## Topic No: 4 Data Acquisition

Data Acquisition Means Acquiring or Collection Data

To, Collect Data it is very expensive in GIS activities

### Types of Data Collection:

1. Data Capture (Direct Collection)
2. Data transfer

## Topic No: 5 Data Capturing techniques and procedures, Data Transformation

### Data Capture (Direct Collection)

- Capture specifically for GIS use
- Raster – remote sensing (e.g. SPOT & aerial photography)
- Passive and active sensors
- Resolution is key consideration
    - Spatial
    - Spectral
    - Temporal

### Two broad capture methods;

1-Primary (direct measurement)

2-Secondary (indirect derivation)

### VECTOR PRIMARY DATA CAPTURE

### Surveying

- Locations of objects determines by angle and distance measurements from known locations
- Uses expensive field equipment and crews
- Most accurate method for large scale, small areas

### GPS

- Collection of satellites used to fix locations on Earth's surface
- Differential GPS used to improve accuracy

## Imagery for GIS

### Secondary Geographic Data Capture

- Data collected for other purposes can be converted for use in GIS
- Raster conversion
- Scanning of maps, aerial photographs, documents, etc
- Important scanning parameters are spatial and spectral (bit depth) resolution

## Data transformation

Functions to transform a layer of one feature type to another.

or

Spatial analyses between different data (stored in different layers)

Some examples: – Point to line: interpolation (contour mapping)

- Point to polygon: buffering –

Polygon to polygon: dissolve/merge

## Point-in-Polygon and Line-In-Polygon

- ✓ Point-in-Polygon is a topological overlay procedure which determines the spatial coincidence of points and polygons.
- ✓ Points are assigned the attributes of the polygons within which they fall.
- ✓ Line-in-Polygon is a spatial operation in which lines in one coverage are overlaid with polygons of another coverage to determine which lines, or portions of lines, are contained within the polygons.
- ✓ Polygon attributes are associated with corresponding lines in the resulting line coverage.

## Geometric Transformations

This function is concerned with the registering of a data layer to a common coordinate scheme. This usually involves registering selected data layers to a standard data layer already registered. The term *rubber sheeting* is often used to describe this function. Rubber sheeting involves stretching one data layer to meet another based on predefined control points of known locations. Two other functions may be categorized under geometric transformations. These involve *warping* a data layer stored in one data model, either raster or vector, to another data layer stored in the opposite data model.

## Map Projection Transformations

This functionality concerns the transformation of data in geographic coordinates for an existing map projection to another map projection. Most GIS software requires that data layers must be in the same map projection for analysis. Accordingly, if data is acquired in a different projection than the other data layers it must be transformed. Typically 20 or more different map projections are supported in a GIS software offering.

# Topic No: 06 Visualization of spatial data, layers and projections

## Spatial Data

Spatial Data is the data or information that identifies the geographic location of features and boundaries on Earth, such as natural or constructed features oceans, and more.

Spatial data is usually stored as coordinates and topology, and is the data can be mapped.

## Characteristics of Spatial Data

- ✓ "Mappable" characteristics:
  - Location (coordinate system)
  - Size is calculated by the amount (length, area, perimeter) of the data
  - Shape is defined as shape (point, line, area) of the feature
- ✓ Discrete or continuous
- ✓ Spatial relationship

## Nature of spatial data:

- ✓ Spatially referenced data "georeferenced"
  - ➢ "Attribute" data associated with location.
- ✓ Example: spatial objects
  - ➢ **Points:** x, y coordinates
    - Cities stores, crimes, accidents.
  - ➢ **Lines:** arcs, *from* node *to* node
    - Road network, transmission lines
  - ➢ **Polygons:** series of connected arcs
    - Provinces, cities, census tracts

## Point Spatial Data:

- ✓ A point is a 0 dimensional object and has only the property of location (x, y)
- ✓ Points can be used to Model features such as a well, building, power, pole, sample location etc.
- ✓ Other name for a point are vertex, node.

