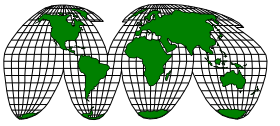
What is a GIS?

Information System

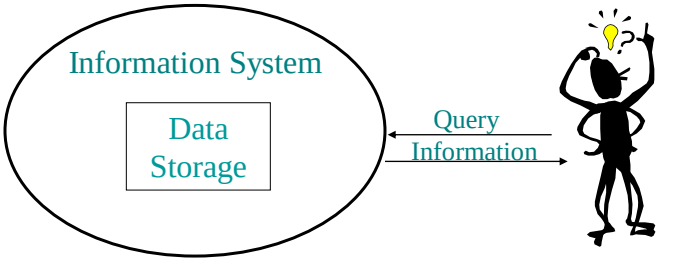
+

Geographic Position



A means of storing, retrieving, sorting, and comparing *spatial data* to support some analytic process.

What is an Information System?



Information systems can be very simple, such as a telephone directory.

What is an Information System?

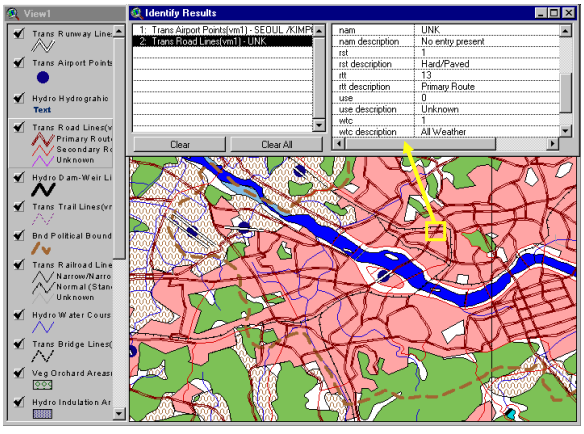
SYSTEM USED FOR:

capturing
storing
updating
manipulating
analyzing

DATA

What is a GIS?

GEOGRAPHIC Information System



GIS links graphical features (**entities**) to tabular data (**attributes**)

GIS Definition

- A GIS is a system (hardware + database engine) that is designed to efficiently, assemble, store, update, analyze, manipulate, and display **geographically referenced information** (data identified by their locations).

- A GIS also includes the **people** operating the system and the **data** that go into the system.

Data vs. Information

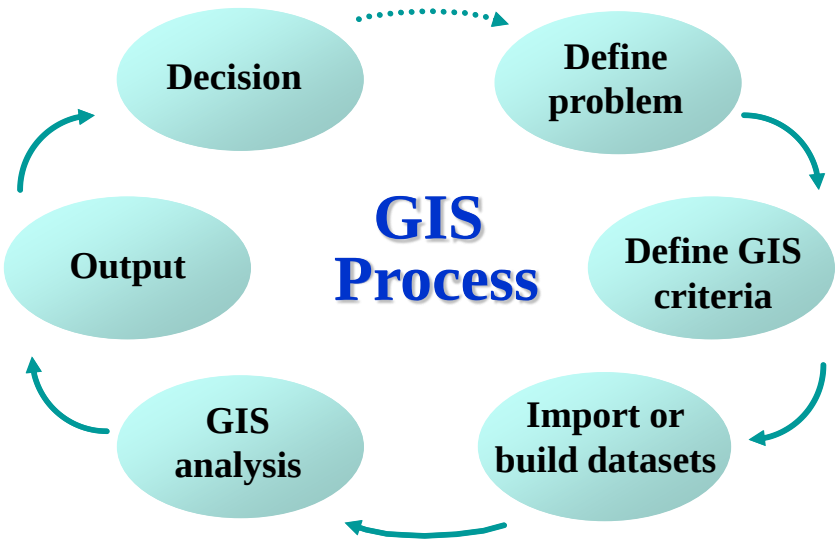
- Data, by itself, generally differs from information.
- Data is of little use unless it is transformed into information.
- Information is an answer to a question based on raw data.
- We transform data into information through the use of an Information System.

