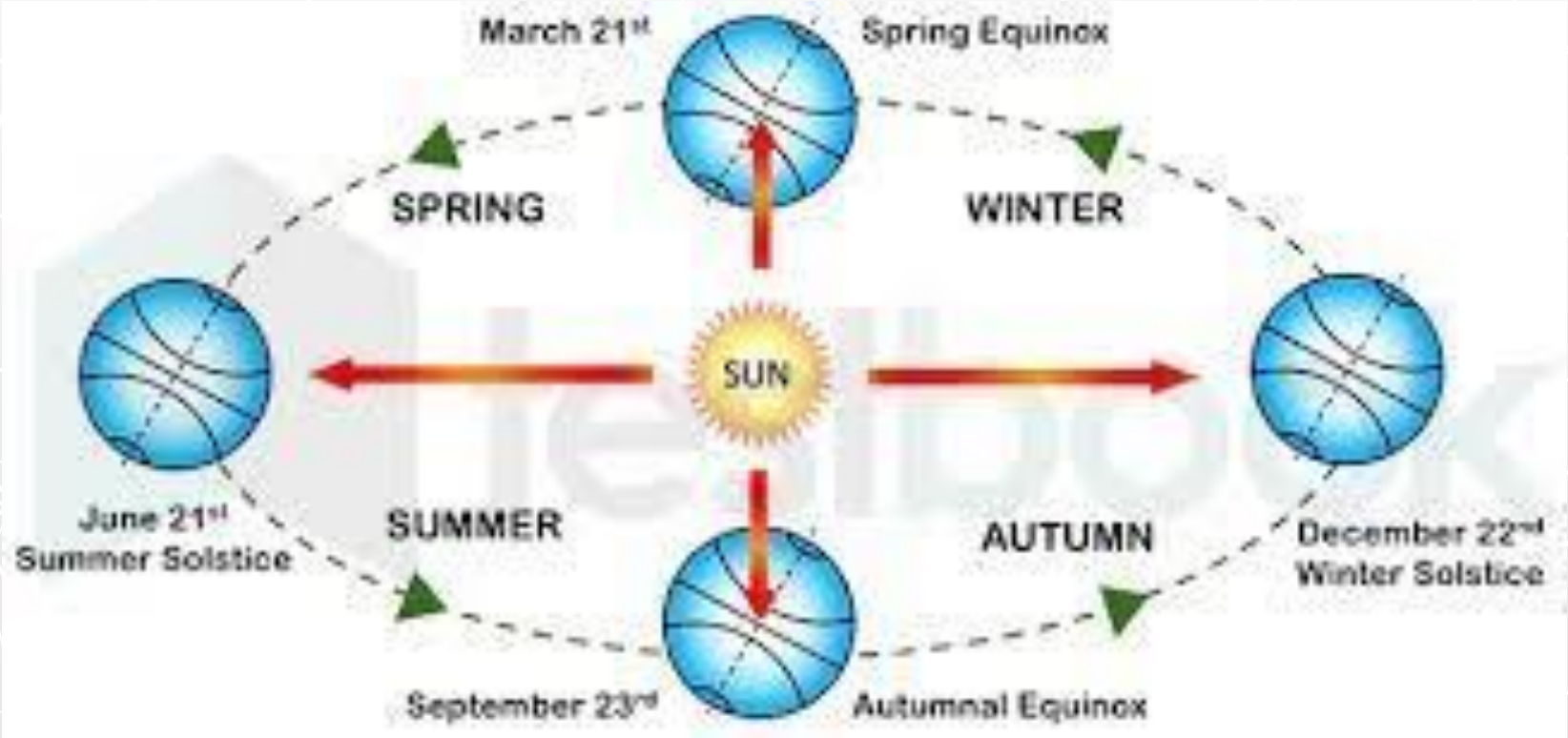
Surveying

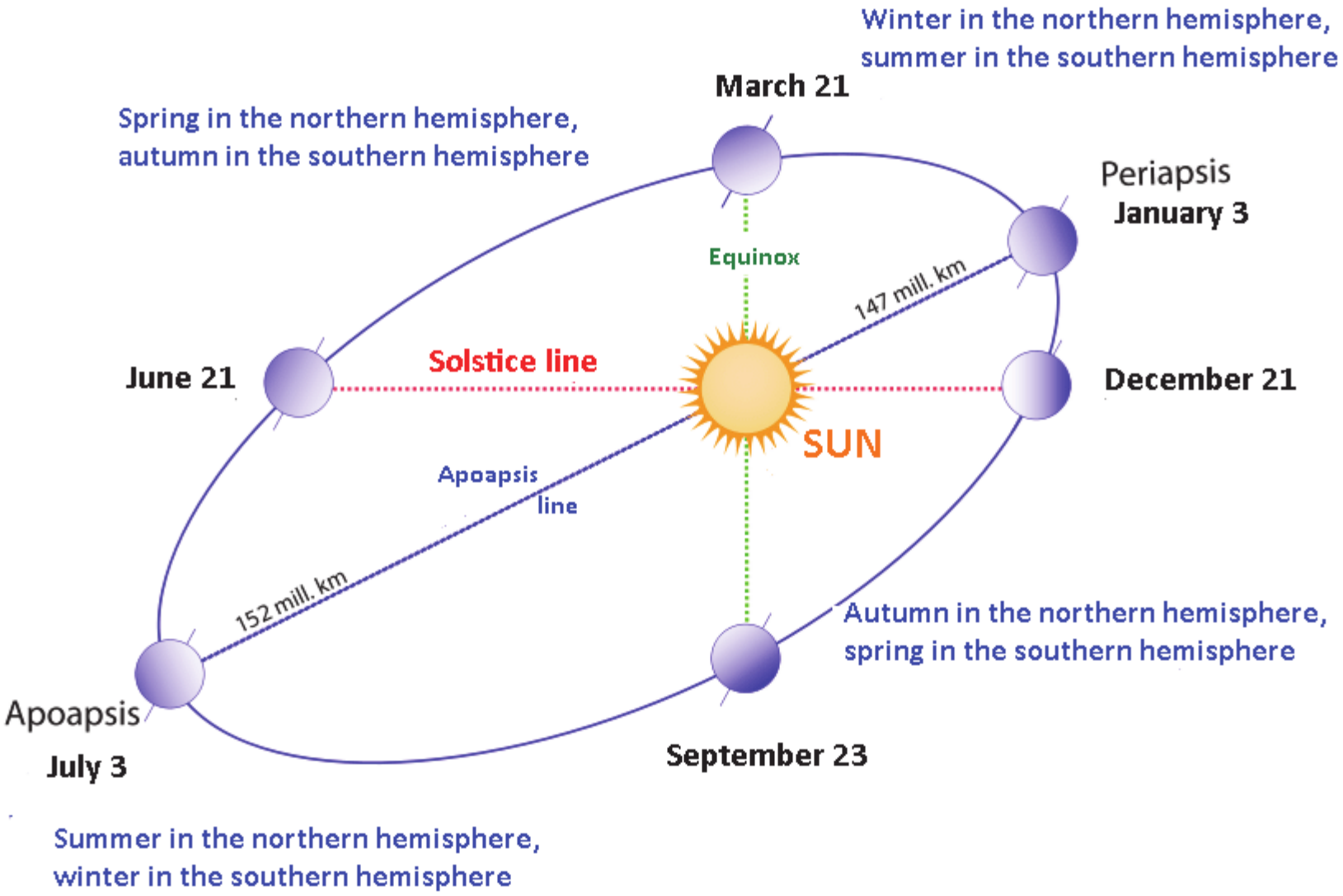
GIS

Revolution of Earth:

- Earth revolves in orbit around the Sun in 365 days, 6 hours, 9 minutes with reference to the stars, at a speed ranging from 29.29 to 30.29 km/s.

- The 6 hours, 9 minutes adds up to about an extra day every fourth year, which is designated a leap year, with the extra day added as February 29th.




Winter in the northern hemisphere,
summer in the southern hemisphere
March 21
Spring in the northern hemisphere,
autumn in the southern hemisphere
Periapsis
January 3
Equinox
147 mill. km
Solstice line
June 21
December 21
SUN
Apoapsis
line
152 mill. km
Autumn in the northern hemisphere,
spring in the southern hemisphere
Apoapsis
July 3
September 23
Summer in the northern hemisphere,
winter in the southern hemisphere

GIS

Today we are going to discuss:

- What is GIS?
- GIS data.
- Linking data to real world.
- Types of Vector data
- Common problems in handling geophysical information.
- Benefits of implementation of GIS
- Areas of GIS application.

Definition of GIS:

- Geographic Information System (GIS), or Geographical Information System.

- **Captures**, stores, analyzes, manages, and presents **data that is linked to location.**

- Includes **mapping software** and its **application.**

Application of capturing information for GIS includes:

- Remote sensing,
- Land surveying,
- Aerial photography,
- Photogrammetry,
- Geography etc.

