

Introduction to Geographic Information Systems



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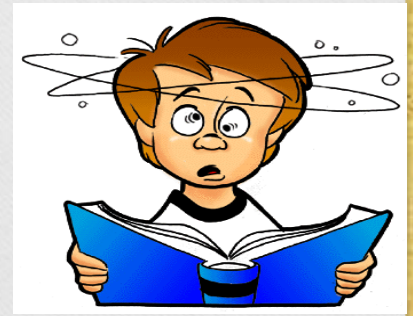


A picture is worth a thousand words...



Lesson Objectives

- Understand what a GIS is?
- Understand how a GIS functions.
- Look at some GIS applications.
- GIS Application in Bangladesh context .



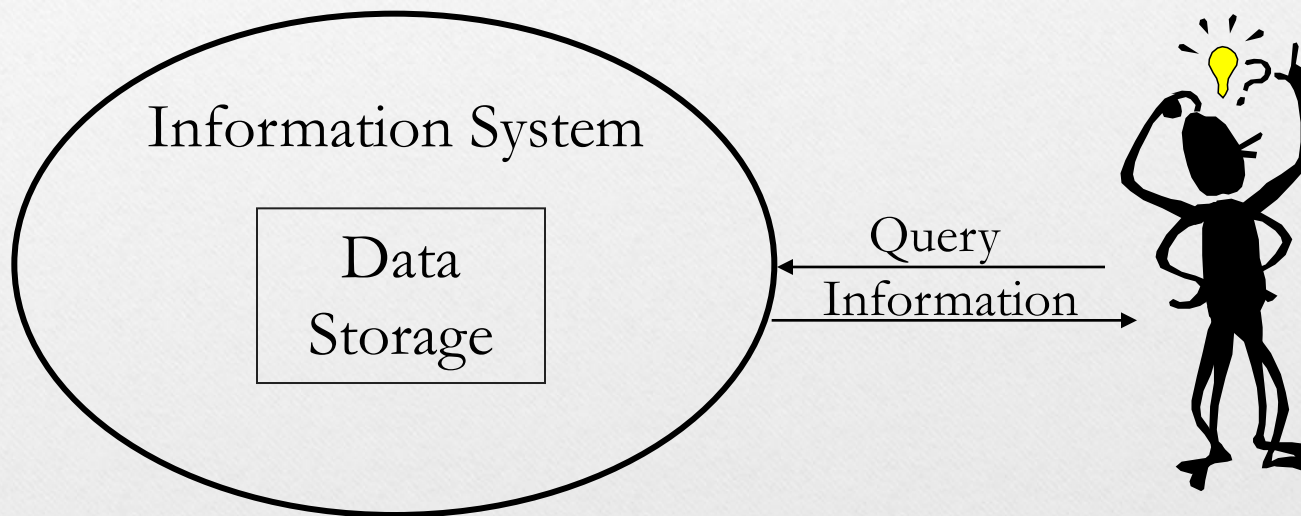
What is an Information System?

SYSTEM USED FOR:

**capturing
storing
updating
manipulating
analyzing**

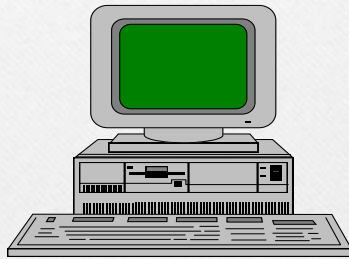
DATA

What is an Information System?



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 a GIS?

The screenshot displays a GIS application interface. On the left is a 'View1' legend with various layers checked, including 'Trans Road Lines(v)' and 'Hydro Water Cours'. The main area shows a map with a network of roads and a river. Overlaid on the map is the 'Identify Results' window, which lists two features:

