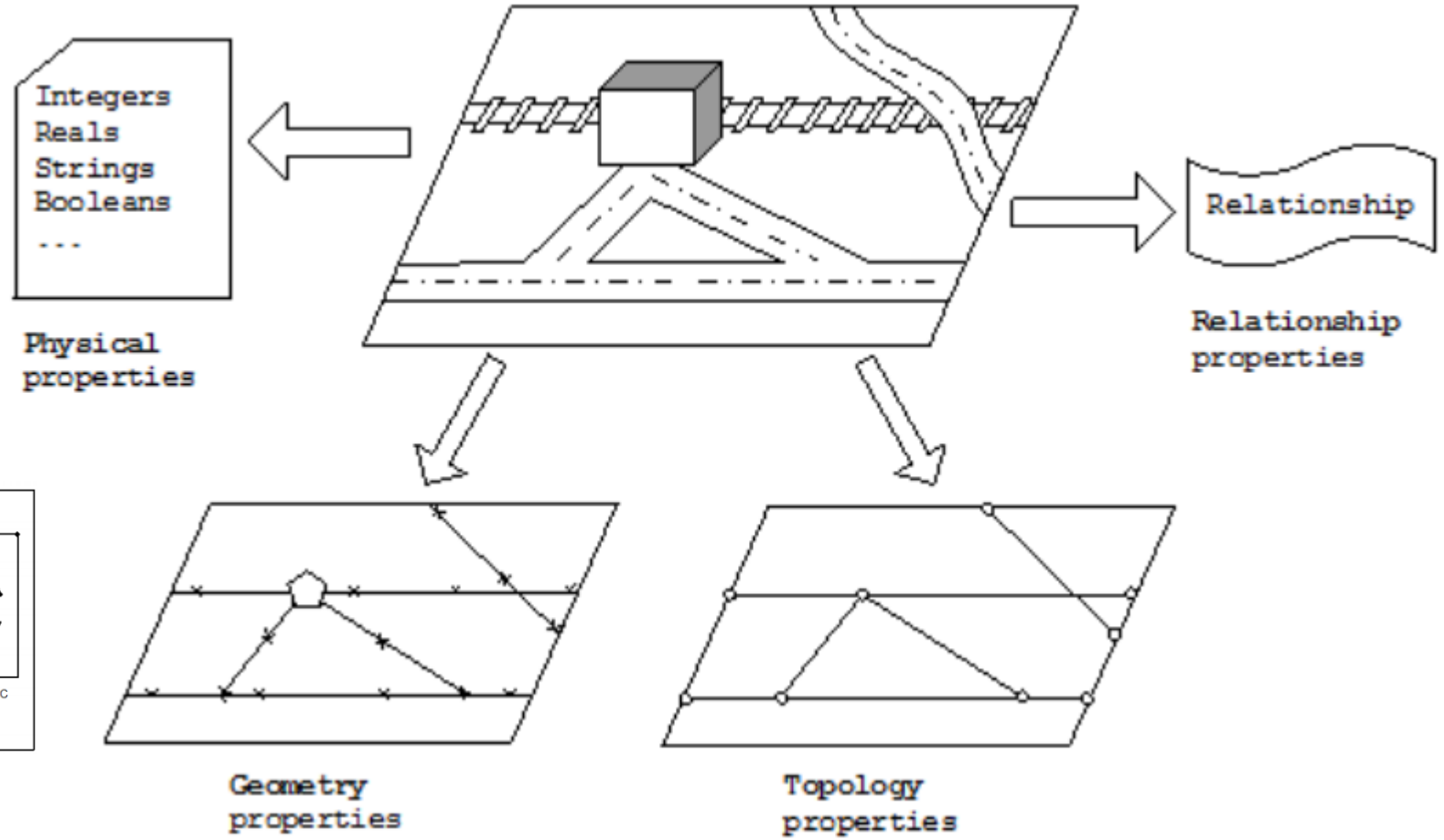
VECTOR DATA MODEL

One model for representing geographic space too!

Point (One Dimension)

Lines and Polygon (Two Dimension)