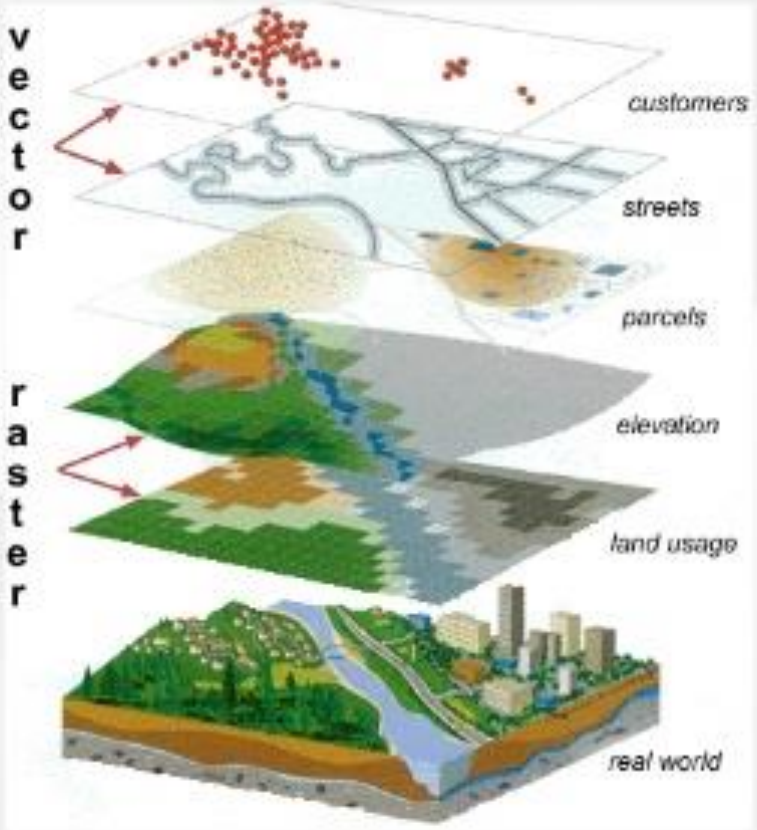
Tools that can be implemented with GIS software.

GIS FUNCTIONS

CAPTURE

STORE

QUERY



ANALYZE

DISPLAY

OUTPUT

What is Query?

- A **query** is a **layer** or **stand-alone table** that is defined.

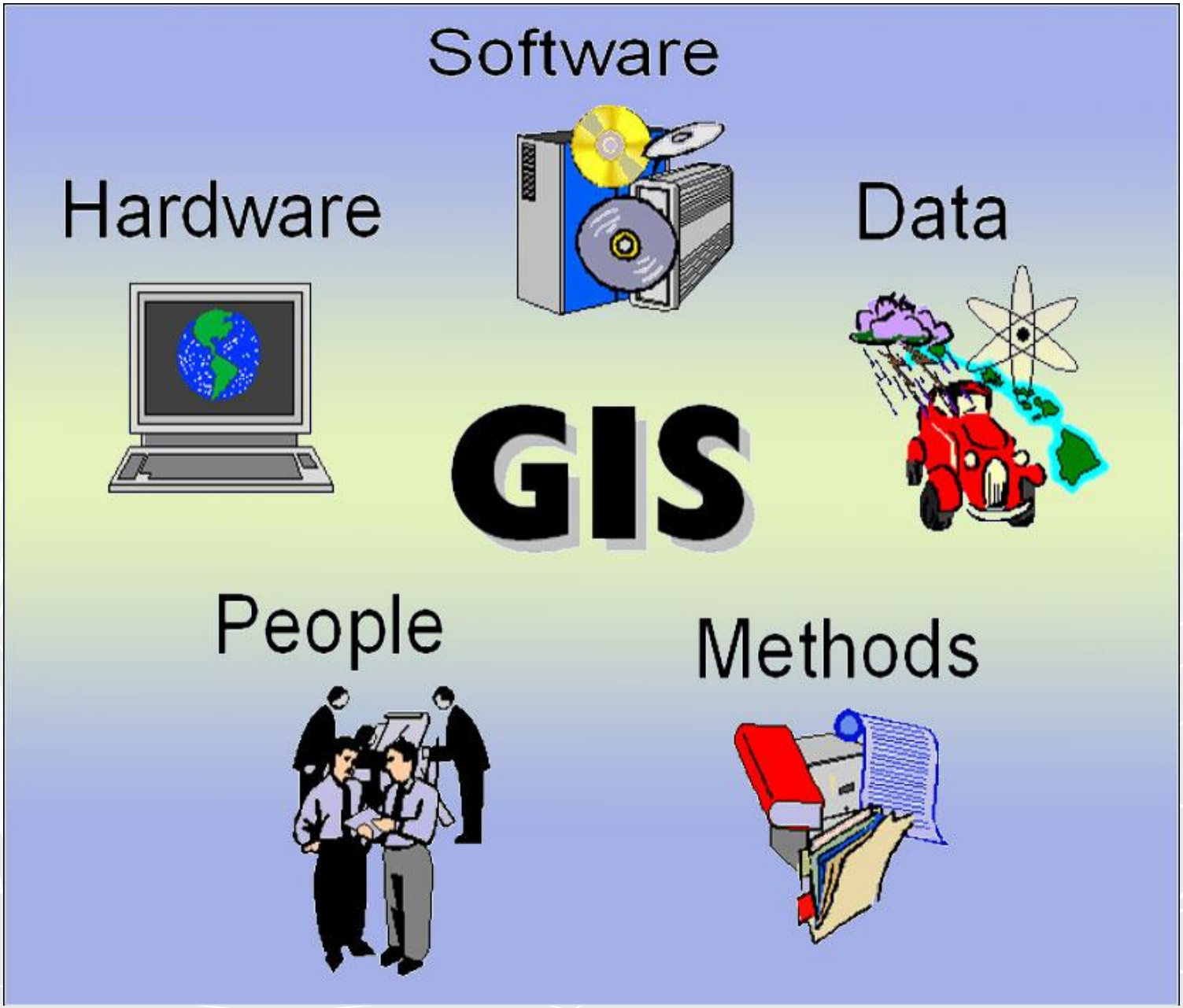
- **Query** allow **both spatial and non-spatial information** stored in a database to be **easily integrated into GIS projects** within ArcGIS Pro.

Spatial and non spatial data:

- Spatial data that are **directly or indirectly referenced to a location** on the surface of the earth.

- Non spatial data **cannot be related to a location** on the surface of the earth.

Components of GIS



Components of GIS:

Hardware: Includes **computer and operating system** to run GIS. Additional equipments may include: monitors for display, digitizer and scanner for spatial data input, and printers and plotters for hardcopy data display.

GIS Software: **GIS software** lets you **produce maps** and other **graphic displays** of geographic information for analysis and presentation.

Infrastructure- refers to the necessary physical, organizational, administrative environments for GIS operations.

GIS data

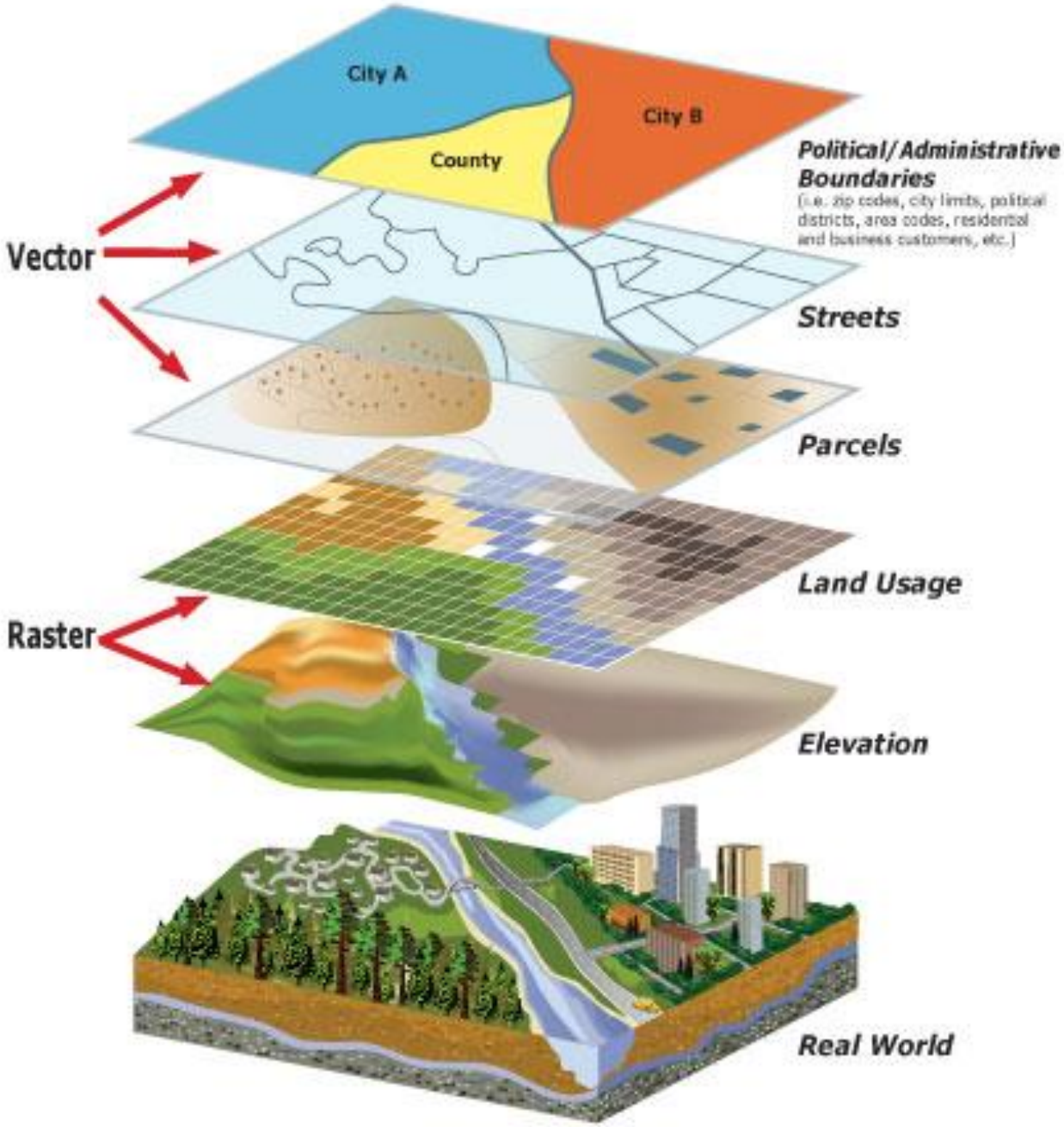
GIS to **handle and process different types of data.**

Spatial/Geospatial Data:

- Data set have **locational information tied to them** such as geographic **data** in the form of coordinates, address, city.