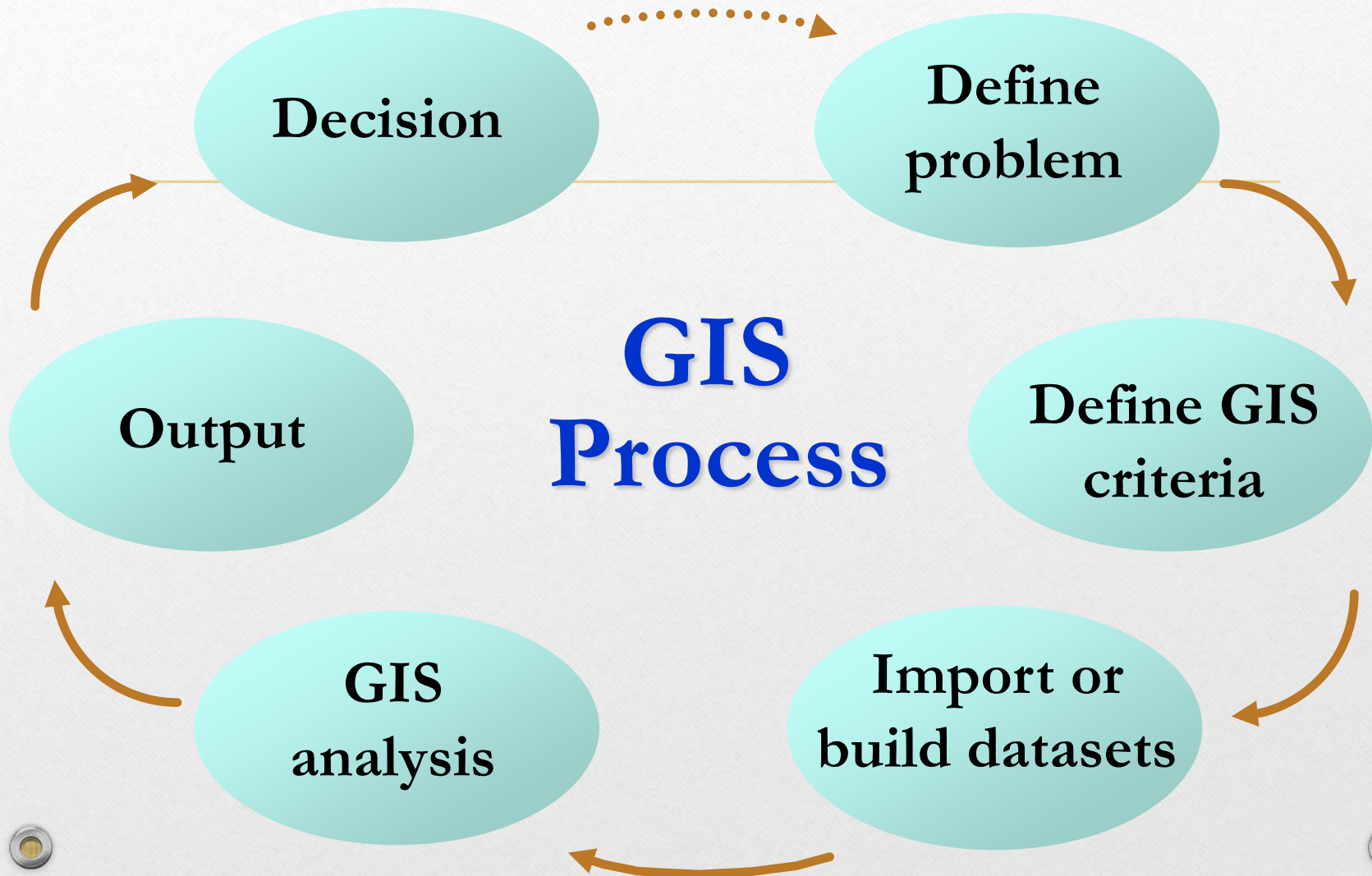
- 1: Trans Airport Points(vm1) - SEOUL /KIMP
- 2: Trans Road Lines(vm1) - UNK

The 'Identify Results' window also contains a table of attributes for the selected feature:

nam	UNK
nam description	No entry present
rst	1
rst description	Hard/Paved
rtt	13
rtt description	Primary Route
use	0
use description	Unknown
wtc	1
wtc description	All Weather

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

Geographic Information Systems



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.

Types of GIS

- **Web-based GIS:** ONS and London Profiler
- **Geo-browser:** Google Earth
- **Desktop GIS:** ArcGIS

Desktop GIS

A GIS, or GIS software, allows you to interactively work with spatial data. A desktop GIS is a mapping software that needs to be installed onto and runs on a personal computer.

Such As (**ArcGIS, ILWIS, QGIS, GRASS**)

Geobrowser

A geo-browser can be understood as an Internet Explorer for geographic information. Like the internet it allows the combination of many types of geographic data from many different sources. The biggest difference between the World Wide Web and the geographic web however is that everything within the latter is *spatially referenced*.

