Geographic Information Systems (GIS)
Introduction to Geographic Information System

(GIS)
What is a GIS?

- A system that uses geographic data to support decisions
- A system that integrates geographic data with database information
- A system that uses interactive graphic displays for effective analysis
Purposes of a GIS
According to David Cowen of the University of South Carolina, GIS has the following purposes: (1) Visualize, (2) Organize, (3) Integrate, (4) Analyze, (5) Predict, (6) Question, and (7) Discover
Purposes of a GIS

- **Visualize:** to assess information by seeing it
Purposes of a GIS

- **Organize:** to structure data according to logical spatial relationships and geographic coordinates
Purposes of a GIS

- **Integrate**: to combine geographic data from a variety of sources such as maps, air photos and tabular information in a coherent and compatible manner.
Purposes of a GIS

- Analyze: to infer meaning from the data
Purposes of a GIS

- **Predict**: to assess the future from patterns in the data
Purposes of a GIS

- **Question:** to find information about map features
Purposes of a GIS

- Discover: to find meaning by chance
General Overview of a GIS
Two Interrelated Components

- In order to understand how a GIS works, it is helpful to view it as two strongly interrelated components: Locational data and Attribute data.
Locational Data

- The Locational Data usually comes from maps or tables of geographic coordinates
- More digitized maps are becoming available
- This data is frequently digitized from paper maps as a series of points, lines and polygons
Points

- Points in a GIS can represent objects such as telephone poles, fire hydrants or well locations
Lines

- Lines in a GIS can represent objects such as rivers, road centerlines, pipelines and fences
Polygons can represent Arial objects such as city parcels, airport runways and property boundaries.
Attribute Data

- Attribute information is the information we want to store about the digitized map features
- In many GIS systems, the attribute data is managed by a Database Management System (DBMS)
Combining Data

- The attribute information is stored by the DBMS as database tables.
- A unique number, provided by the software, forms a link between the information in the database table and the corresponding digitized feature.
Steps for Making Successful GIS
Step One: Problem Specification

- Specify what information you need from the system, what reports you need generated, and what maps you need drawn
Step Two: Database Definition

- Determine what information you need to put into the system
Step Three: System Specification

- Specify the exact hardware and software components you will use to turn the database information into products which will solve the specified problem.
Step Four: Project Prototyping

- Test your approach on a small piece of the landscape to see if you have forgotten anything important in the problem specification, system specification, and database definition steps.
Step Five: Data Acquisition and Capture

- Digitize the required map data and enter the required attribute information into the database
Many times data has come from a variety of sources. This may need to be preprocessed in order to make the data sets compatible.
Step Seven: Data Analysis

- This is where you turn raw data into usable information
Step Eight: Data Management

✦ Data management involves issues of data security and update
✦ Provisions must be made to insure that the data remains timely and secure from unauthorized access
Step Nine: Information Output

- This is where you display information in charts, tables or maps
Step Ten: Error/Accuracy Assessment

- It is important to check the results to be sure they make sense. A computer knows how to do things, but doesn’t know if the results are true or false.
When the other steps have been completed, the information created should empower wise decision making.
Who uses a GIS?

- City/County Governments: to establish land boundaries and calculate taxes
- Emergency Planners: to calculate emergency response times
- Environmental Researcher: to find the best way to clean a contaminated site
- Utilities: to monitor lines/pipes
Future of GIS

- GIS will be used by everyone, in one form or another
- As the need for better solutions to complex problems increases, so will the use of GIS