Any data **related to or containing information about a specific location** on the earth surface.

- Can **exist in a variety of format**.
- **Contain just location** specific information.

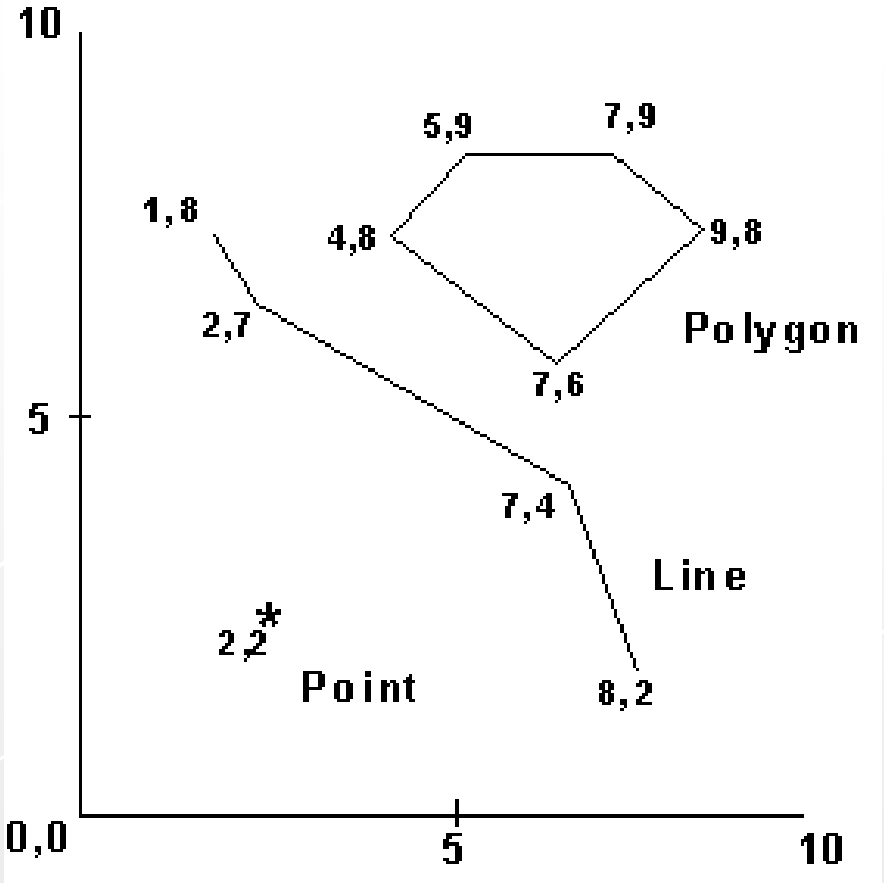

City A
City B
County
Political/Administrative Boundaries
(i.e. zip codes, city limits, political districts, area codes, residential and business customers, etc.)
Vector
Streets
Parcels
Land Usage
Raster
Elevation
Real World

Vector Data:

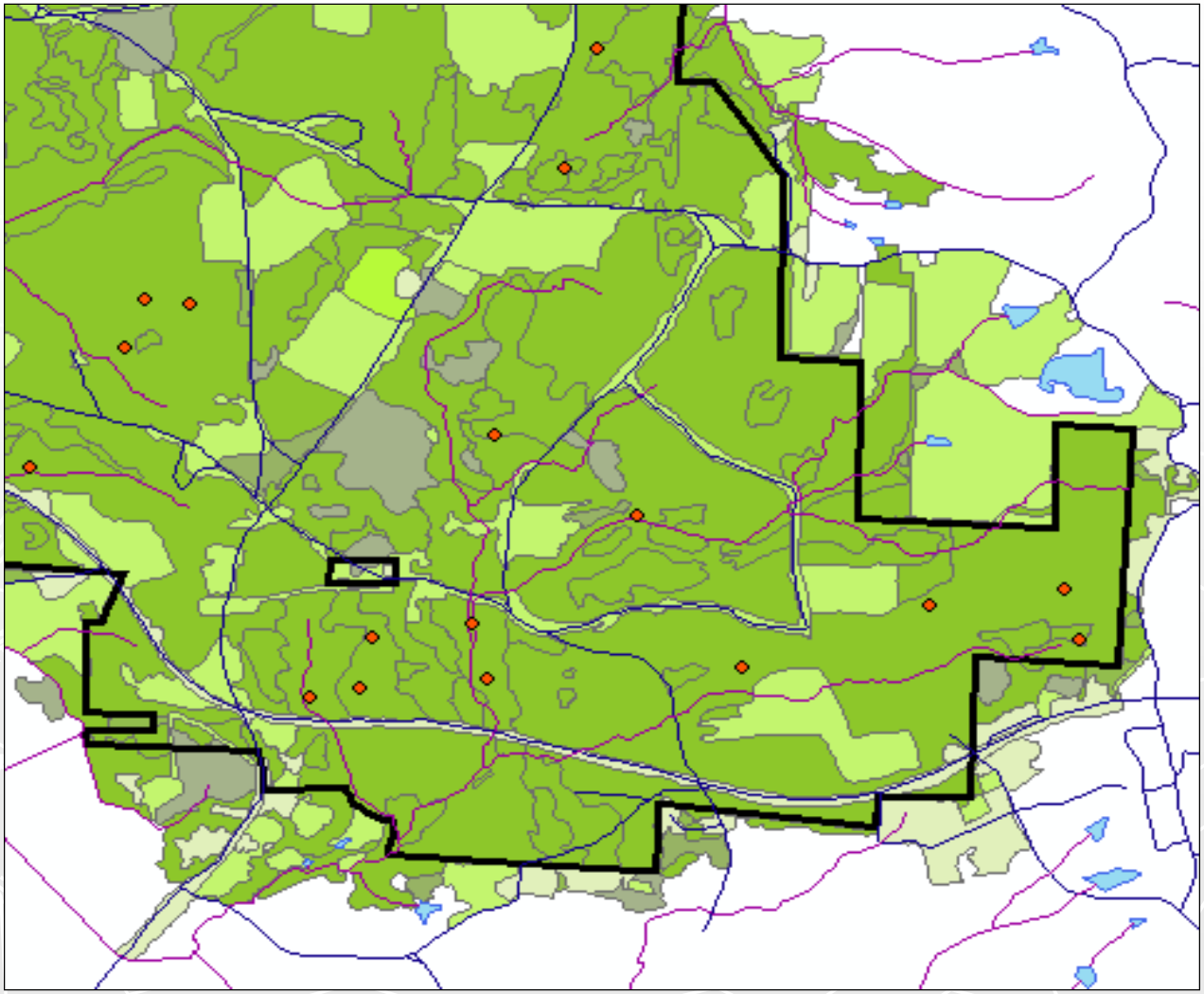
- **Geographical representation** of real world.
- Three main types: **points, lines and polygons**.
- Best used to **present generalization of objects or features** on the earth's surface.