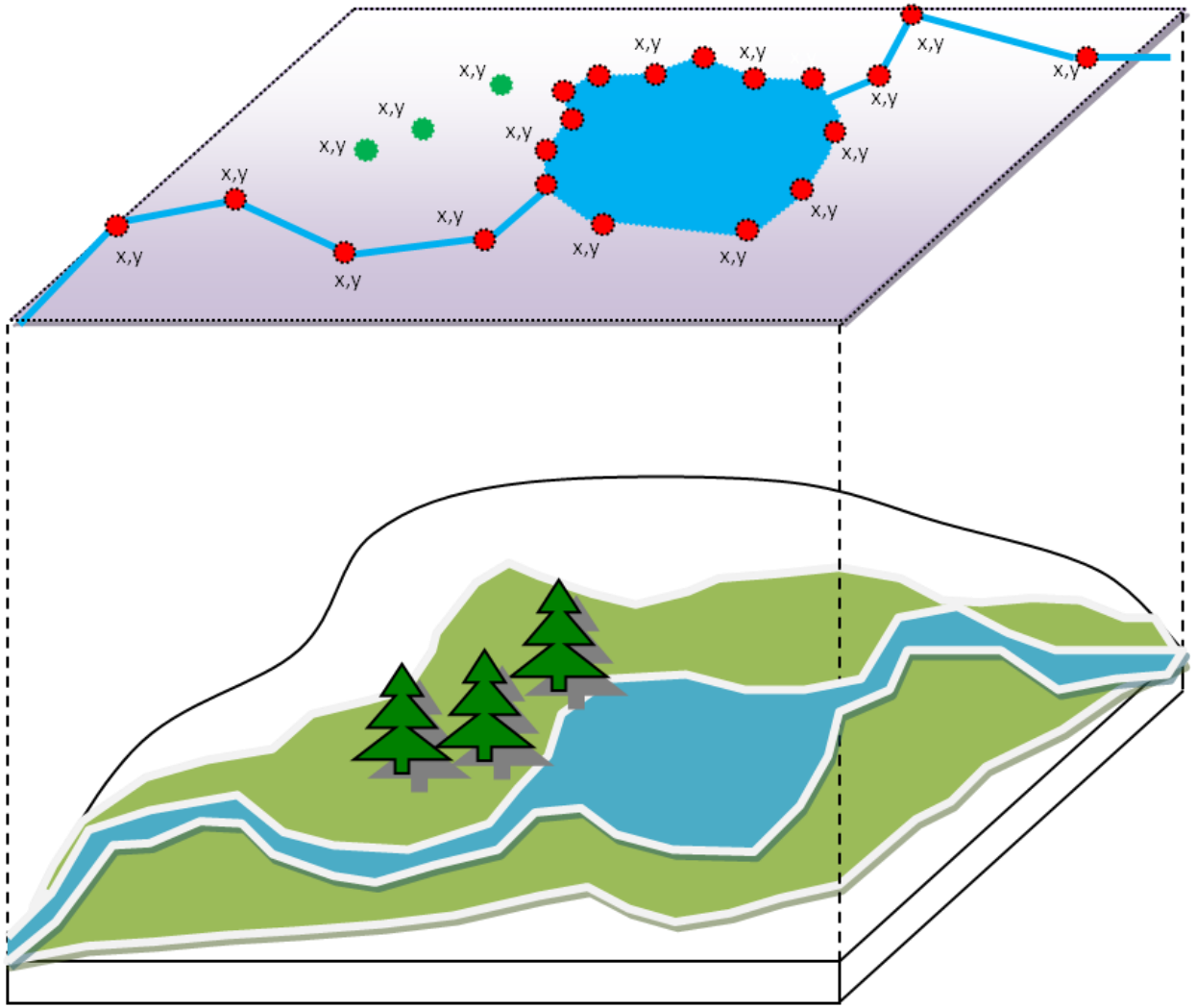




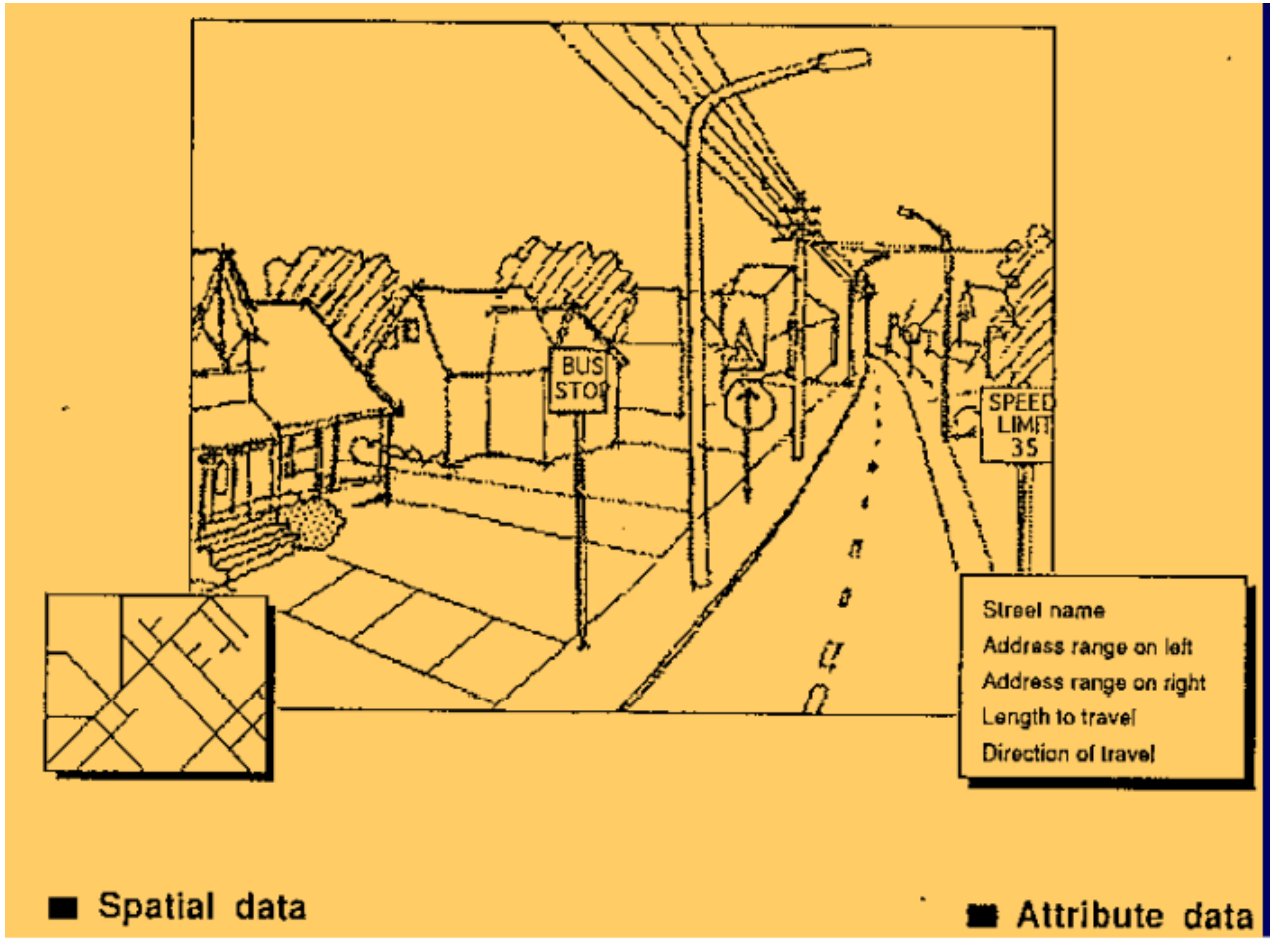
VECTOR DATA MODEL

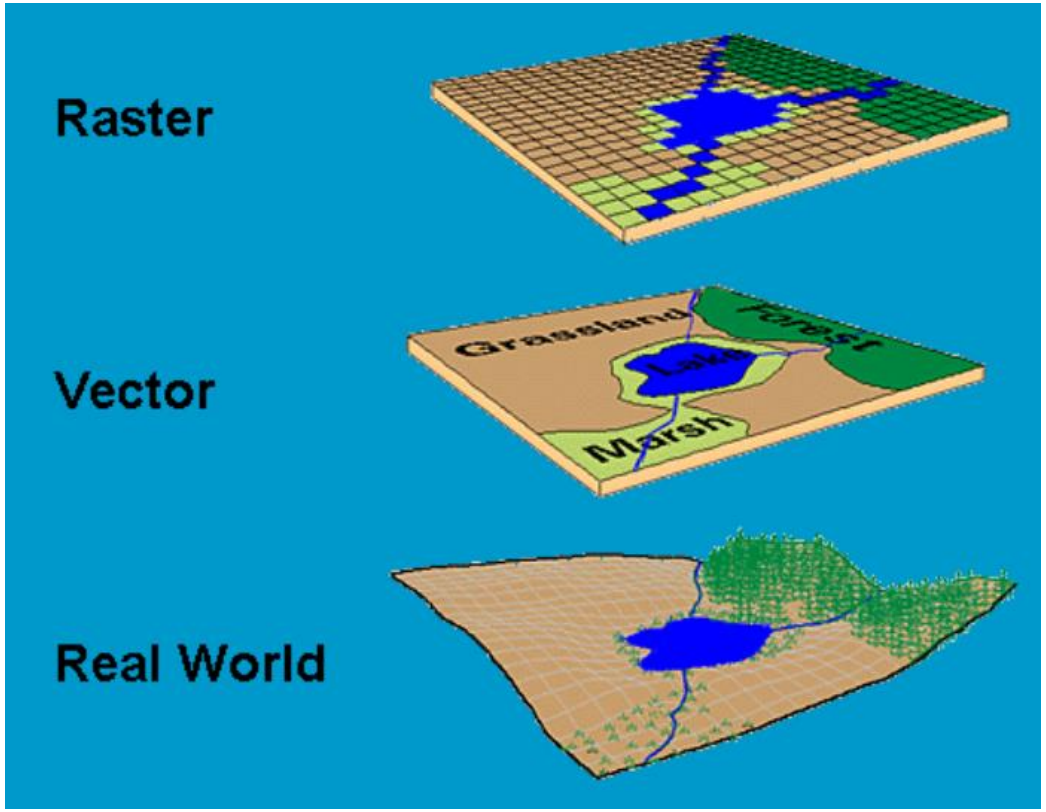
- Compact data structures
- Accurate graphic representation at all scale

- Complex data structures
- Hard to simulation modeling, spatial analysis
- Display and plotting often time consuming and expensive
- Uses considerable computer power



GEOGRAPHIC DATA = SPATIAL DATA + ATTRIBUTE DATA



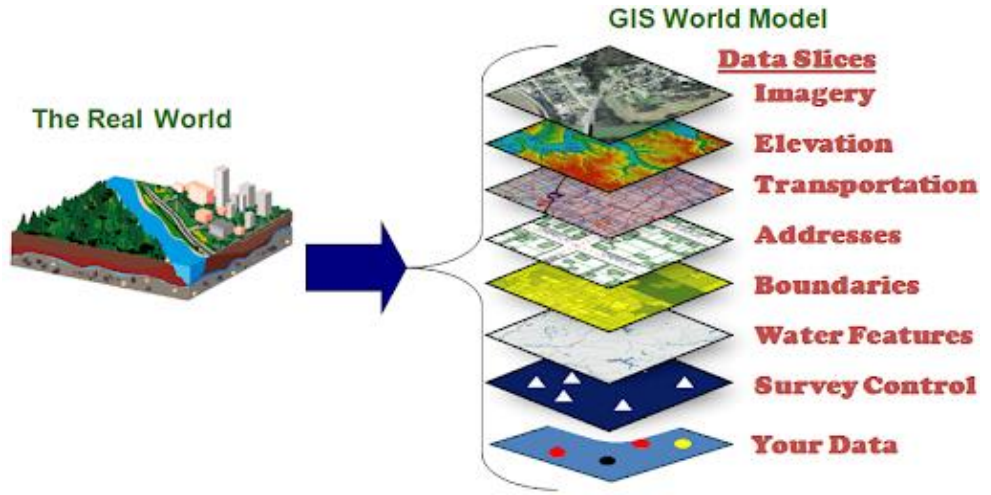


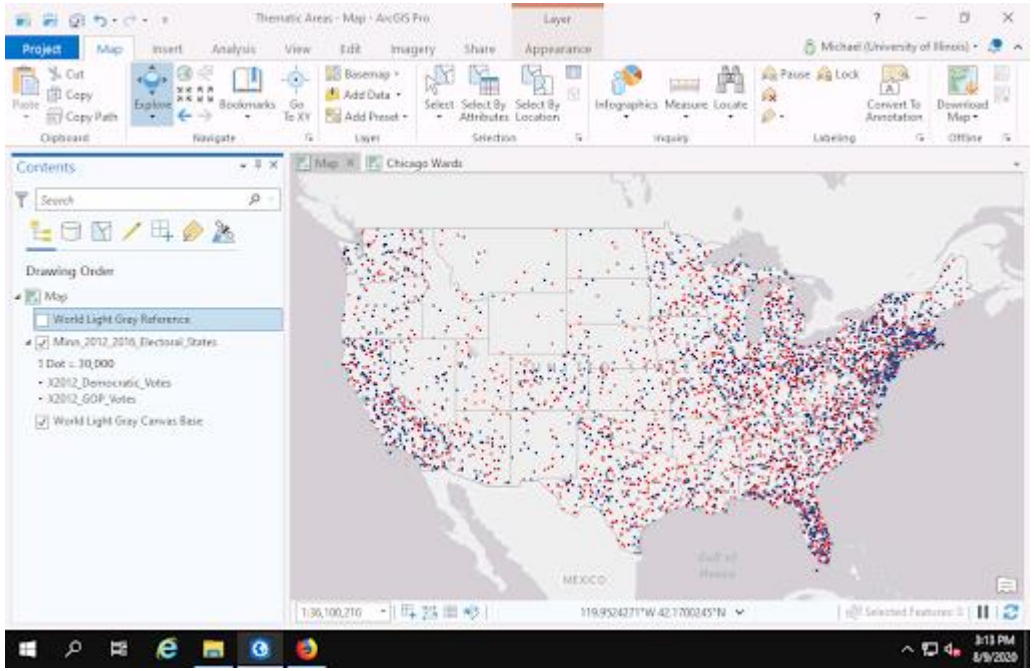
Geography Information System (GIS)

- An information system which captures, stores, checks, manipulates, analyses, and displays both spatial and non-spatial data.

- Five Component of GIS : Computer Hardware, Set of Application software modules, data, people and method.

- Three GIS Applications : Transaction Processing, Management Information System and Decision Support Application