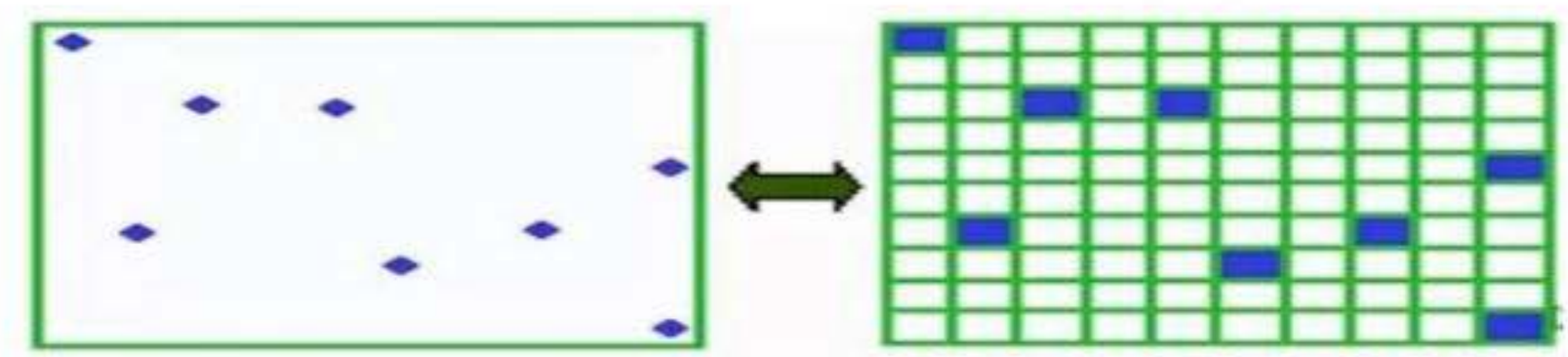

**Fig No: 08 Shows the Point Spatial Data**

## Line Spatial Data:

- ✓ A line is a one dimensional object that has the property of length.
- ✓ Lines can be used to represented road, streams, faults, maker beds, boundary, contacts etc.
- ✓ In an arc info coverage an arc starts with a node, has zero of more vertices, and ends with a node.

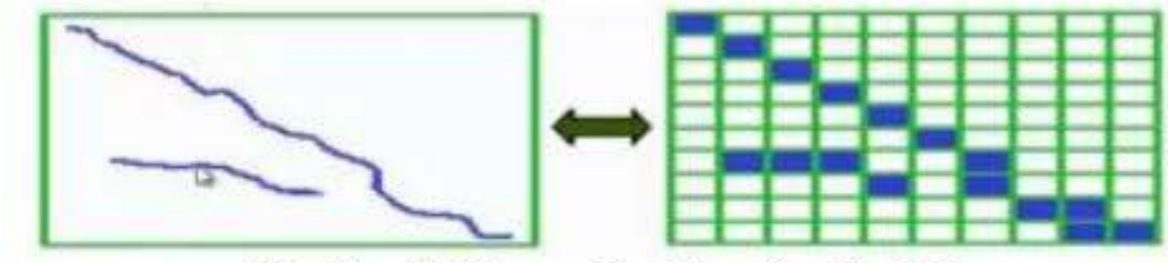

**Fig No: 09 Shows the Line Spatial Data**

## Polygon Spatial Data:

- ✓ A polygon is a two dimensional object with properties of area and perimeter.
- ✓ A polygon can represent a city, geologic formation, lake, river, etc.
- ✓ Other names for polygons are face and zone.