Such As (**Google Earth**)

Web-based GIS

Web-based GIS, or Web GIS, are online GIS applications which in most cases are excellent data visualisation tools. Their functionality is limited compared to software stored on your computer, but they are user-friendly and particularly useful as they not required data download.

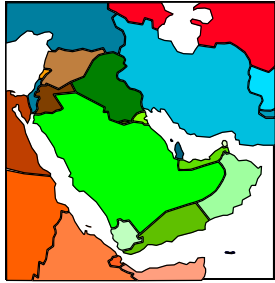
Such As (**the Office of National Statistics (ONS), Neighbourhood mapping tool and the London Profiler.**)

Key Functions of a GIS

- Data Assembly
- Data Storage
- Spatial Data Analysis and Manipulation
- Spatial Data Output

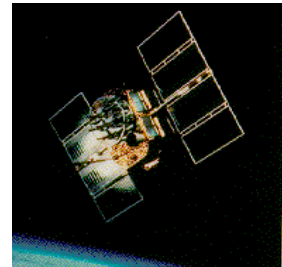
GIS Functions

Data Assembly



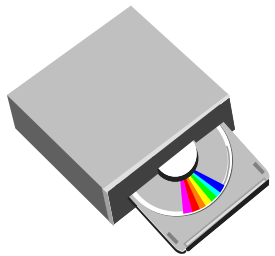