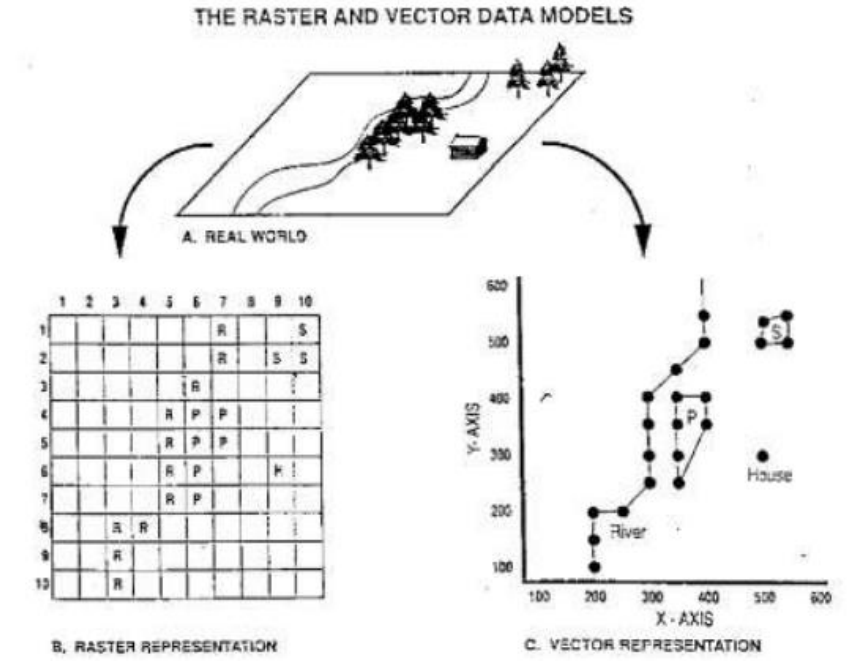


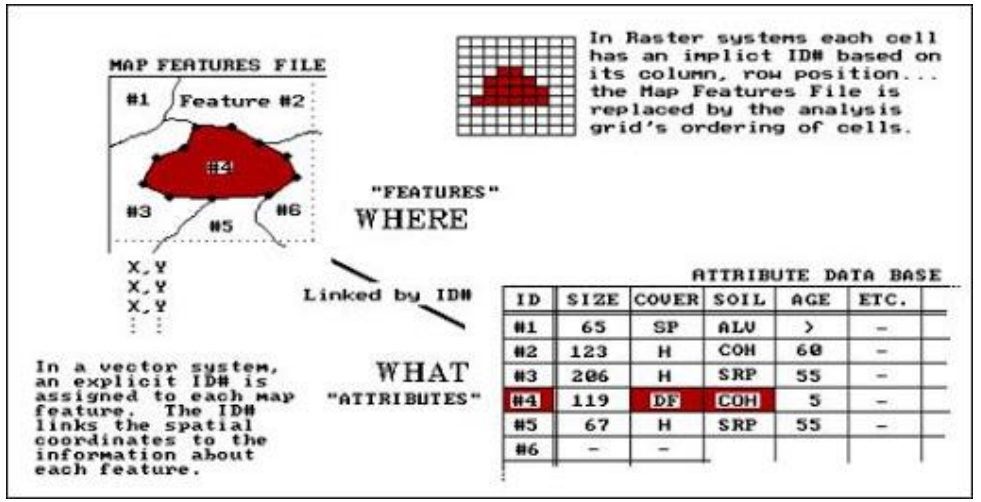


GIS DATA

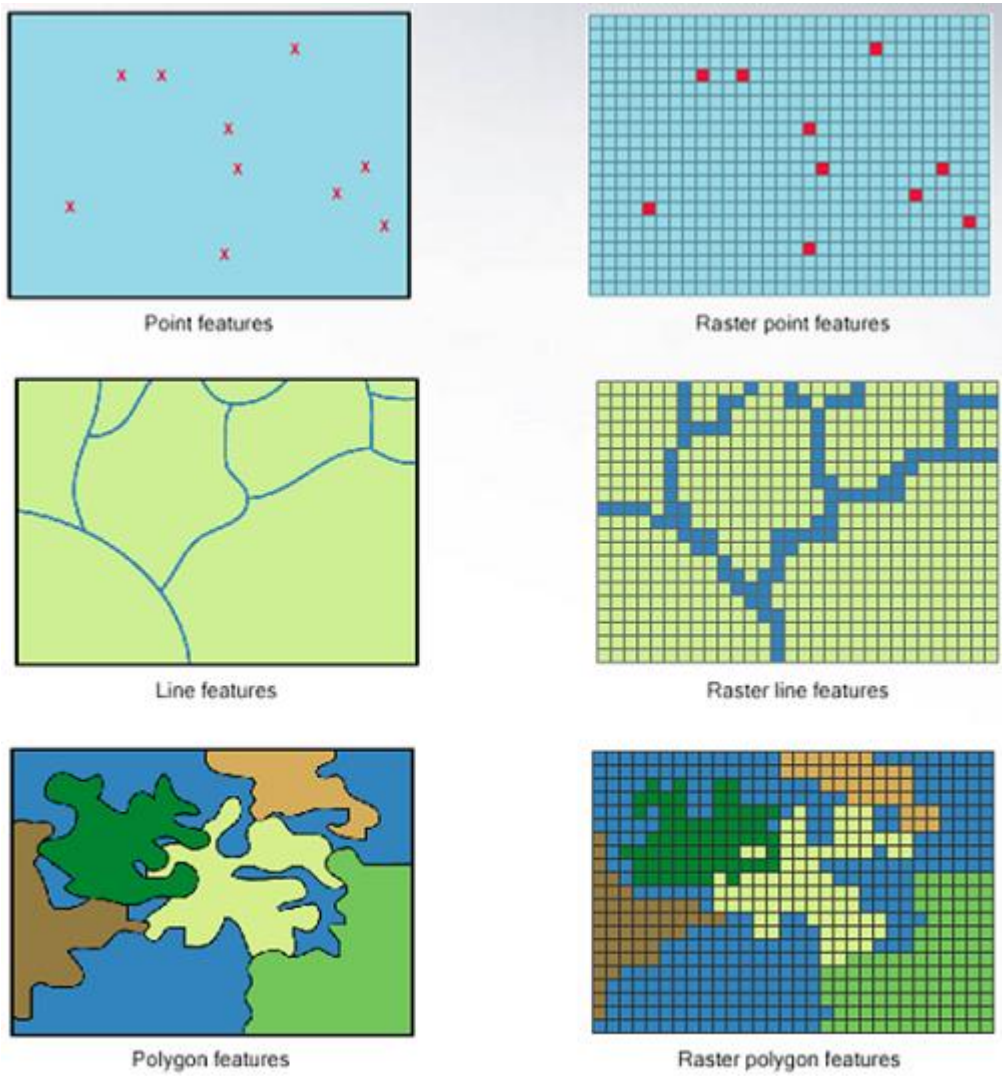
Geographical Data = Spatial Data and Attribute Data

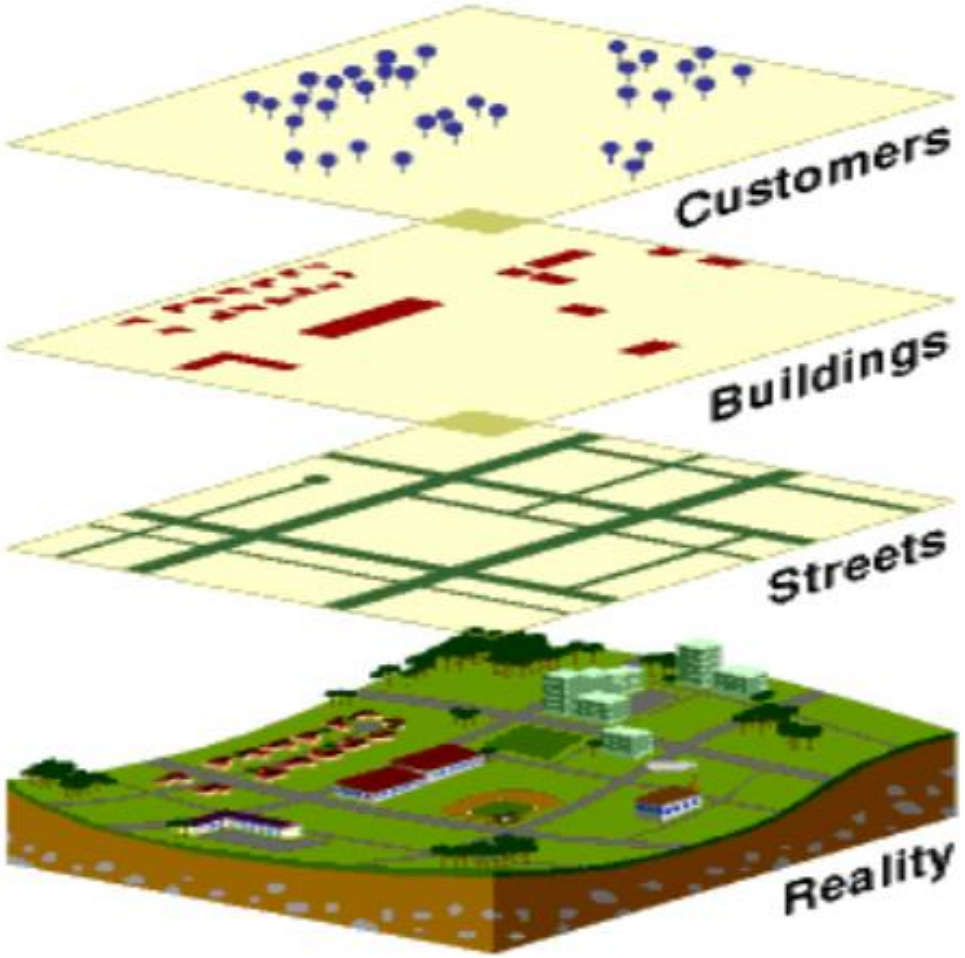
- Spatial Data
  - Levels of Data Abstraction : Real World --> Data Model --> Data Structure --> File Structure
    - Field Based (Continuous) --> Raster Data
    - Object/Entity Based (Discrete) --> Vector Data
  - Vector Data : Point, Line, Polygon
  - Raster Data : Code in Grid Cell
- Attribute Data
  - The data is described properties of spatial data.
  - Type : Quantitative Data and Qualitative Data
  - Scale : Nominal, Ordinal, Interval and Ratio Scale
- Spatial and Attribute are linked by “ID”





GIS DATA

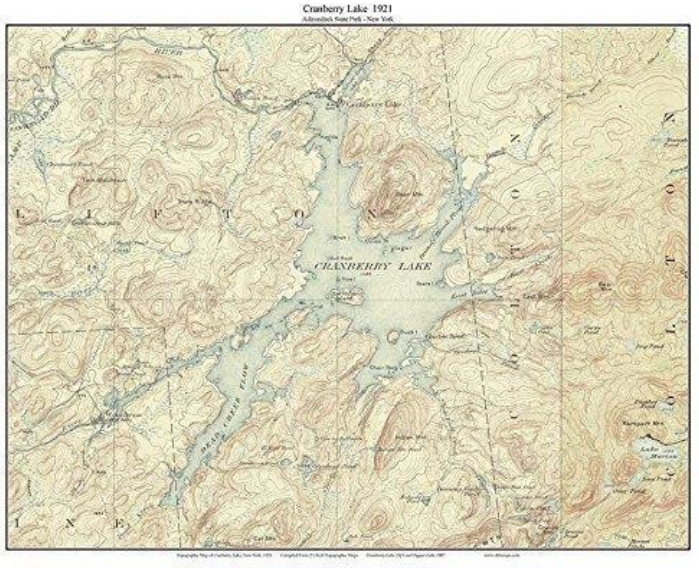

Point features
Raster point features
Line features
Raster line features
Polygon features
Raster polygon features

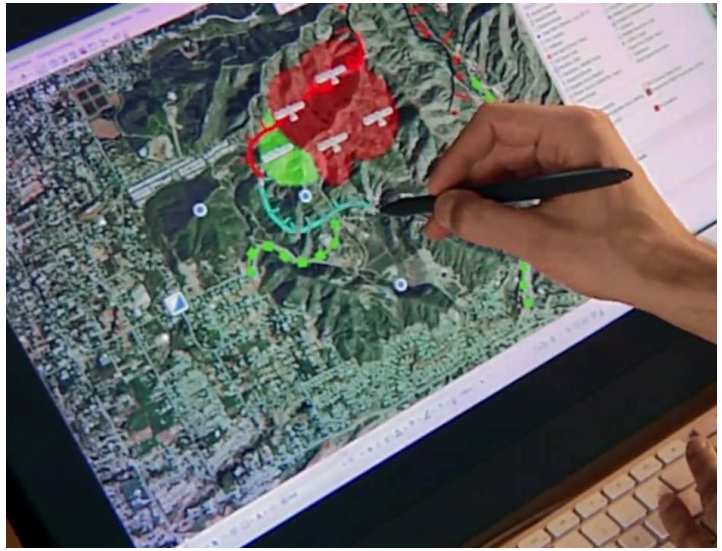

Customers
Buildings
Streets
Reality

GIS INPUT

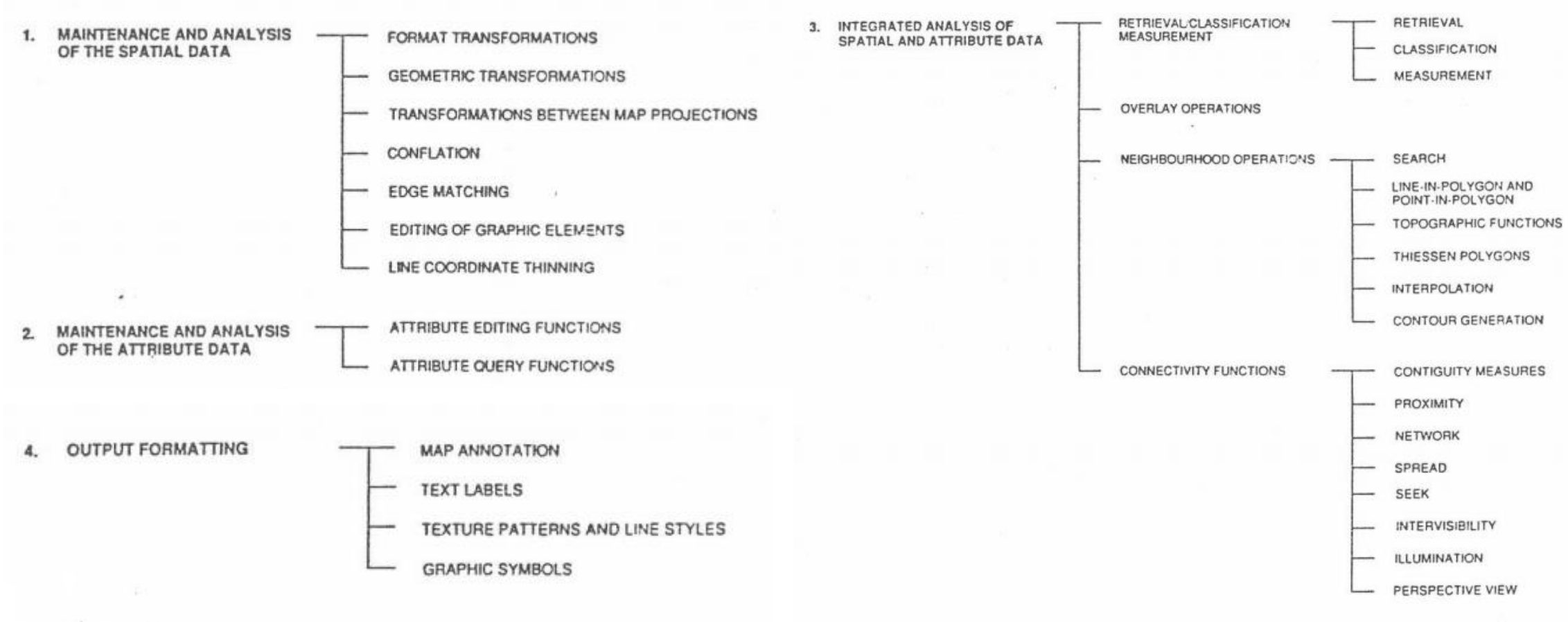
Method for GIS Data Input.