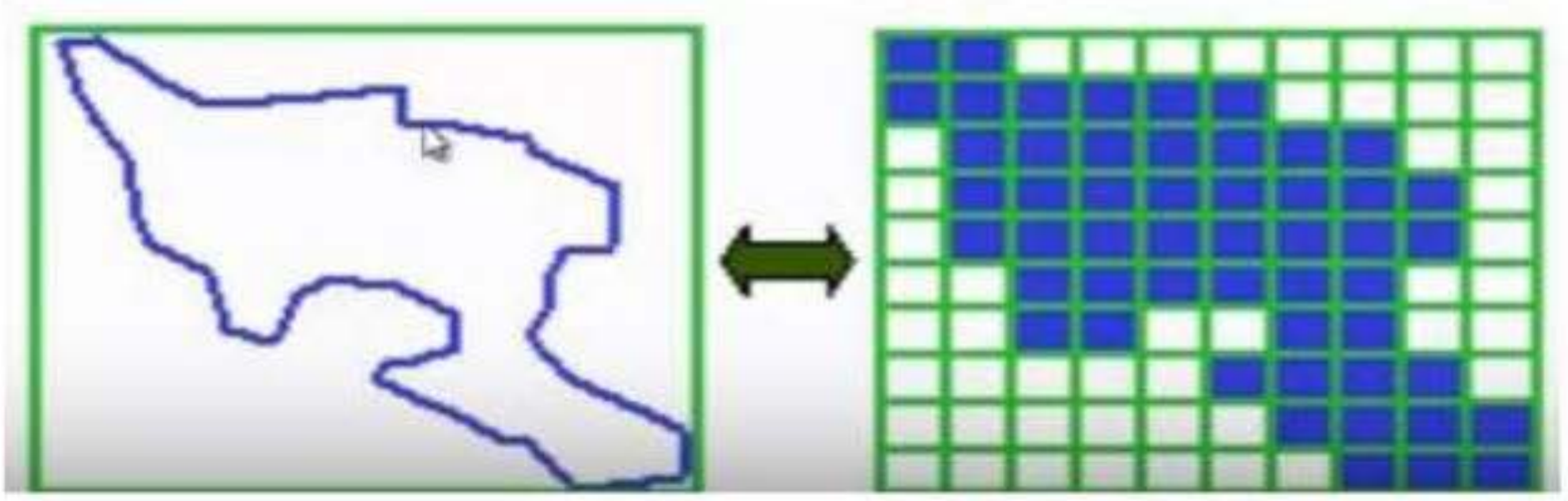

**Fig No: 10 Show the Polygon Spatial Data**

## Three Classes of Spatial Data

1. Geo statistical Data
    - Points as sample locations ("field" data as opposed to "objects")
    - Continuous variation over space
2. Lattice/ Regional Data
    - Polygons or points (centroids)
    - Discrete variation over space, observations associated with regular or irregular areal units.
3. Point patterns
    - Points on map (occurrences of events at locations in space)
    - Observation of a variable are made at location X
    - Assumption that spatial arrangement is directly related to the interaction between units of abservation

## Geostatistical Data:

- ✓ Spatial Process
  - Index set D is fixed subset of $R_d$ (continuous)
- ✓ Data
  - Sample points from underlying continuous surface
  - Example: mining, air quality, house sales price.

## Point patterns:

- ✓ Spatial process
  - Index set D is point process, s is random
- ✓ Data
  - Mapped pattern
  - Example: location of disease, gang shootings
- ✓ Research question
  - Interest focuses on detecting absence of spatial randomness (cluster statistics)