Key Functions of a GIS

Data can be:

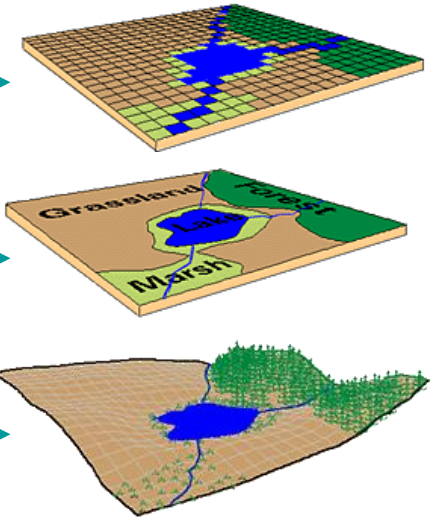
1. Positioned by its known spatial coordinates.
2. Input and organized (generally in **layers**).
3. Stored and retrieved.
4. Analyzed (usually via a Relational DBMS).
5. Modified and displayed

Geographic Information Systems



Representing Spatial Elements

- RASTER →
- VECTOR →
- Real World →



Representing Spatial Elements

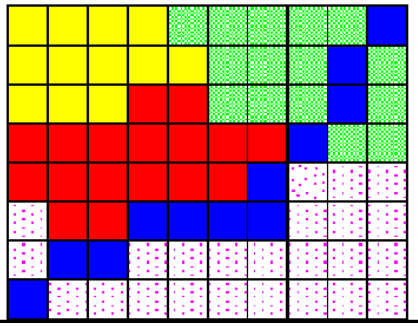
Raster

Stores images as rows and columns of numbers with a Digital Value/Number (DN) for each cell.

Units are usually represented as square grid cells that are uniform in size.

Data is classified as "*continuous*" (such as in an image), or *"thematic"* (where each cell denotes a feature type.

Numerous data formats (TIFF, GIF, ERDAS.img etc)

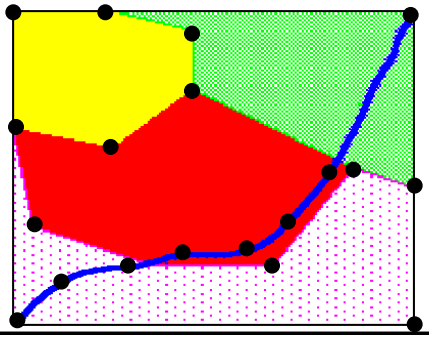


Representing Spatial Elements

Vector

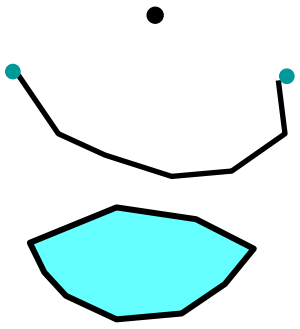
Allows user to specify specific spatial locations and assumes that geographic space is continuous, not broken up into discrete grid squares

We store features as sets of X,Y coordinate pairs.



Entity Representations

We typically represent objects in space as three distinct spatial elements:



Points - simplest element

Lines (arcs) - set of connected points

Polygons - set of connected lines

We use these three spatial elements to represent real world features and attach locational information to them.

Attributes

- In the raster data model, the cell value (Digital Number) is the attribute. Examples: brightness, landcover code, SST, etc.
- For vector data, attribute records are linked to point, line & polygon features. Can store *multiple* attributes per feature. Vector features are linked to attributes by a *unique feature number*.

Raster vs. Vector

Raster Advantages

The most common data format

Easy to perform mathematical and overlay operations

Satellite information is easily incorporated

Better represents “continuous”- type data

Vector Advantages

Accurate positional information that is best for storing discrete thematic features (e.g., roads, shorelines, sea-bed features.

Compact data storage requirements

Can associate unlimited numbers of attributes with specific features

GIS Applications in Agriculture

- Precision Farming
- Nutrient management
- Water management
- Suitability Analysis
- Forming homogenous zones (Agro-ecological / agro-climatic, agro-edaphic etc.)
- Pests and diseases monitoring and management
- Establishment of Agro-industries.
- Nearest site for Agro product storage like coldstorage.
- Selection of shortest route for agricultural produce transportation.