- Keyboard
- Coordinate Geometry
- Digitizing
- Scanning
- Digital Data

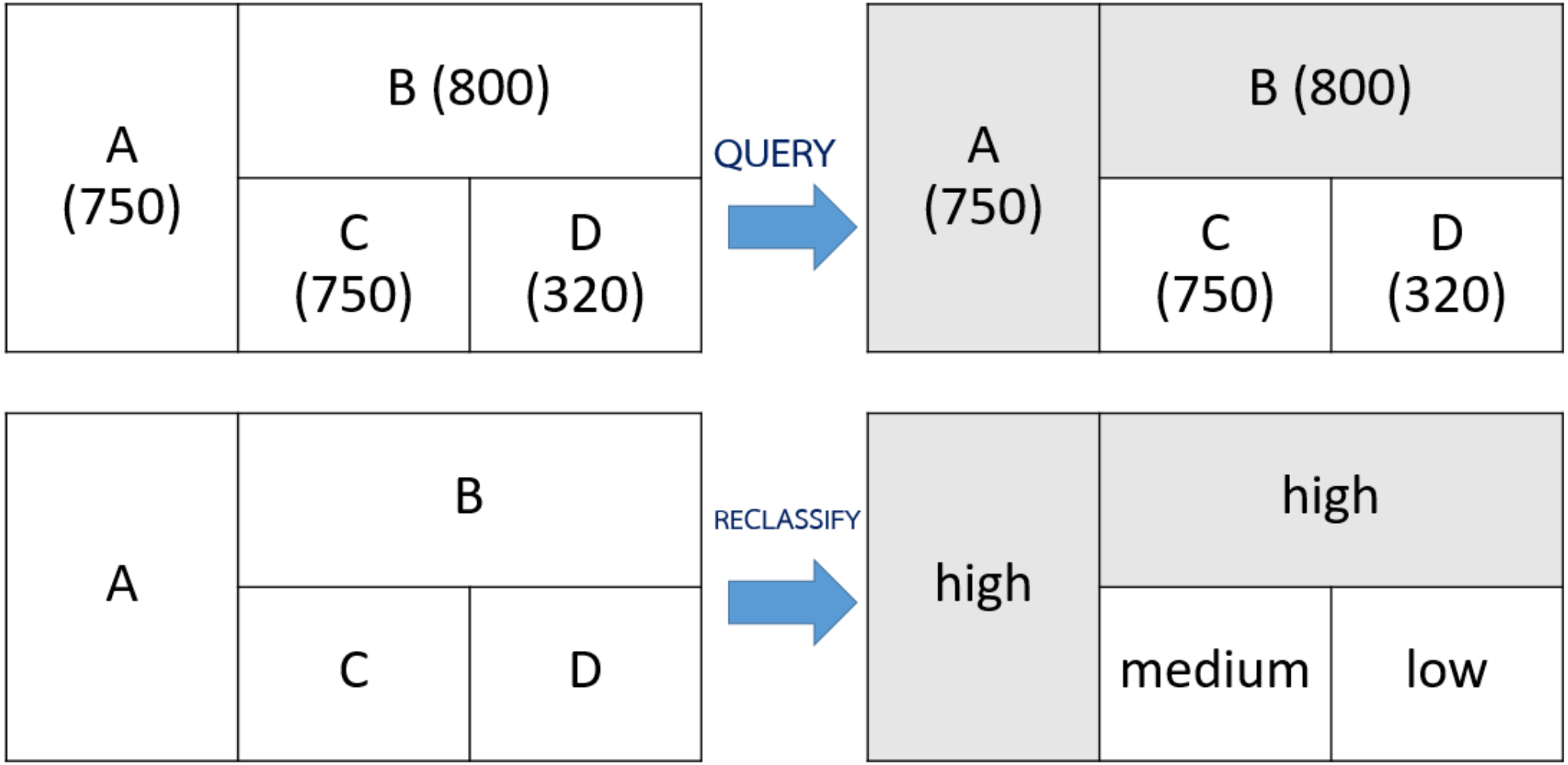




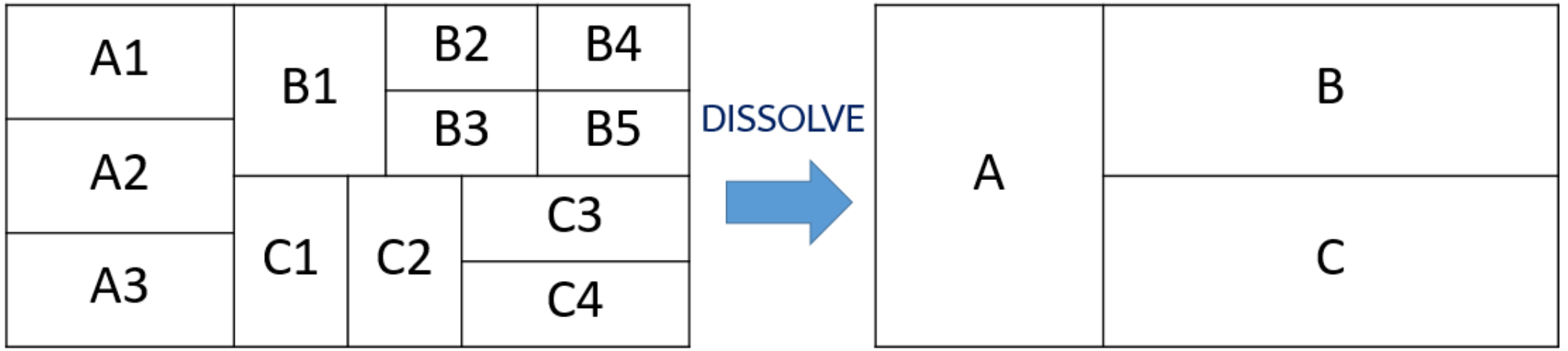
GIS FUNCTION

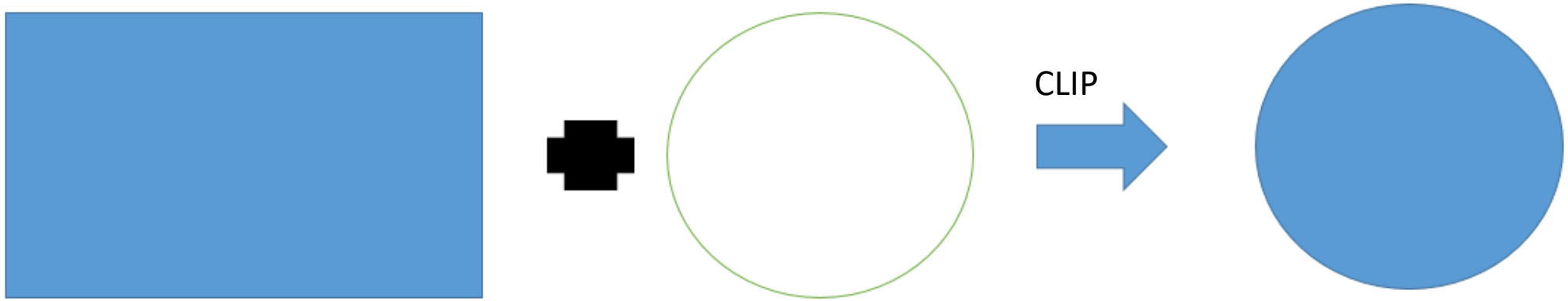


BASIC GIS FUNCTION

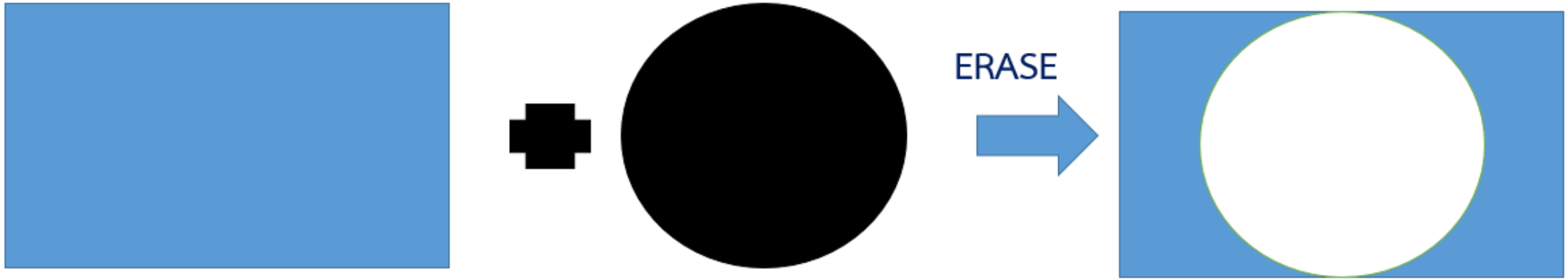


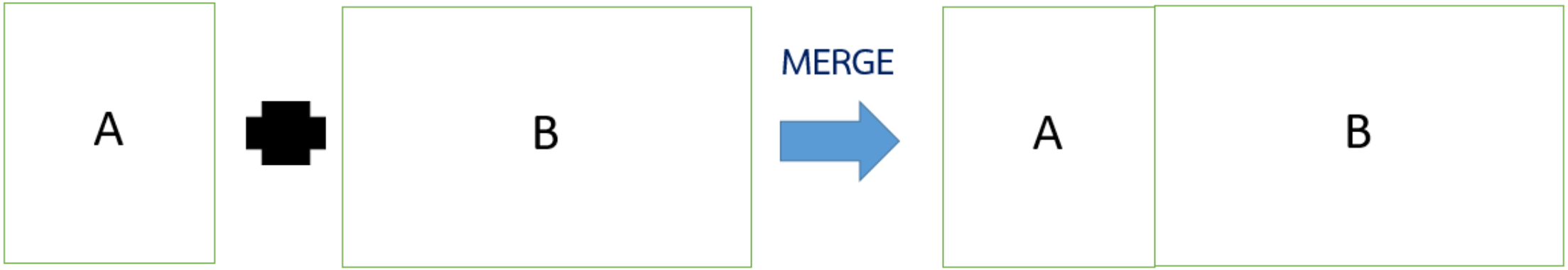
BASIC GIS FUNCTION



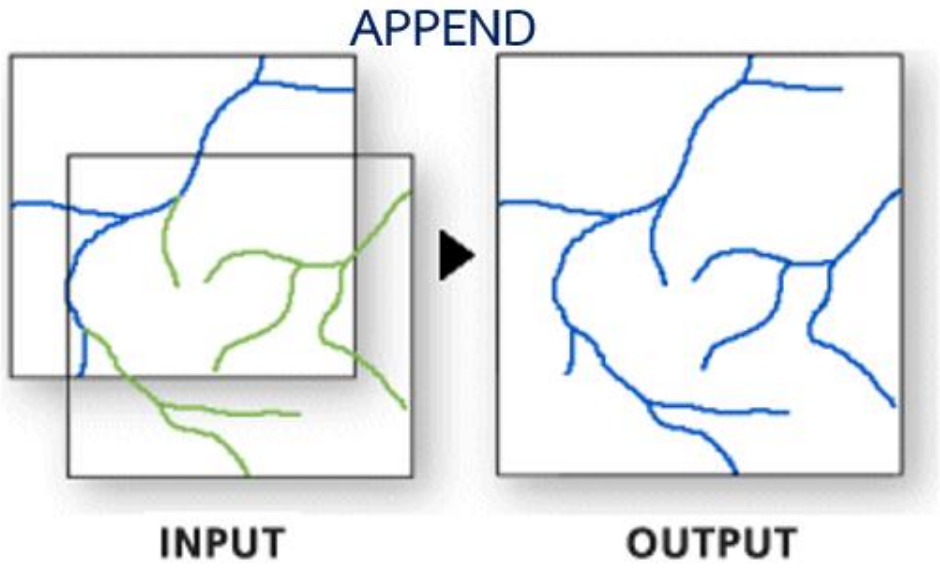


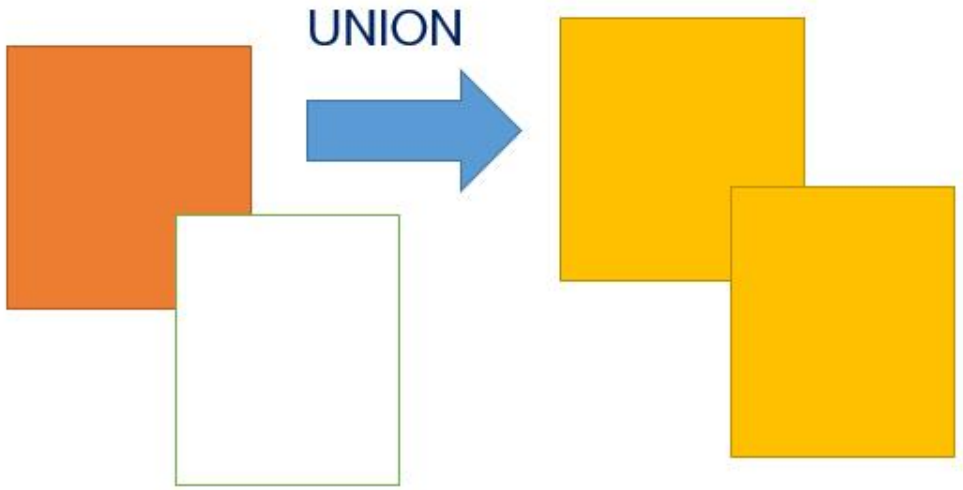