Maps

Manual Digitizing
Scanning



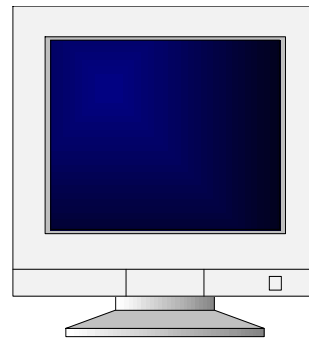
RSI

Manual Digitizing
Scanning



Intel Database

Data Transfer



Data Transfer



GPS

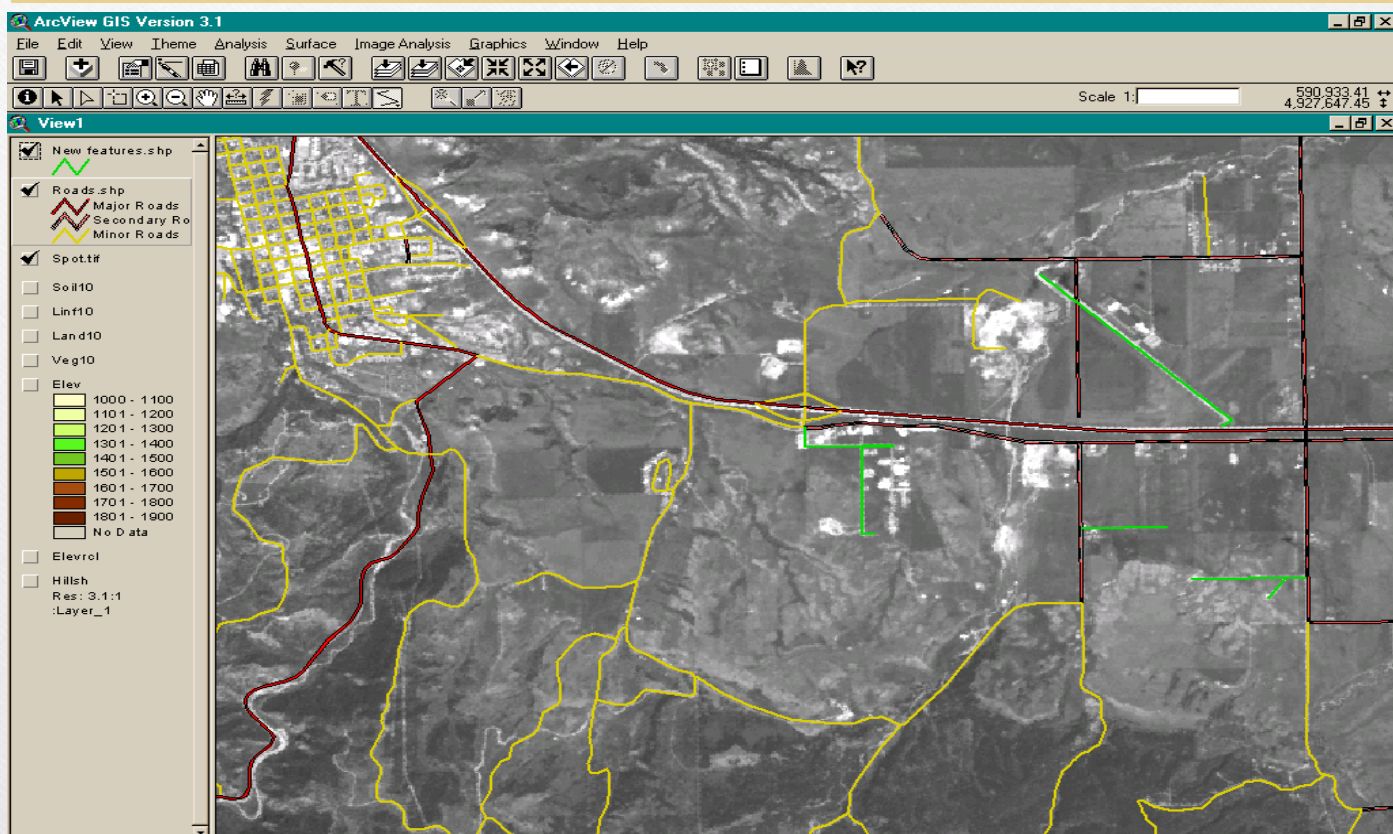
Direct Entry



Keyboard

GIS Functions

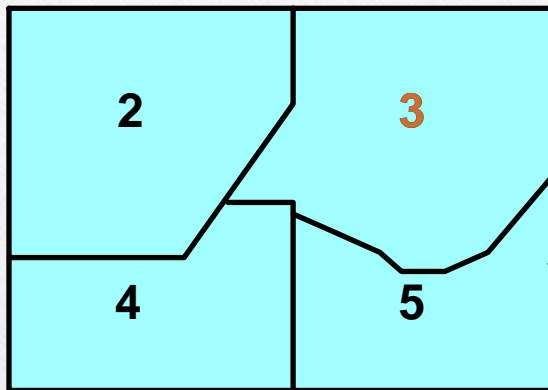
Data Input/Creation



GIS Functions

GIS Storage

1 (Universe polygon)



← *Spatial data*

Attribute data →

COV#	ZONE	ZIP
1		0
2	C-19	22060
3	A-4	22061
4	C-22	22060
5	A-5	22057

GIS Functions

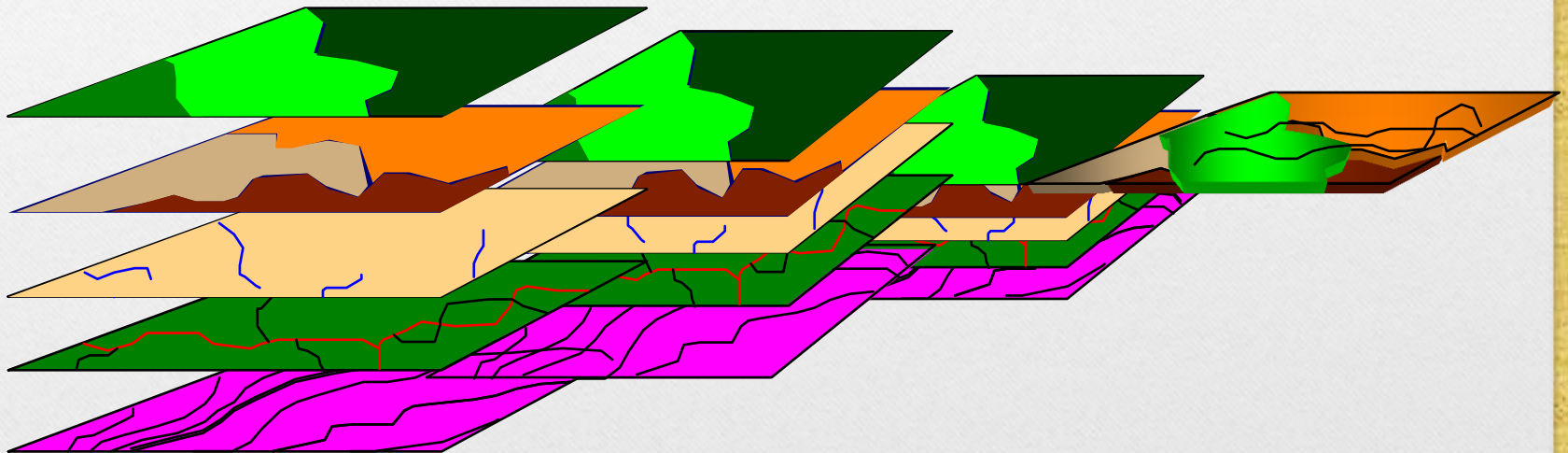
Spatial Data Manipulation and Analysis

- Common Manipulation
 - Reclassification
 - Map Projection changes
- Common Analysis
 - Buffering
 - Overlay
 - Network