Vector Data Model

- Geographic features are represented by **points, lines, and polygons**
- Points, lines and polygons are **defined by a set or sets of ordered and connected x,y coordinates**
- Used to **represent discrete objects** over the space



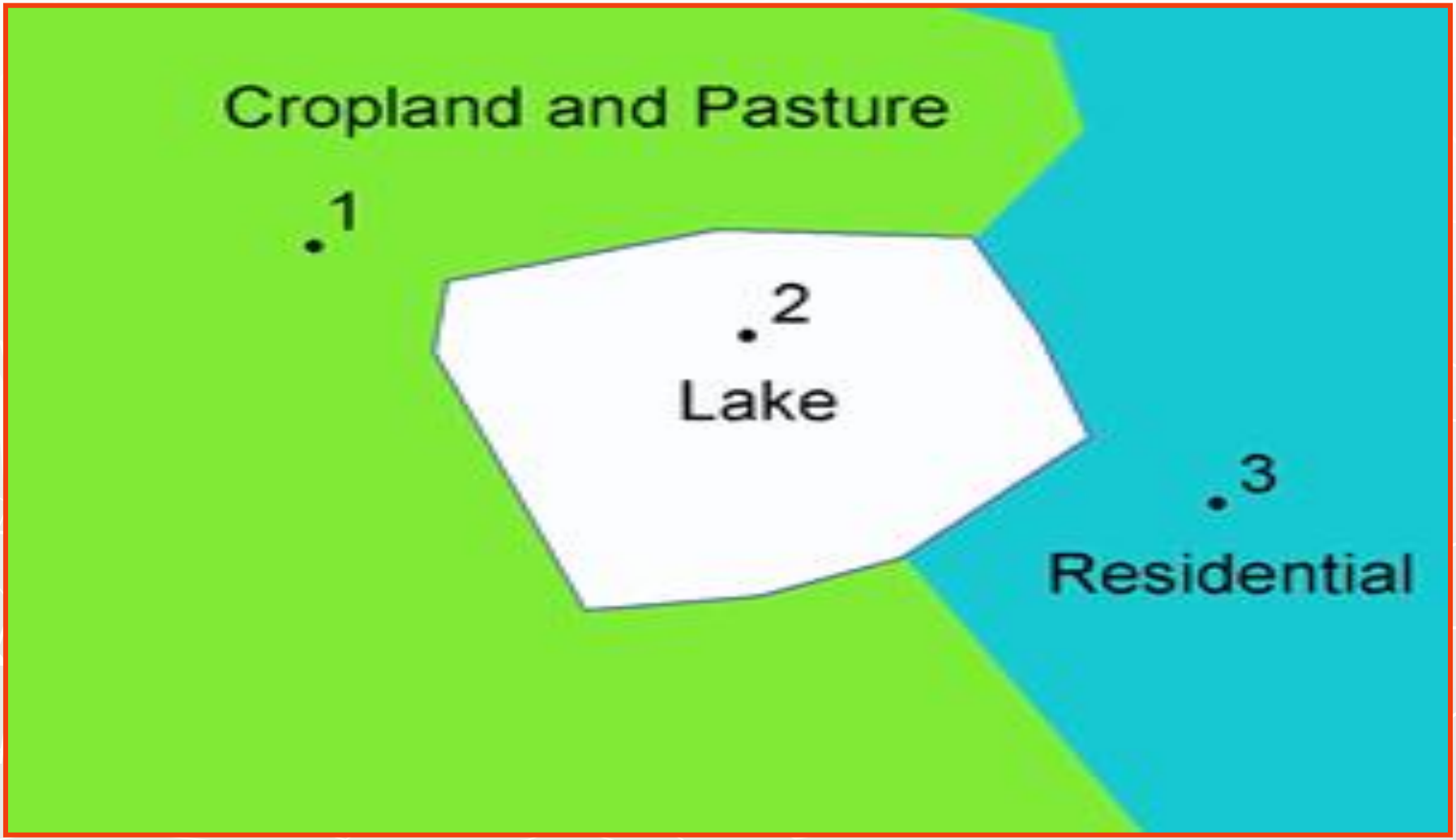
Vector Data



What are the discrete features?

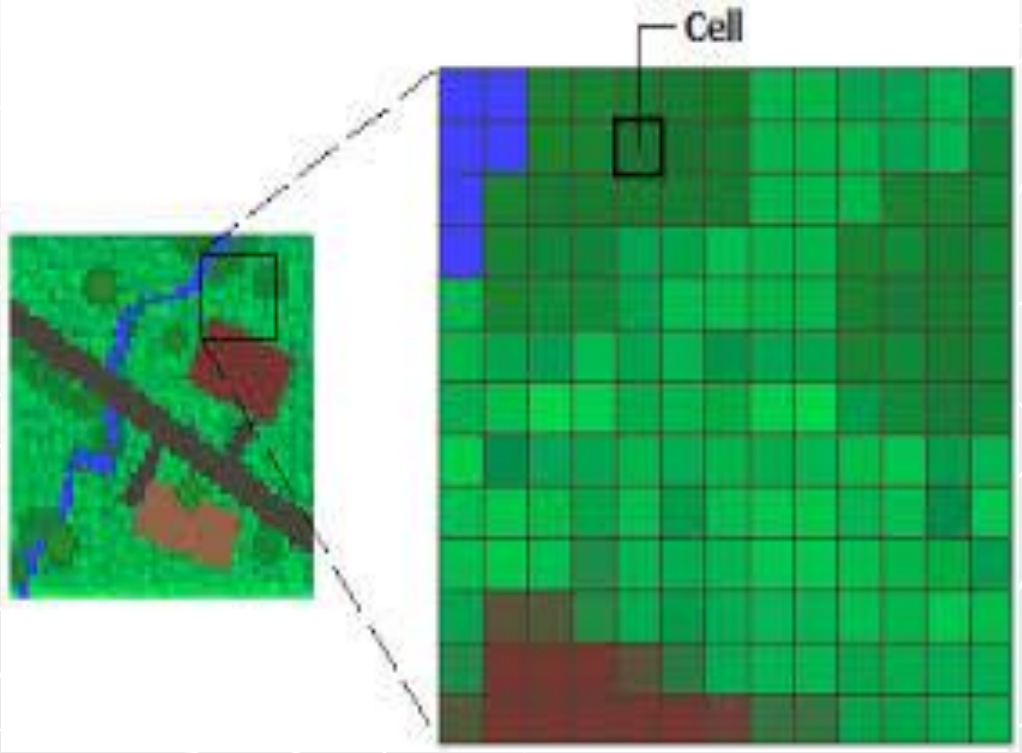
-Have definite **boundaries and identity**.

-Examples-Houses, farm land, towns, Pasture (land used for grazing) etc.

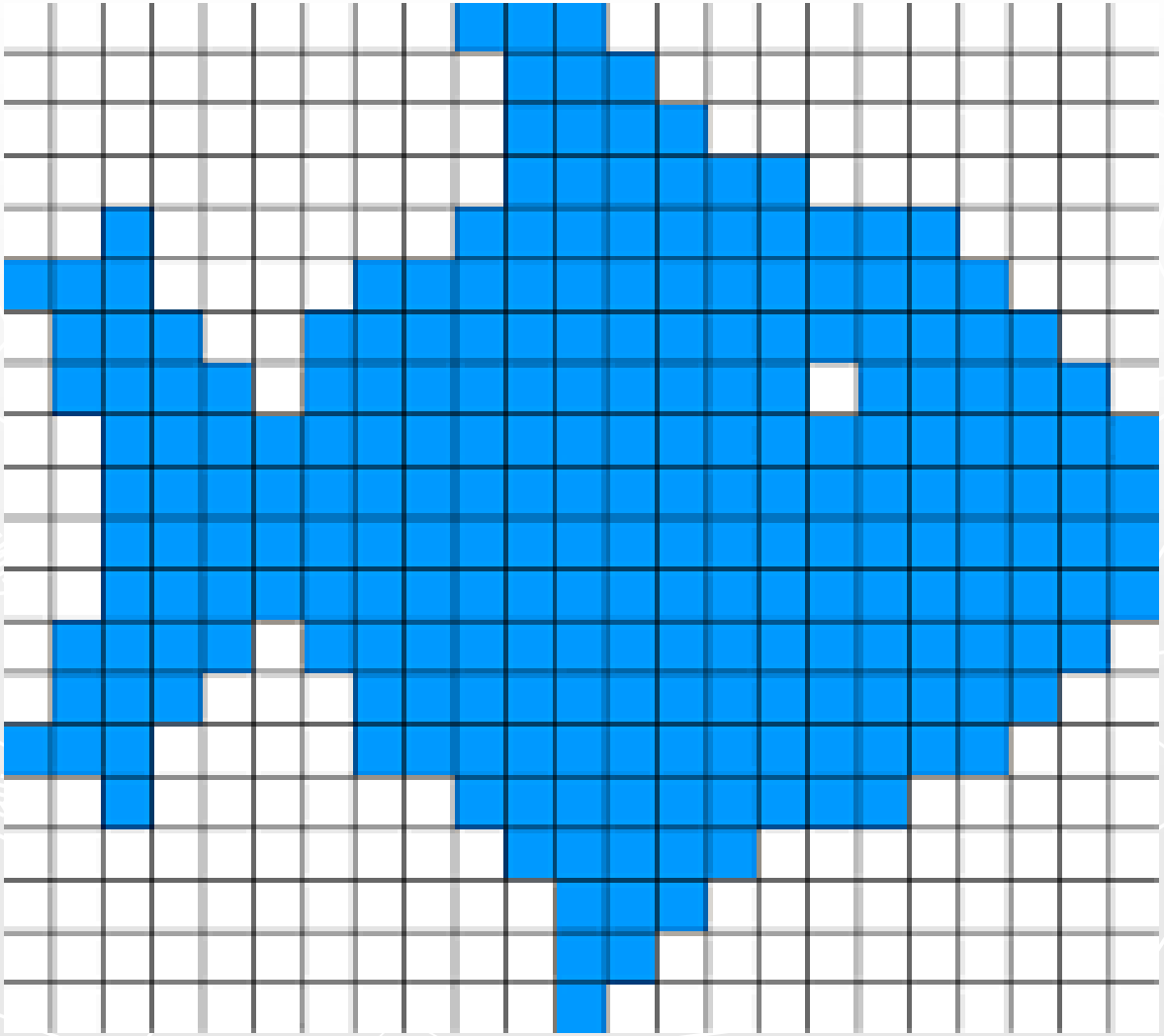


Raster Data:

- Data is presented in **a grid of pixels**.
- **Each pixel with a raster has a value**, whether it be **color or unit of measurement.**
- **Represent continuous features** like precipitation, elevation, temperatures etc.