BASIC GIS FUNCTION



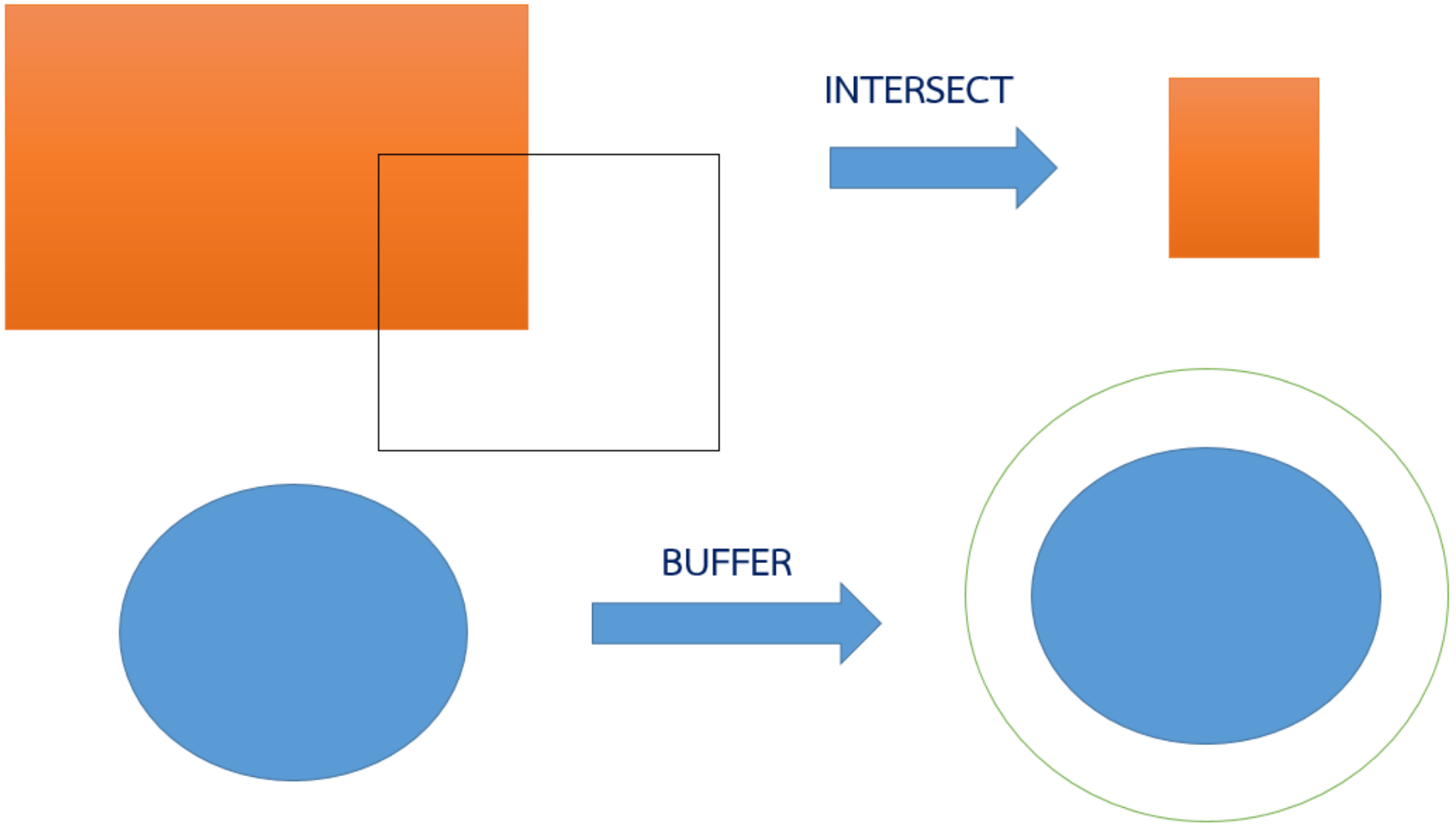


BASIC GIS FUNCTION

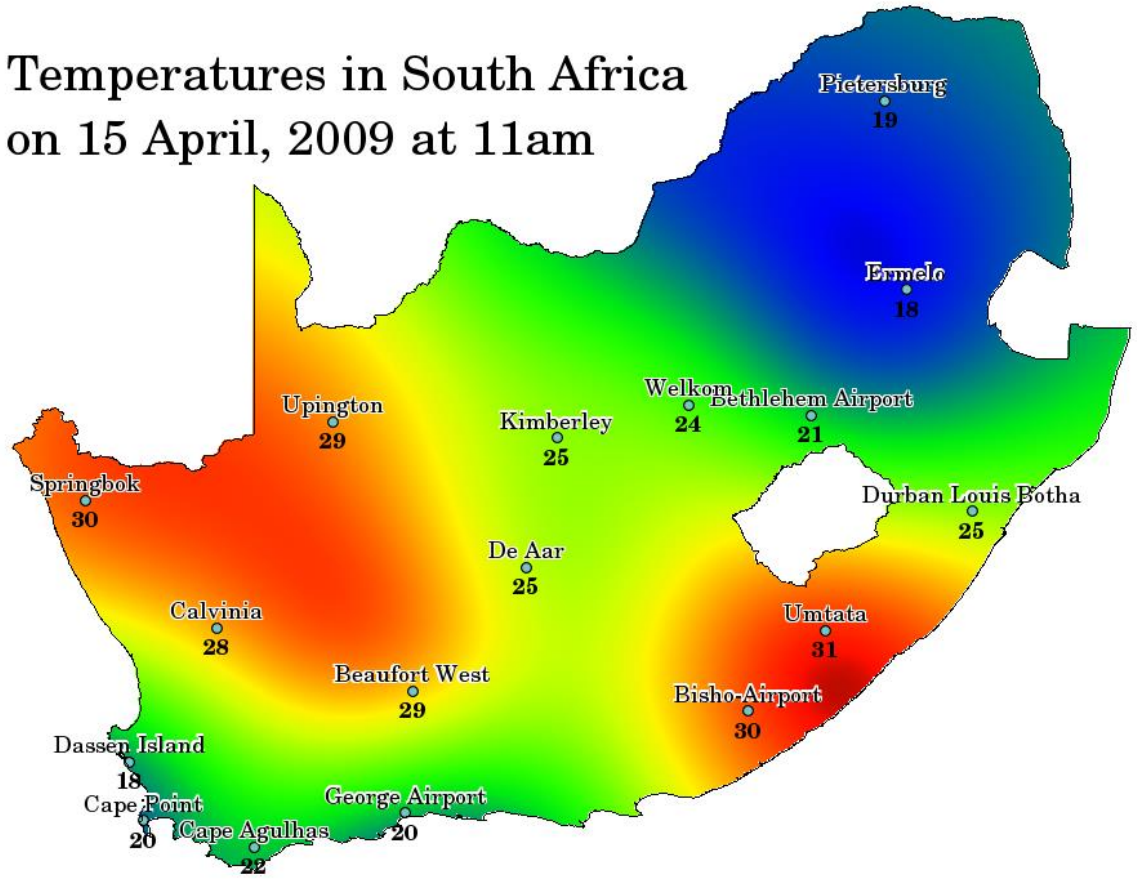


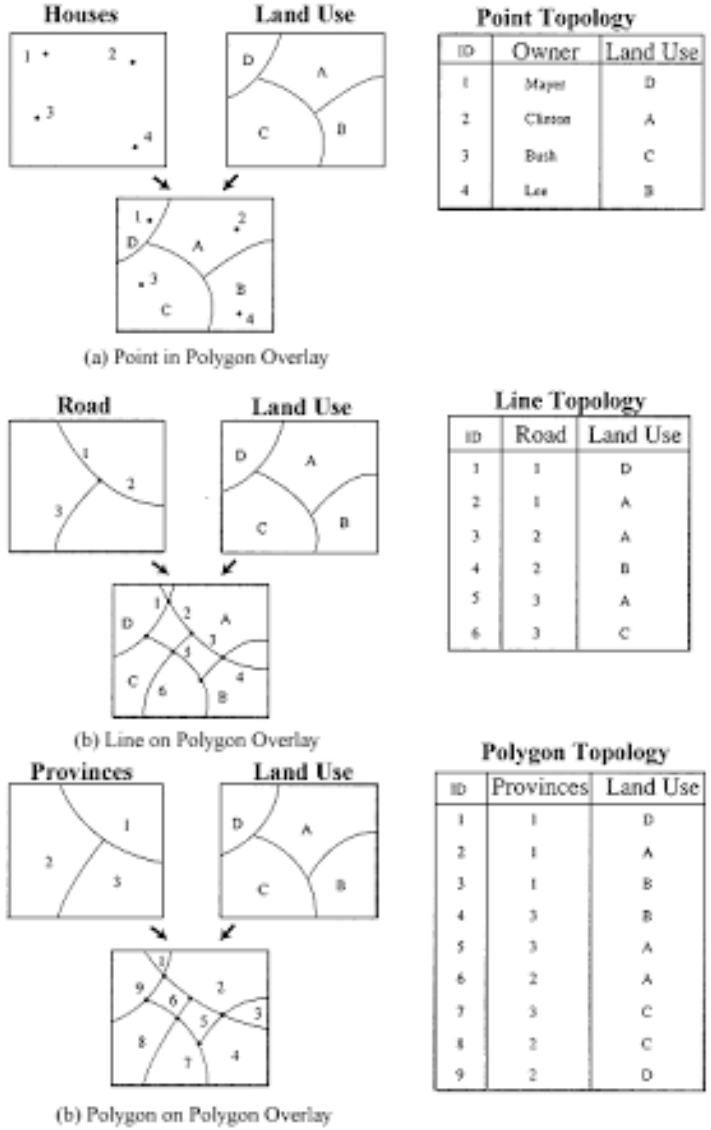


BASIC GIS FUNCTION



GIS FUNCTION : NEIGHBOURHOOD ANALYSIS

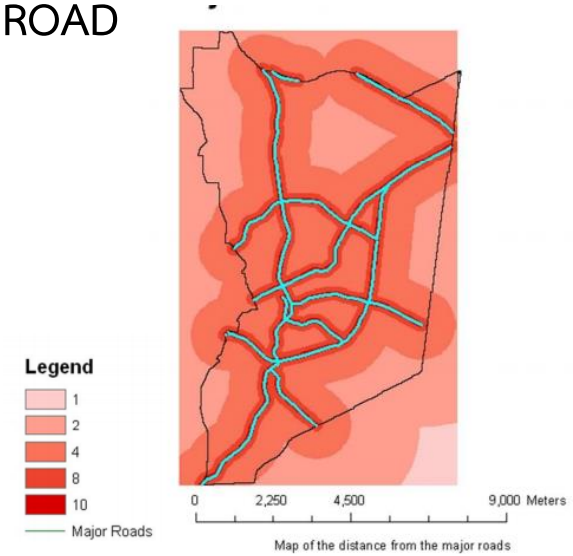




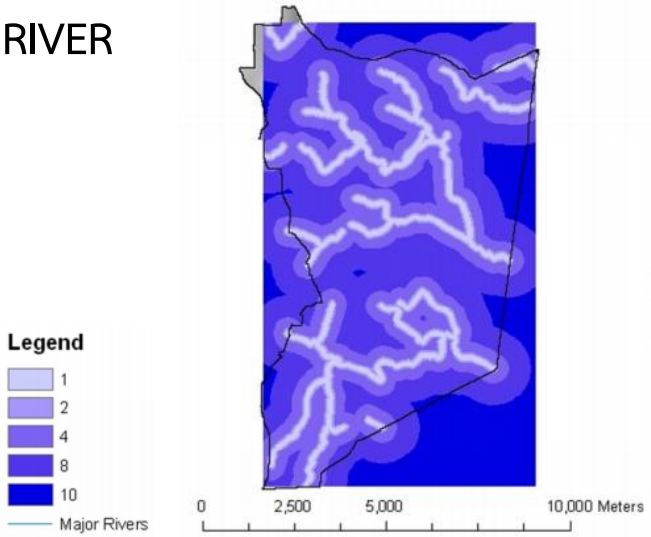
Figue 4.7 Overlay of Vector Data

GIS FUNCTION : CONNECTIVITY ANALYSIS