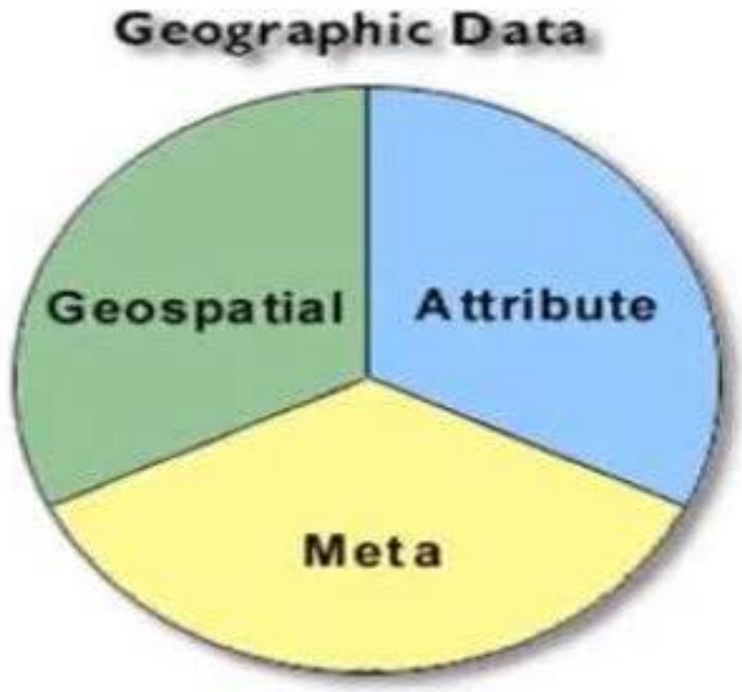


**Fig No: 11 Geographic data**

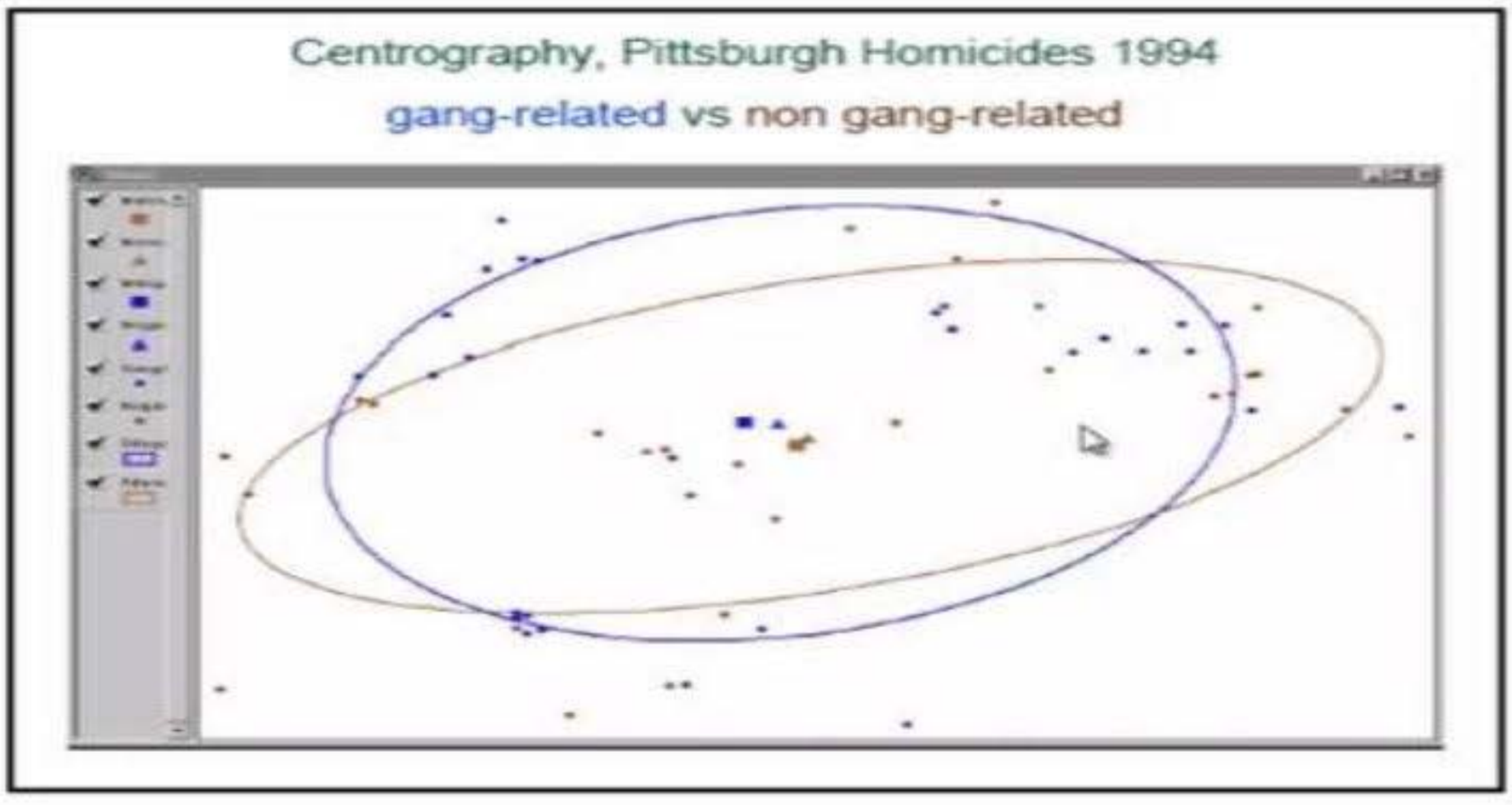


**Fig No: 12 show the gang related v/s Non gang related**

## Lattice or Regional Data:

- ✓ Spatial process
  - Index set D fixed collection of countably many points in Rd
  - Finite, discrete spatial units.
- ✓ Data
  - Fixed points or discrete location (region)
  - Example: county tax rates, state unemployment
- ✓ Research question
  - Interest focuses on statistical inference
  - Estimation, specification tests.