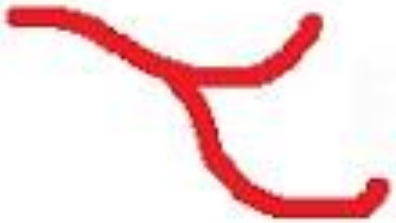
Raster: Are **spatial data models** that define space as an **array of equally sized cells,** arranged in rows and columns, and composed of single or multiple bands.



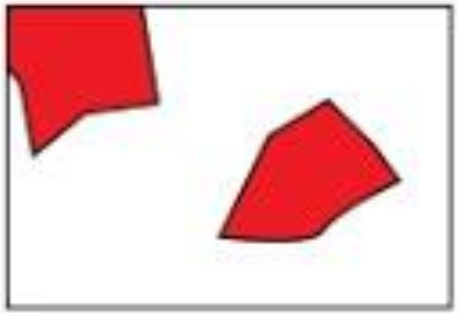
Vector



Points

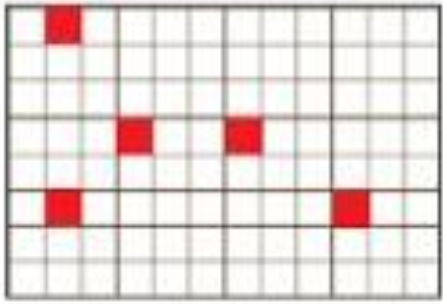


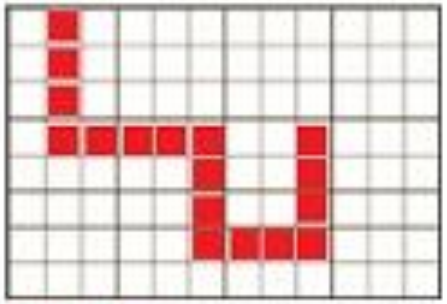
Lines

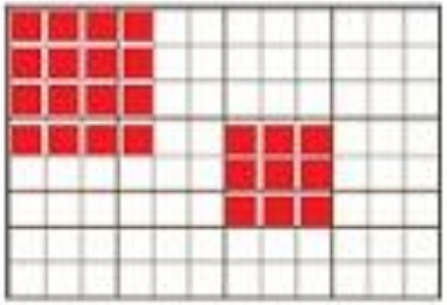


Areas

Raster





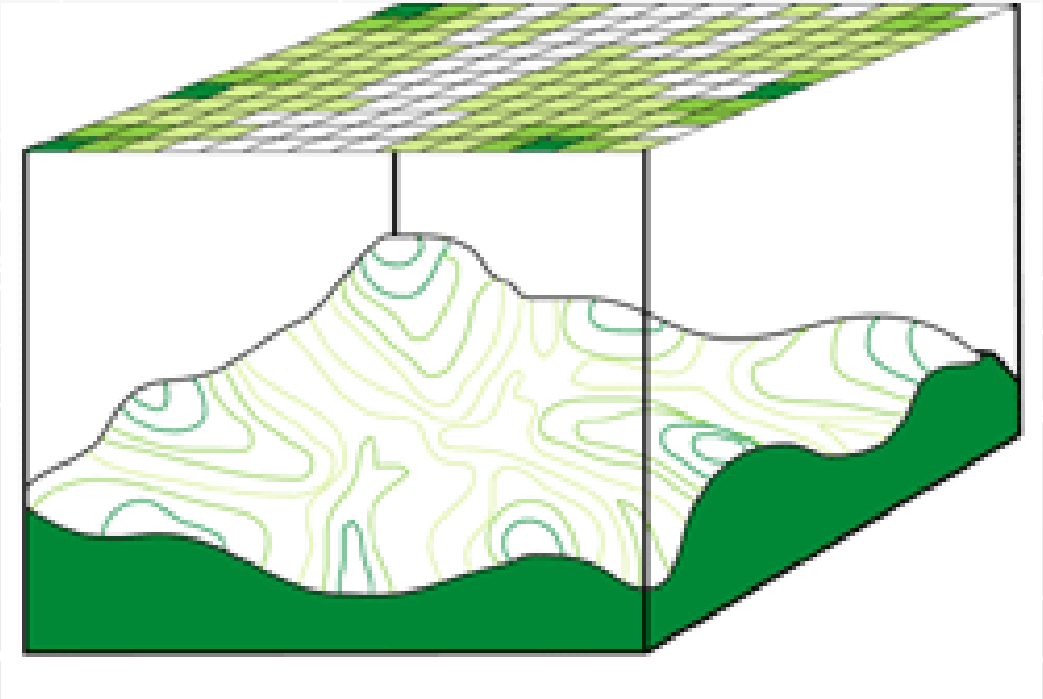


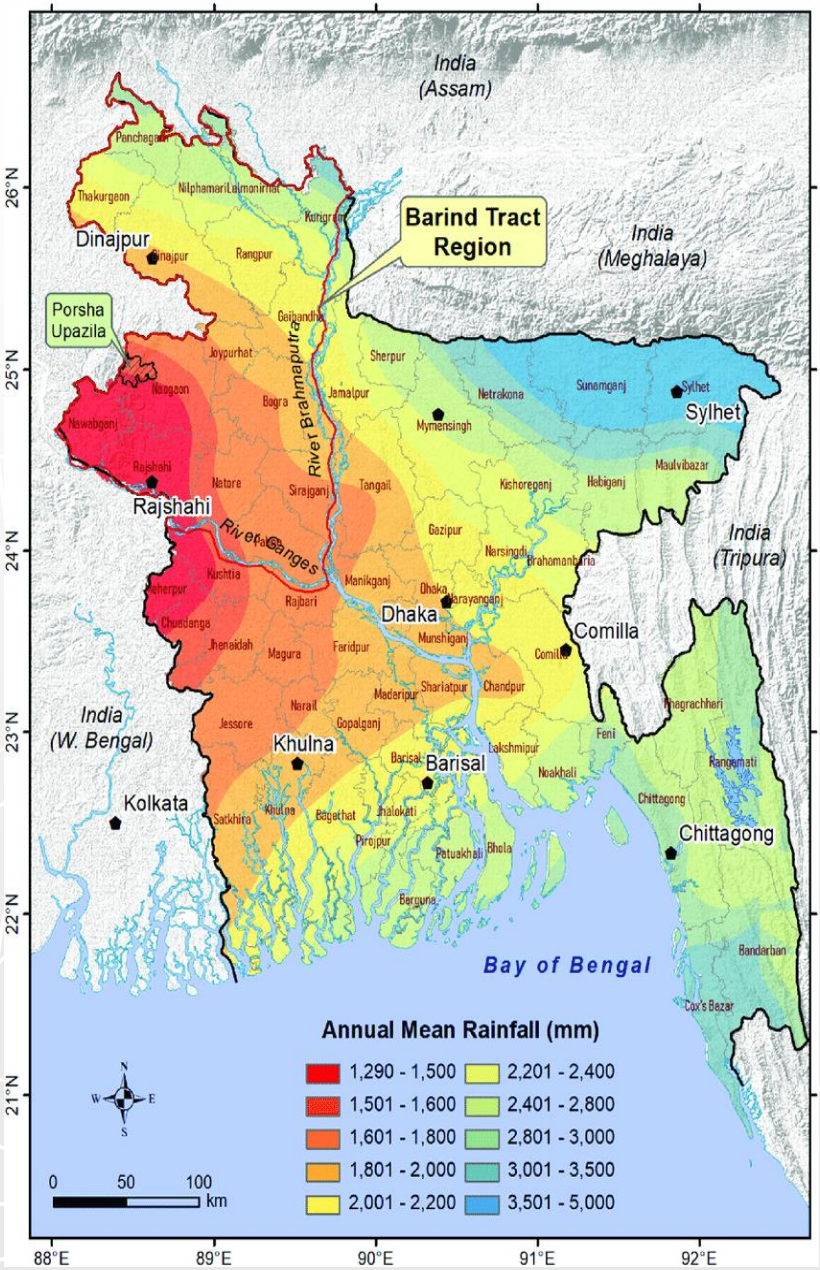
© Buzzle.com

Continuous Features:

Has **no defined border** or **distinctive value,** instead, a **transition from one value to another**.

Example- temperature, elevation, rainfall etc.





Attribute Data:

- **Contain more information than just a location** on the surface of the earth.

- Any **additional information or non spatial data** that **describe the features**.