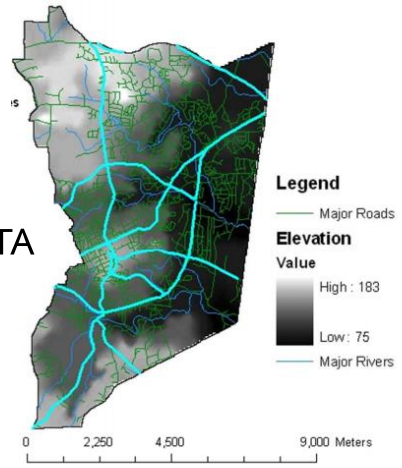
ROAD



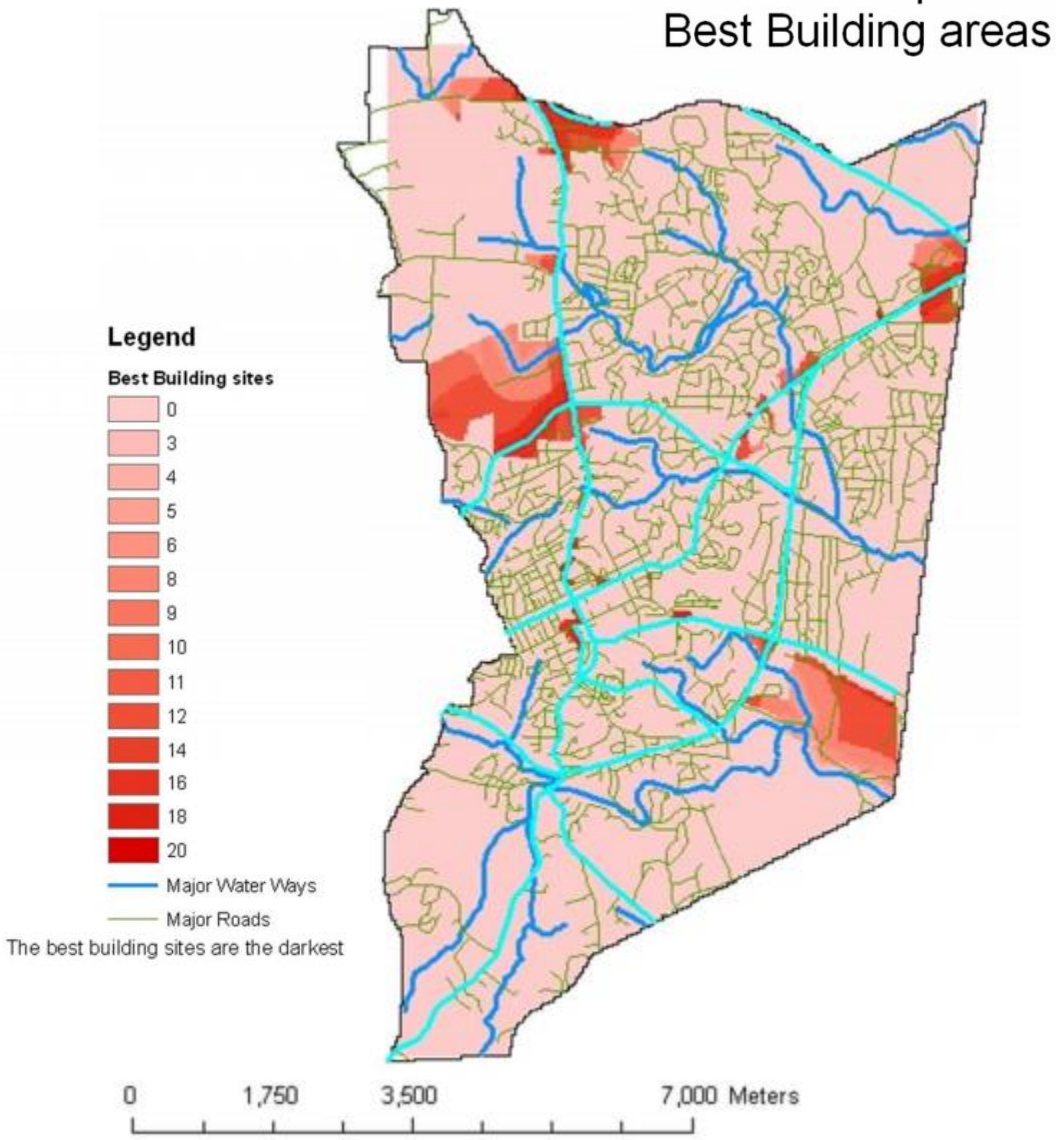
RIVER

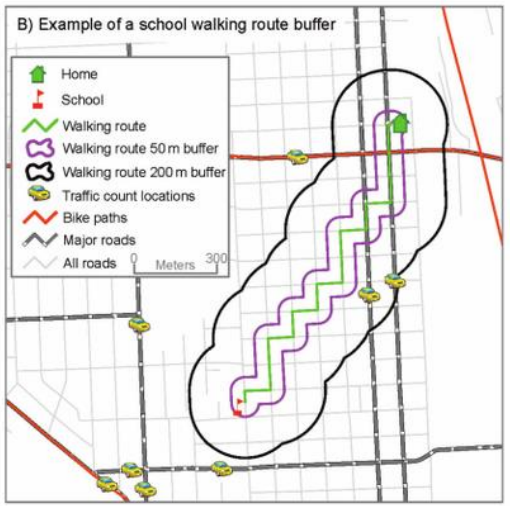


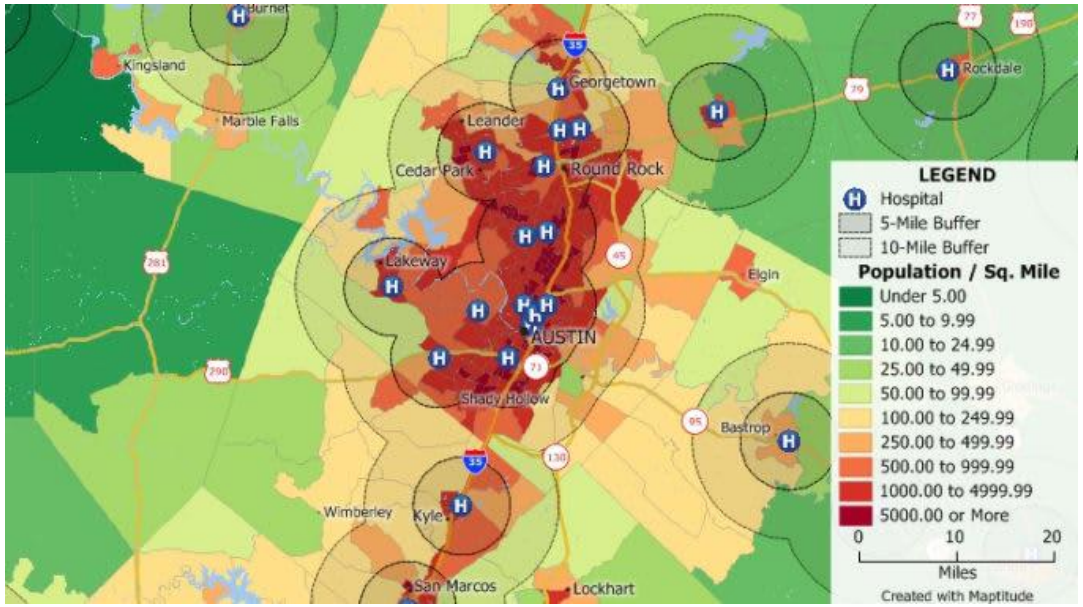
INITIAL DATA

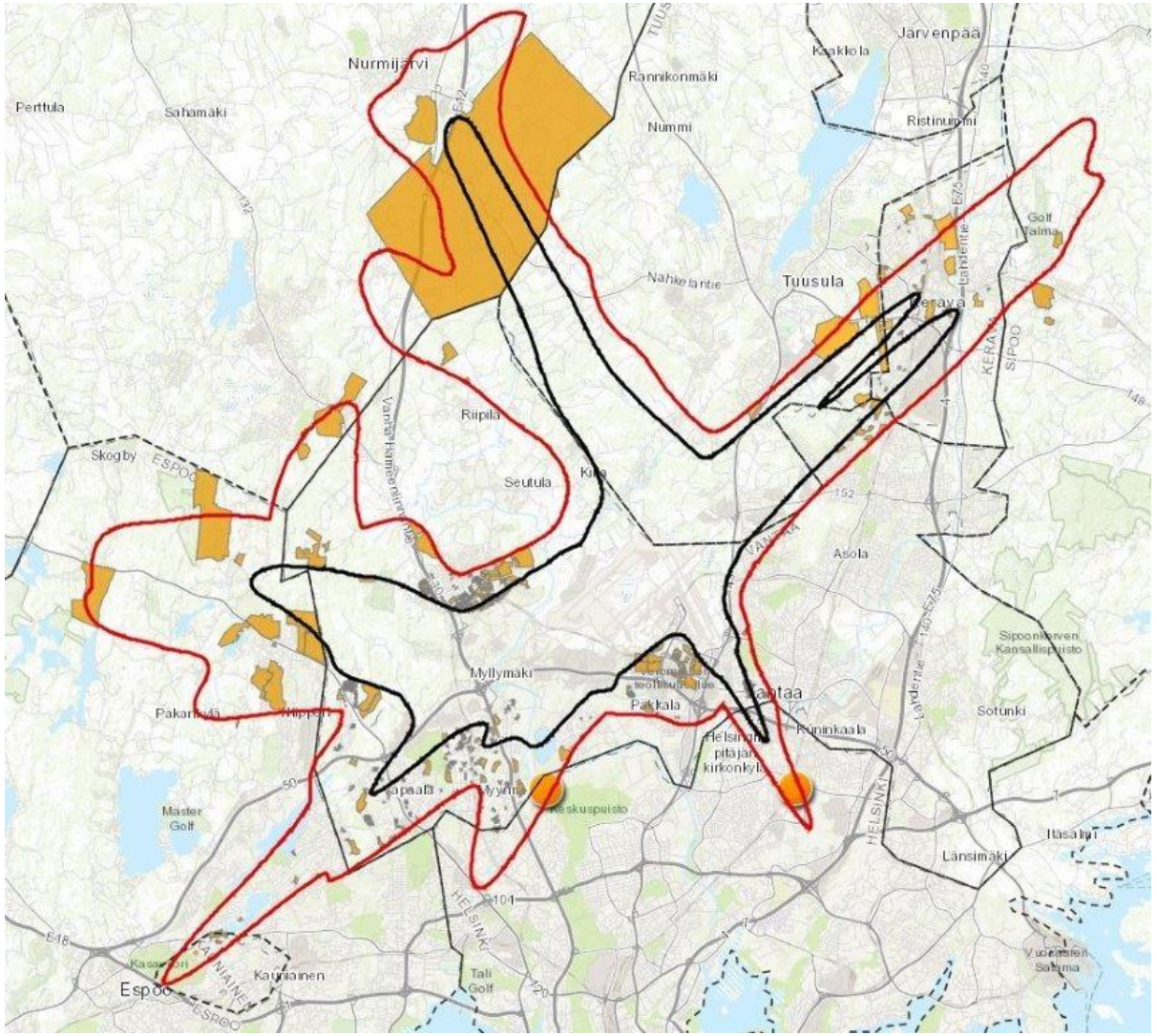


Town of Chapel Hill
Best Building areas









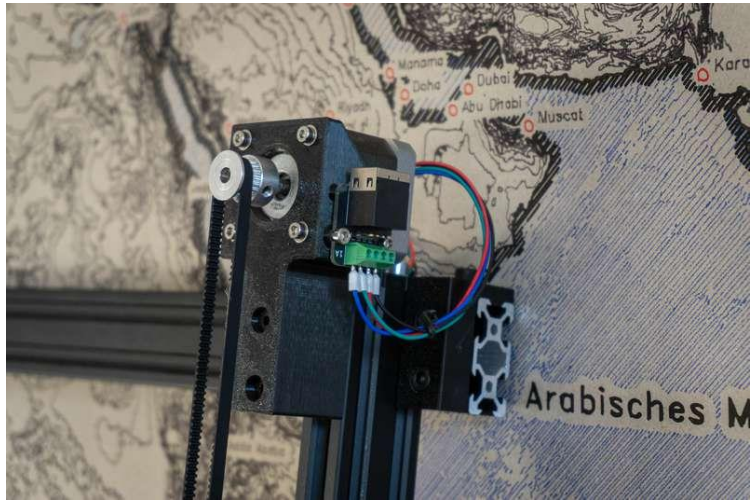
Use the map window to see the current zoning situation in the noise area, Helsinki Airport