## Visualization of Spatial Data

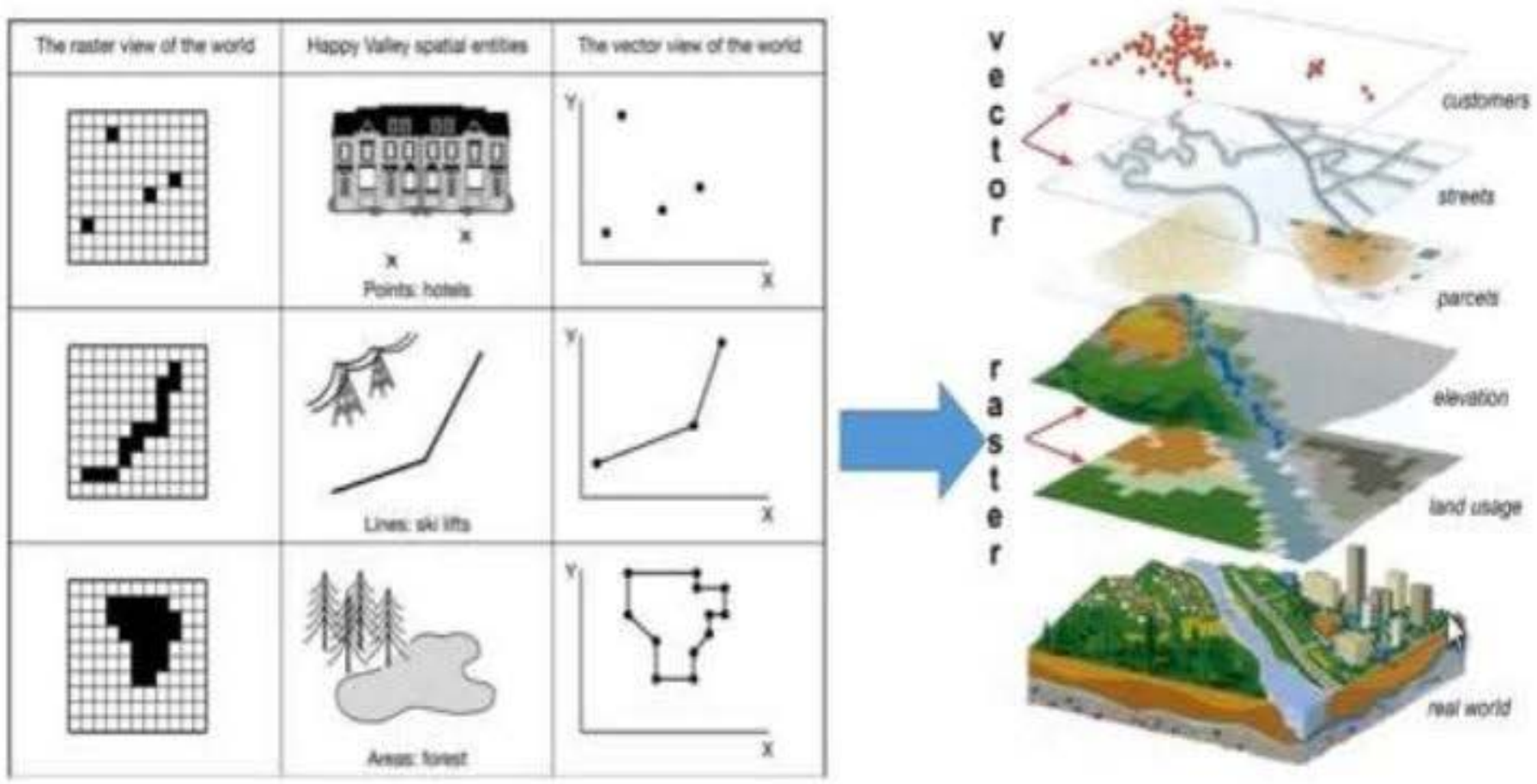


**Fig No: 13 show the Visualization of spatial data**