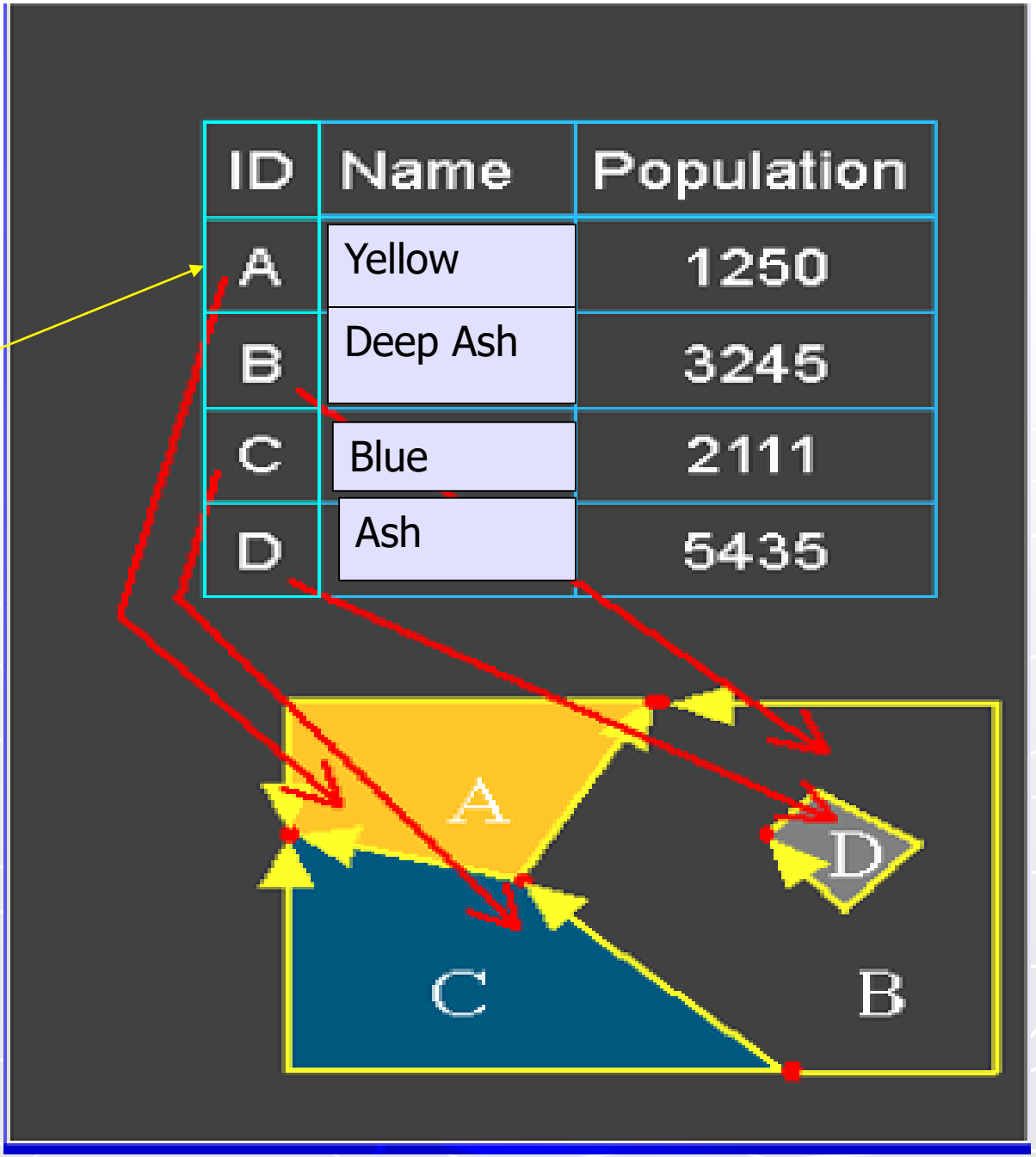
- Spatial data can have **any amount of attribute** ie **accompanying information about the location**.

- **Attribute data** is defined as information used to **create control charts.**

Example: Map of **displaying buildings may have attributes** like **type** of houses, **year** of construction etc.

Attribute Data

Control chart



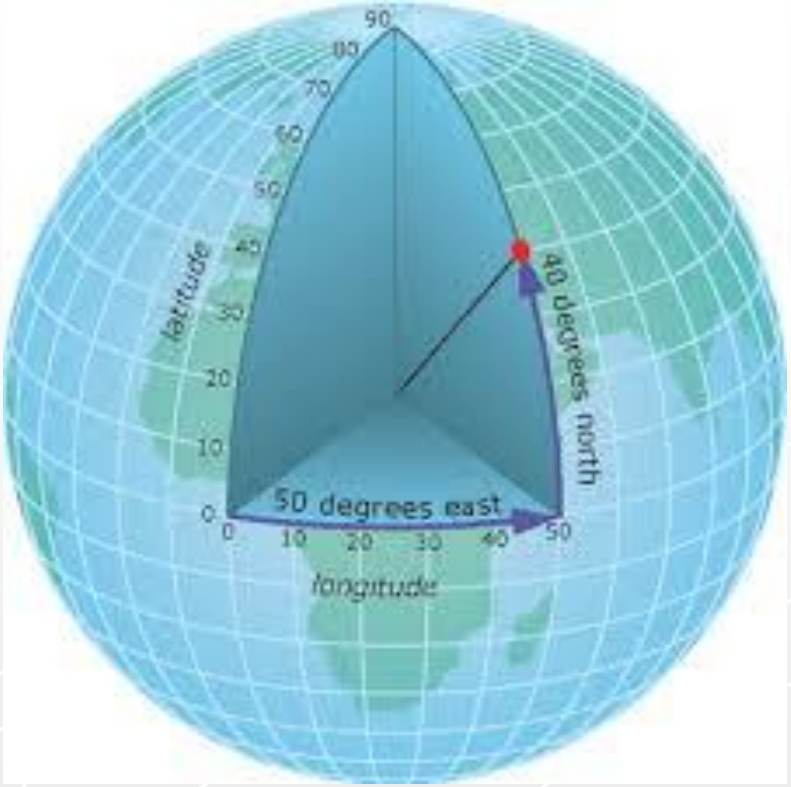
Linking Data to Real World:

Geographic coordinate System:

- **Lines of Latitude** (run east-west) and longitude (run north south).

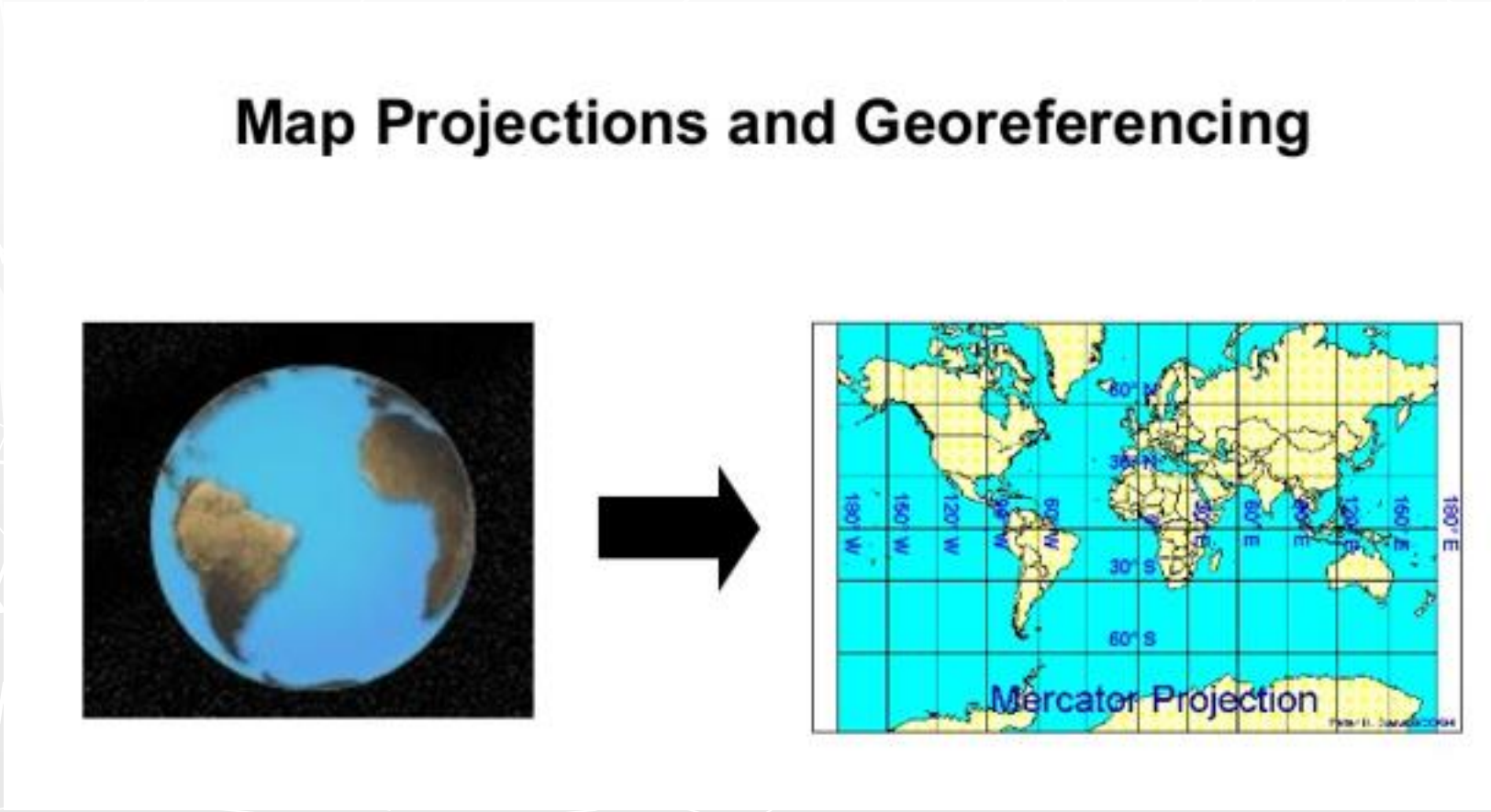
- **Represents angles** at which lines are oriented with respect to the center of the earth.