GIS Functions

Spatial Analysis

- Overlay function creates new “layers” to solve spatial problems

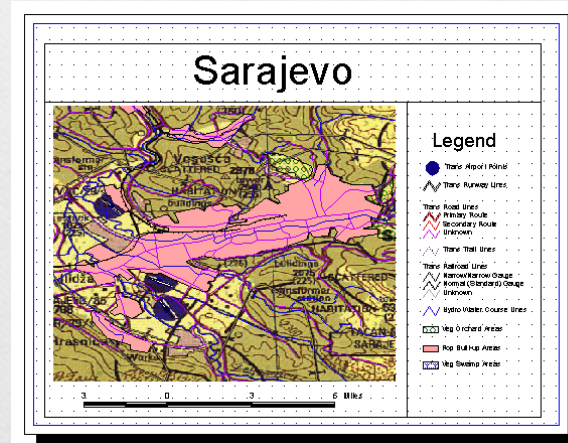


GIS Functions

Spatial Data Output

- Tables
- Maps
- Interactive Displays
- 3-D Perspective View

Shape	id	f_code	f_code description	exc	exc description	nam
Polygon	1	AL020	Built-Up Area	999	Other	Vinkovci
Polygon	2	AL020	Built-Up Area	999	Other	Nustar
Polygon	3	AL020	Built-Up Area	999	Other	Bobota
Polygon	4	AL020	Built-Up Area	999	Other	Otok
Polygon	5	AL020	Built-Up Area	999	Other	Bijelo Brdo
Polygon	6	AL020	Built-Up Area	999	Other	Trpinja
Polygon	7	AL020	Built-Up Area	999	Other	Kometinci
Polygon	8	AL020	Built-Up Area	999	Other	UNK
Polygon	9	AL020	Built-Up Area	999	Other	Backi Monastor
Polygon	10	AL020	Built-Up Area	999	Other	Hercegszanto



Component of GIS

1. **Computer System:** Operating system to run GIS(e.g. windows XP, Windows 7)
2. **GIS software:** ESRI – ArcGIS 9.3, Intergraph, Open source GRASS etc.
3. **People:** GIS professional & Users
4. **Data:** Various kind of Inputs that system takes to produce information
5. **Infrastructure:** Physical, organizational, cultural environment

The major areas of GIS application

- **Local Government**
 - Public works/infrastructure management (roads, water, sewer)
 - Planning and environmental management
 - property records and appraisal
- **Real Estate and Marketing**
 - Retail site selection, site evaluation
- **Public safety and defense**
 - Crime analysis, fire prevention, emergency management, military/defense
- **Natural resource exploration/extraction**
 - Petroleum, minerals, quarrying
- **Transportation**
 - Airline route planning, transportation planning/modeling
- **Public health and epidemiology**
- **The Geospatial Industry**
 - Data development, application development, programming

Examples of Applied GIS

- **Urban Planning, Management & Policy**
 - Zoning, subdivision planning
 - Land acquisition
 - Economic development
 - Code enforcement
 - Housing renovation programs
 - Emergency response
 - Crime analysis
 - Tax assessment
- **Environmental Sciences**
 - Monitoring environmental risk
 - Modeling storm water runoff
 - Management of watersheds, floodplains, wetlands, forests, aquifers
 - Environmental Impact Analysis
 - Hazardous or toxic facility siting
 - Groundwater modeling and contamination tracking
- **Political Science**
 - Redistricting
 - Analysis of election results
 - Predictive modeling
- **Civil Engineering/Utility**
 - Locating underground facilities
 - Designing alignment for freeways, transit
 - Coordination of infrastructure maintenance
- **Business**
 - Demographic Analysis
 - Market Penetration/ Share Analysis
 - Site Selection
- **Education Administration**
 - Attendance Area Maintenance
 - Enrollment Projections
 - School Bus Routing
- **Real Estate**
 - Neighborhood land prices
 - Traffic Impact Analysis
 - Determination of Highest and Best Use
- **Health Care**
 - Epidemiology
 - Needs Analysis
 - Service Inventory

ANY QUESTIONS