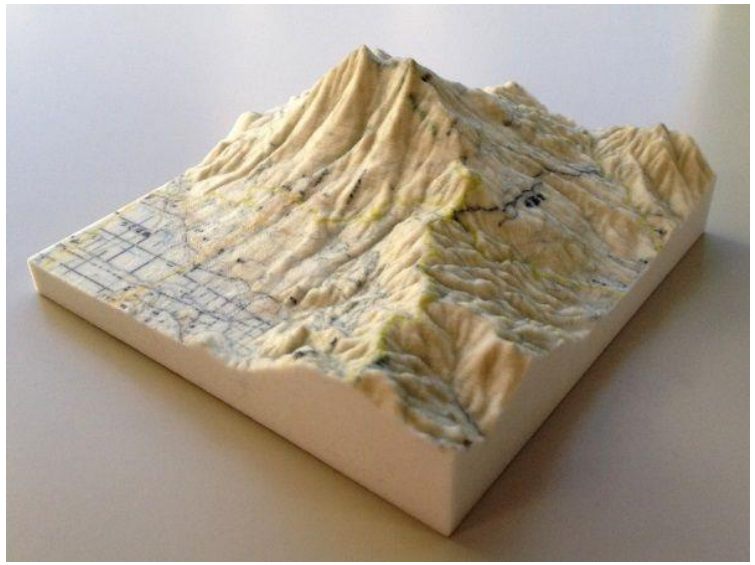
GIS Output : Map (Label, Annotation, Symbol, Texture Patterns and Line Style)

GIS Output

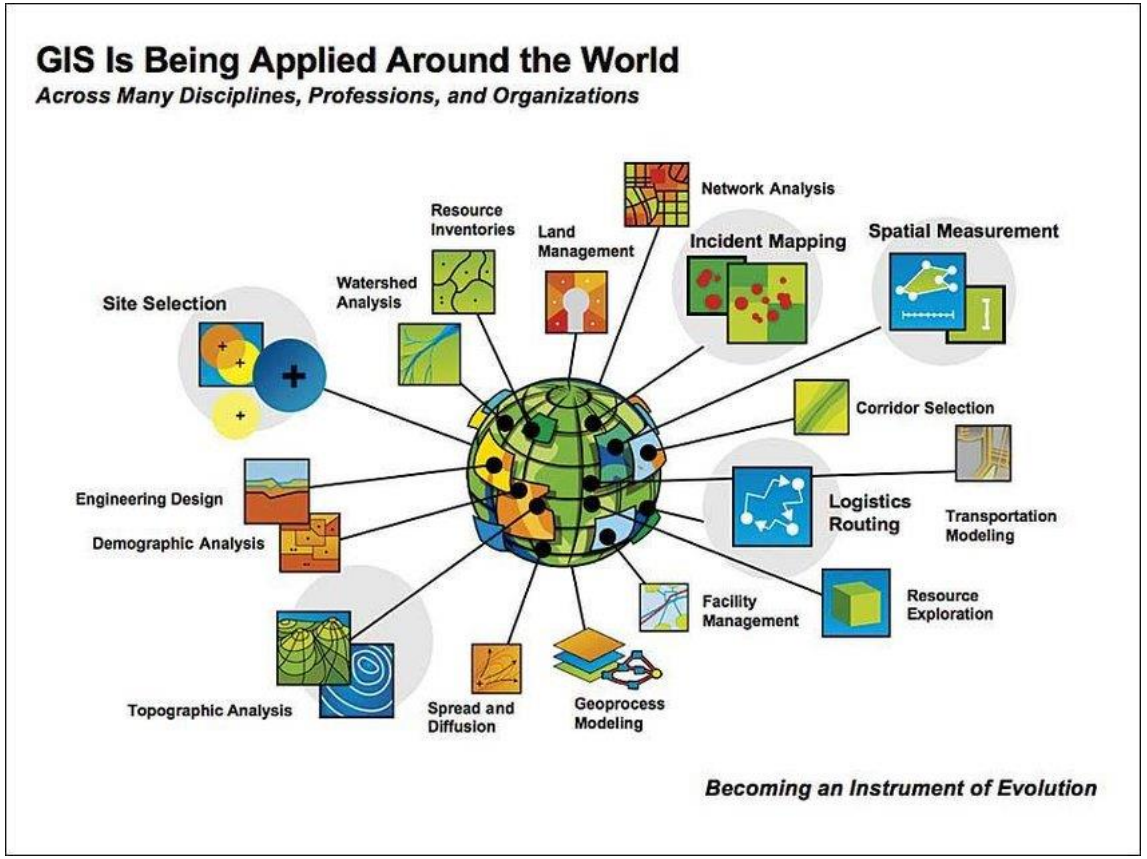
Method for GIS Data Output.

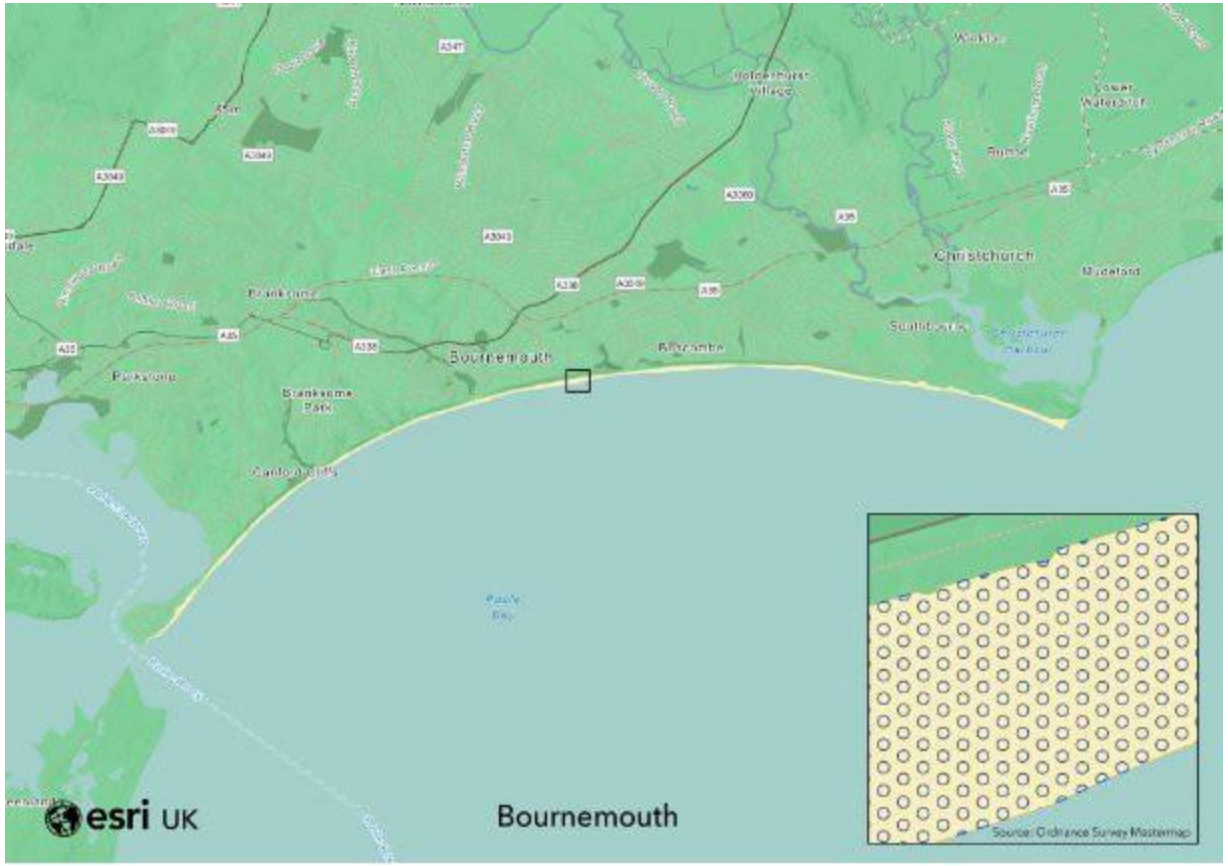
- Hardcopy Device
  - Plotter (Vector)
  - Printer (Raster)
  - 3D printer, Holography
- Softcopy Device : Computer Monitors, LCD projector, Smartphone Tablet
- Digital Output