- unit of measurement is **degree.**



Geo-referencing:

- Geo-referencing means that the **internal coordinate system of a map or aerial photo image** **can be related to a geographic coordinate system.**



- **Adding geographic information to the image,**

- So that **GIS or mapping software** can **'place' the image in its appropriate real world location**.



Geocoding:

- **Process of taking input text**, such as an address or the name of a place, and

- **Returning a latitude/longitude location** on the Earth's surface for that place.



Vectors: Simple & Higher-Level Data

Simple Vector Data:

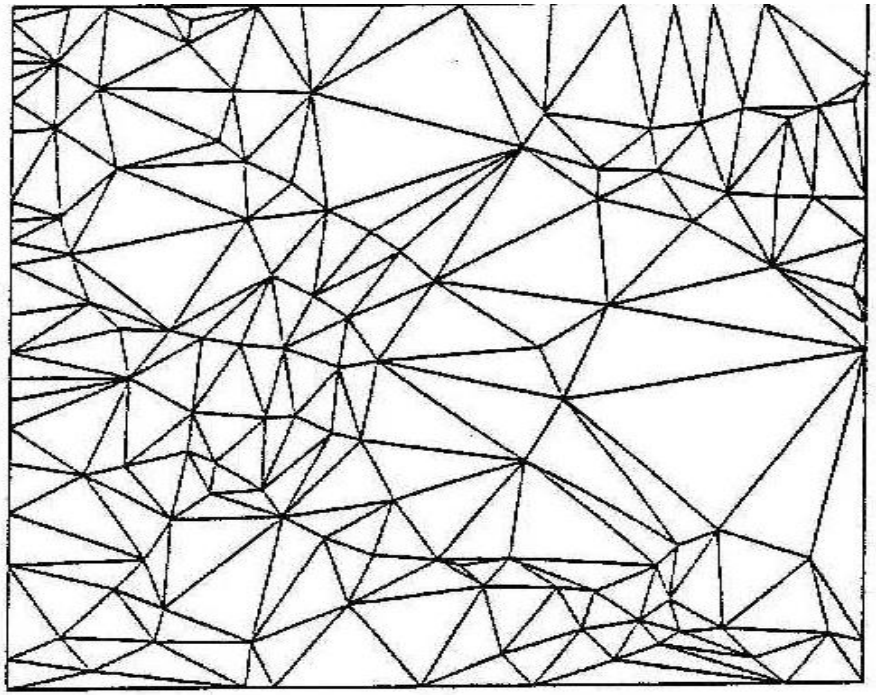
- Consists of point, line and polygon

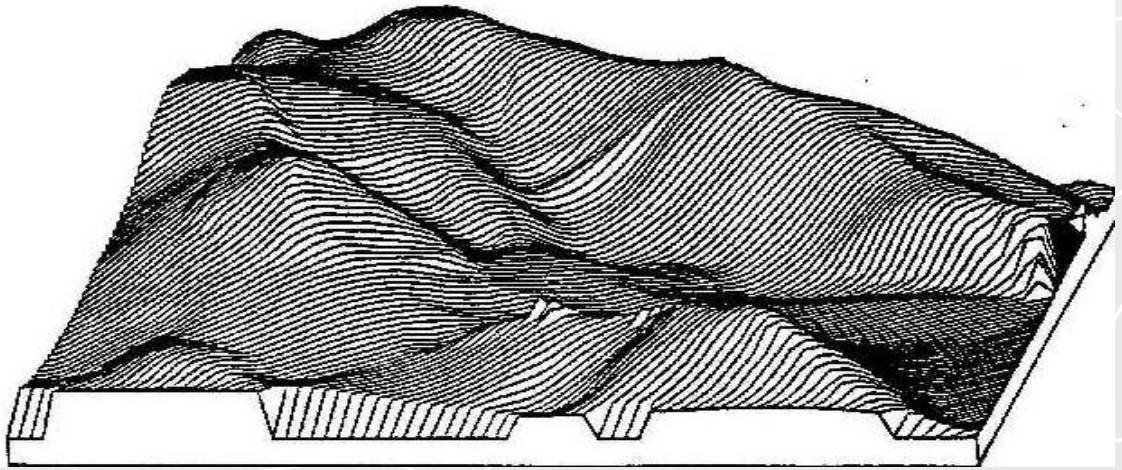
Higher-Level Vector Data

Triangulated Irregular Network (TIN):

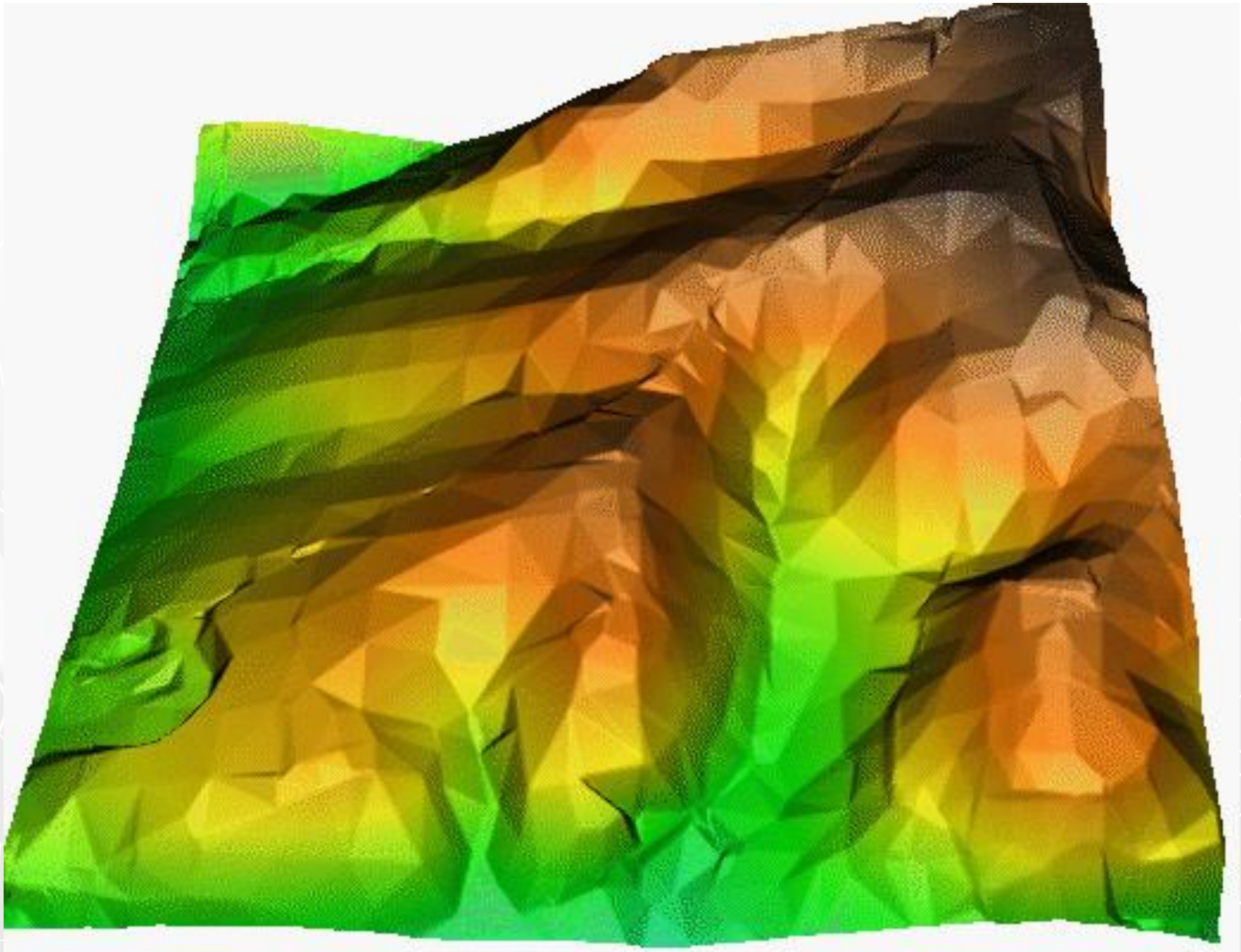
- Approximates terrain with a **set of non-overlapping triangles.**
- Each triangle **consists of points and edges**.
- These **points to form triangles**

Triangulated Irregular Network (TIN)





TIN

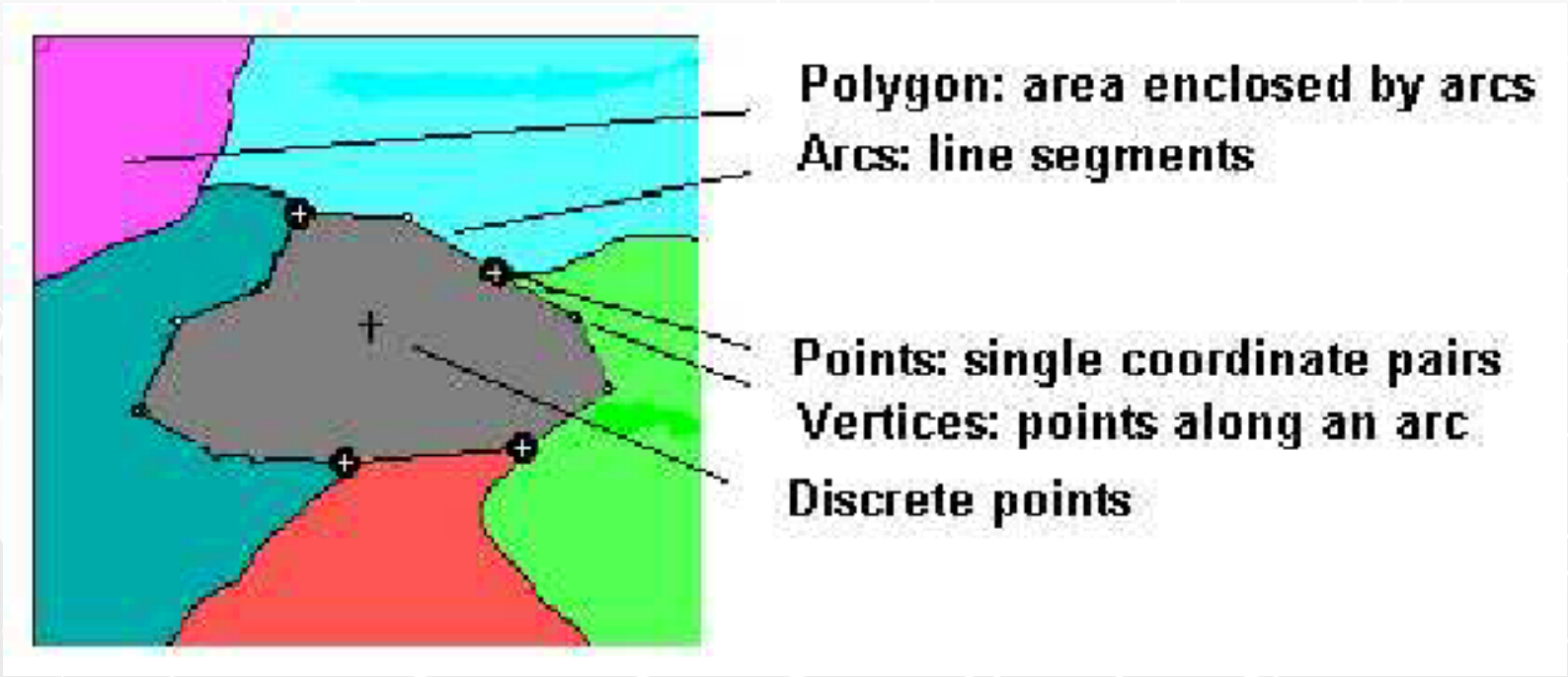


Vectors: Higher-Level Data

Region:

- **Collection of polygons**, which may or may not be connected.

- Regions **may overlap with one another or form a nested shape**



Vectors: Higher-Level Data

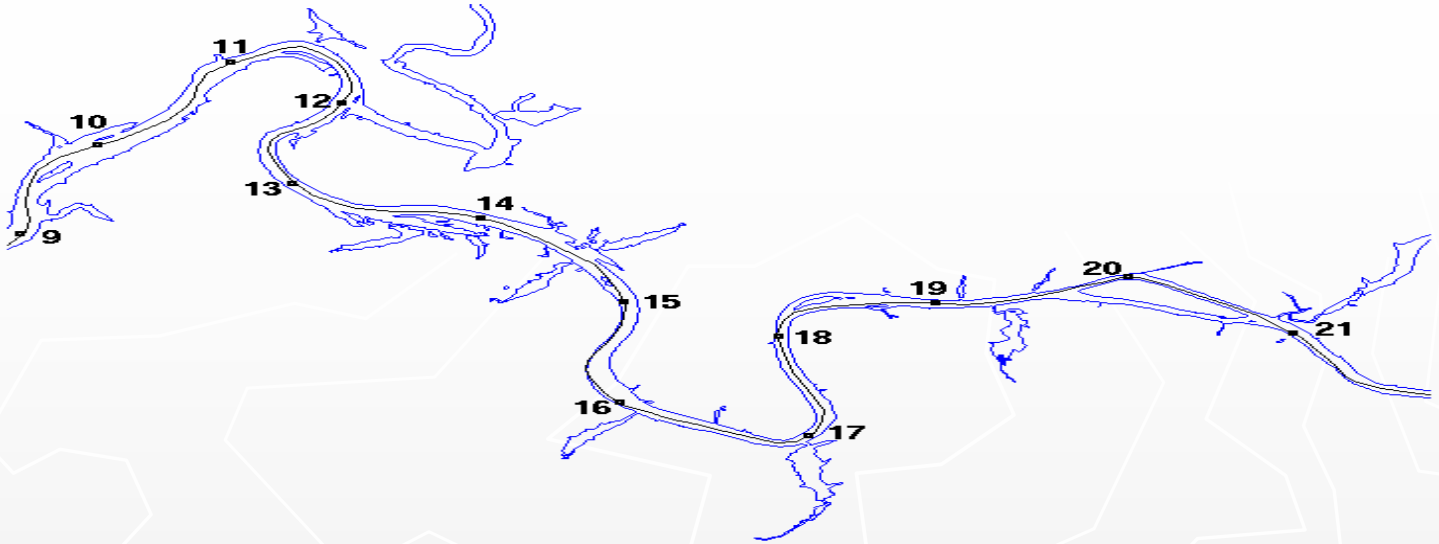
Dynamic Segmentation:

- **Process of transforming linearly referenced data** (also known as events) that have been stored in a table; **into features** that can be **displayed and analyzed on a map**.

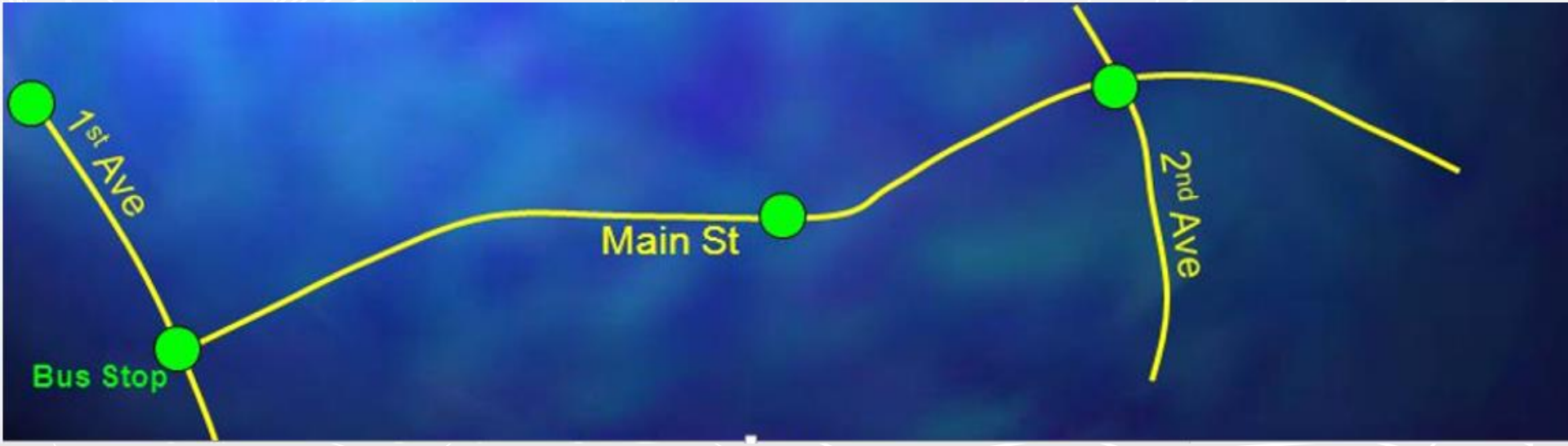
- Built upon **lines of a network** and

- Allows the use of **real-world coordinate with linear measures** such as mileposts.

Dynamic Segmentation



Events can be a point features ie. Accidents, **bus stop** or **linear features** ie pavement condition, pavement type



Problems of handling geo-spatial information:

Common problems:

- Geospatial data are **poorly maintained**.
- Maps and statistics are **out of date**.
- Data and information are **inaccurate.**
- No data **retrieval services**
- No data **sharing**.

Benefits of implementation of GIS:

- Data are **better maintained on standard format.**
- **Revision and updating are easier**.
- **Easier search, analysis and represent.**
- **More value added products**.
- Can be **shared and exchanged freely**.
- **Time and money are saved**.
- **Better decision** can be made.

Basic Functions of GIS:

- **Data acquisition and processing**: digitizing, editing etc.
- **Database management and Retrieval**: data archival, network modelling etc.
- **Spatial Management and Analysis:** overlay operations, connectivity operations etc..
- **Graphic output and visualization**: topological map, statistical map etc.

Areas of GIS Application:

- **Facilities Management**:
  -Locating underground pipes and cable; planning facilities maintenance; telecom network services et.

- **Environmental and Natural Resources Management**: Environmental impact assessment, disaster management and mitigation.

- **Street Network:** Locating houses and streets; car navigation, transportation planning etc.

- **Planning and Engineering works**: Urban planning, regional planning, development of public facilities etc.

- **Land information:** ***Taxation, zoning of land use, land acquisition etc.***

GIS

Today so far we discussed:

- What is GIS?
- GIS data.
- Linking data to real world.
- Types of Vector data
- Common problems in handling geophysical information.
- Benefits of implementation of GIS
- Areas of GIS application.

Thank You