GIS Application





Beach Capacity using GIS

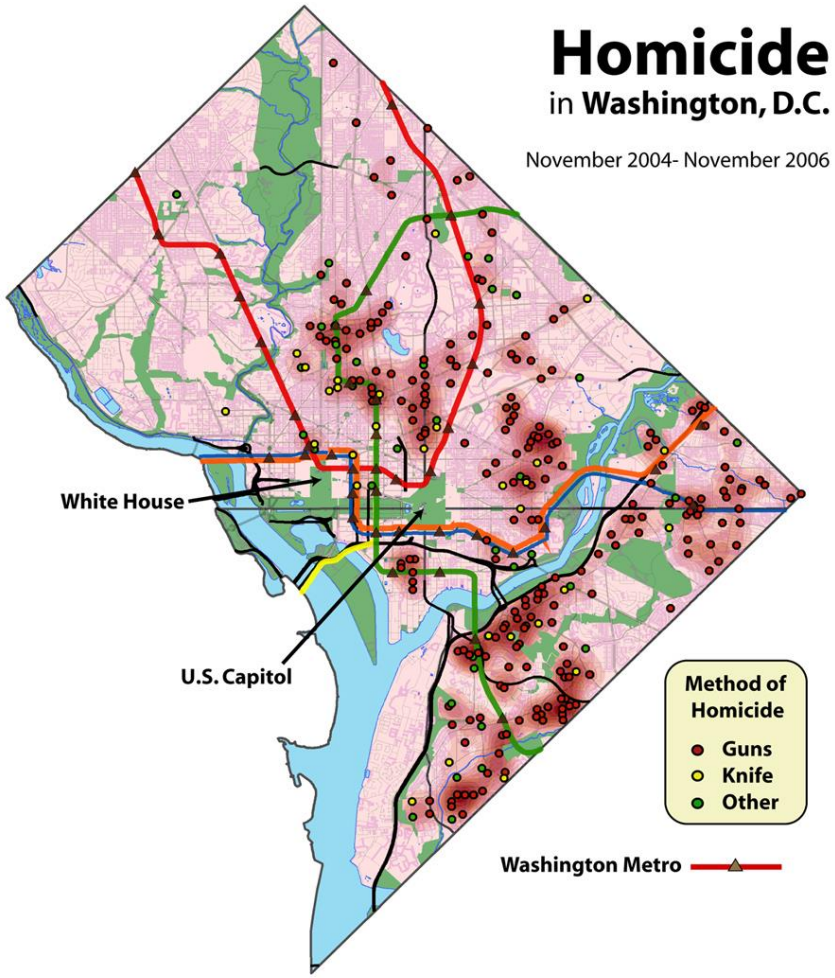
The technique used involves placing a person inside a 2 m diameter circle that follows the 2 m social distancing rule. Another 2m is added between circles to allow people to move around on the beach.

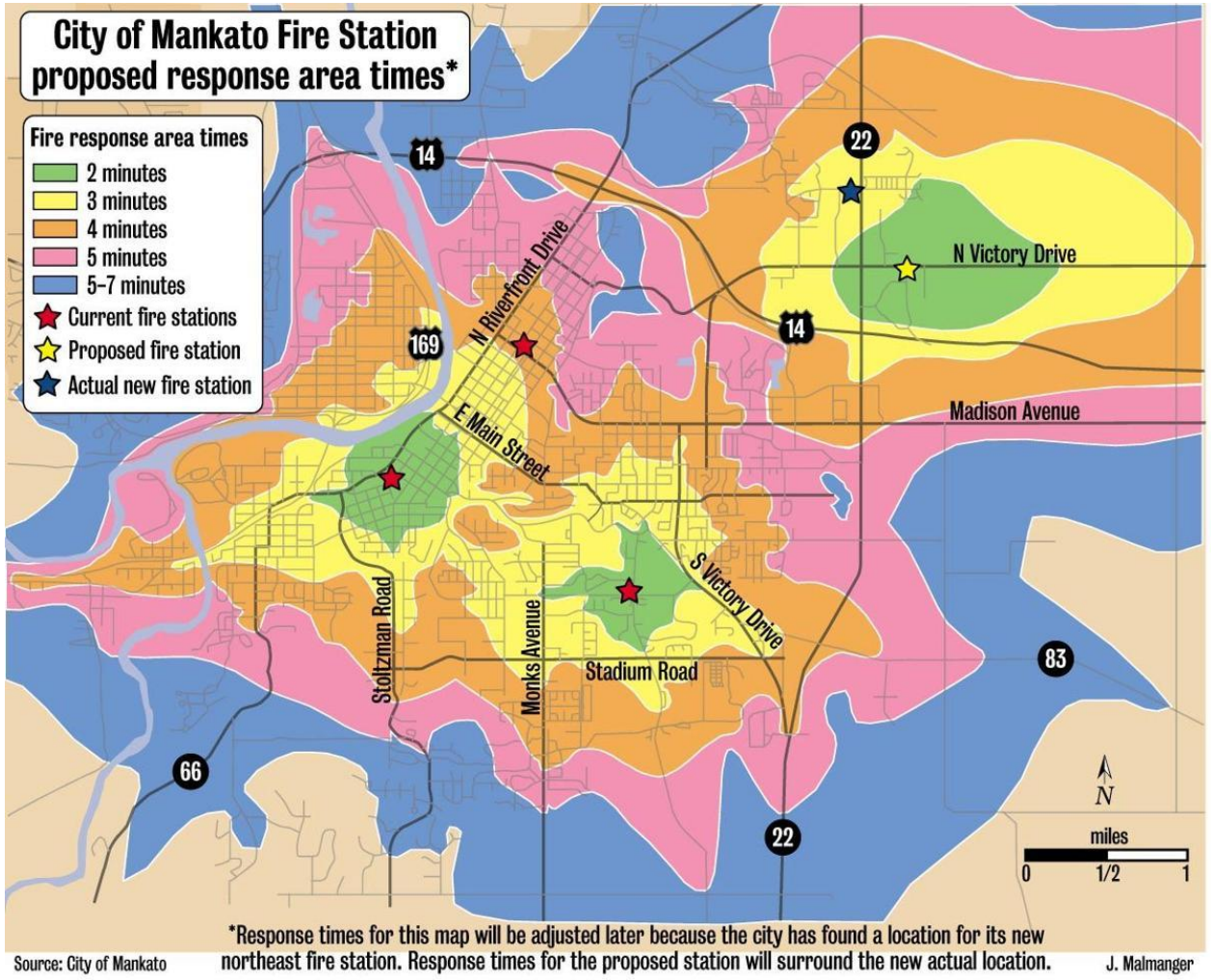
GIS Application

GIS Tax Mapping
Satellite Imaging Corporation

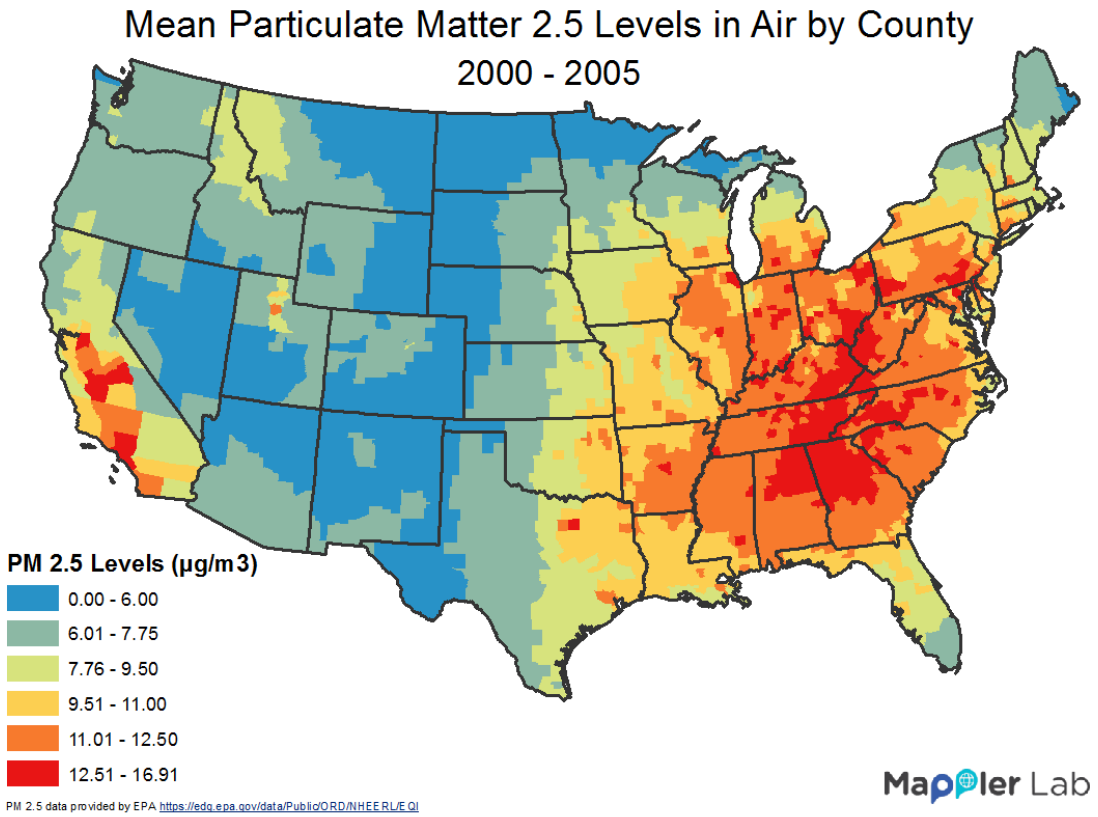
The relevance of GIS for land administration and management
Pen Profile

GIS Application

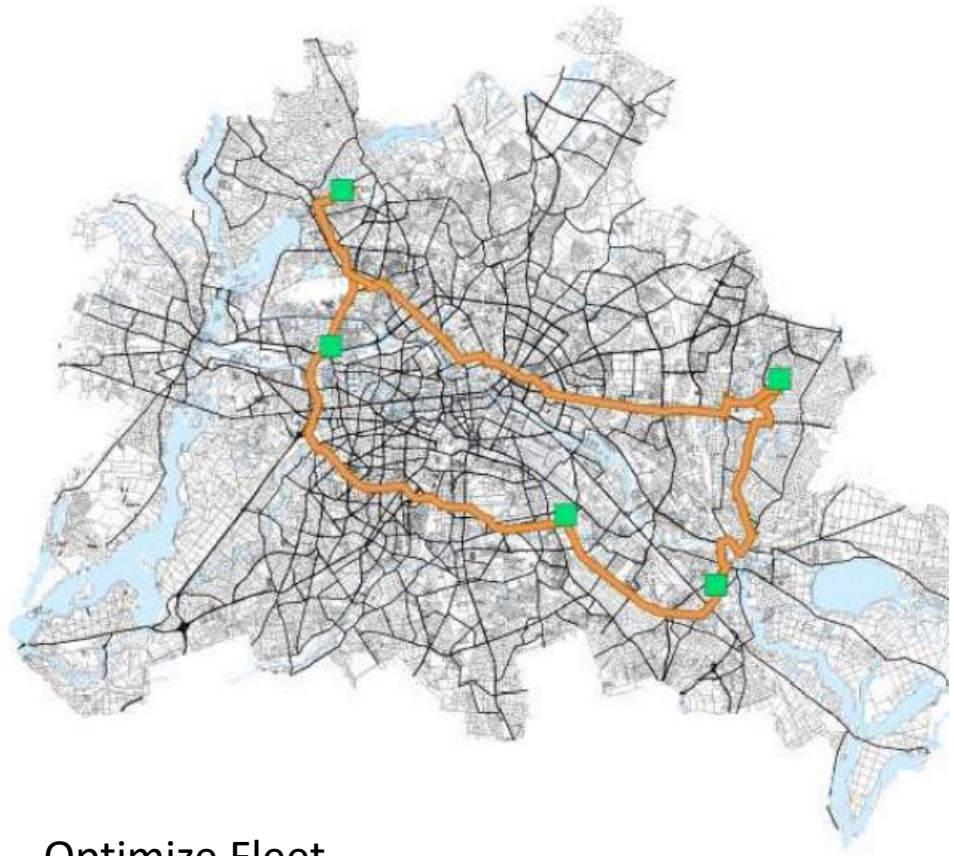




GIS Application



GIS Application



Optimize Fleet