

Geographic Information System (GIS)

Why make GIS a business and planning tool?

- GIS can be used for its very strong visualisation functions.
- Conventional GIS provides tools and decision-rules for making more rational and effective decisions.
- Use of some GIS functions could result in better co-ordination and monitoring in businesses.
- Some of the above could result in cost - savings.

Spatial Data: Data that has locational characteristic and which can be represented on a map is called Spatial Data. Spatial Data tells us where the objects of interest are located, their distributions and extent. Examples are a street atlas, a tourist guide map, a weather map, and a route map.

Why Should A Map Be Used ?

Conventionally business decisions are taken by analysing attribute data stored in tables. Some of these decisions taken without a map may turn out to be uneconomical. A mere tabular analysis does not reveal correlation between two entities due to their spatial proximity. Spatial proximity and their influence is an important characteristic in deciding the location of service points, in distribution and in revealing spatial patterns.

How Can Spatial Data be Used?

- Spatial data can be used to look for spatial patterns. Are my important clients /shops concentrated in some area? We are able to identify patterns that were hitherto not apparent from tabular data.
- You could use it to analyse the reach of the office/depots/ sales points. How many of my clients are within 2 KM of my office?
- Spatial data can be used to locate service /sales /contact points. You can use spatial data to locate a facility, ATM or to identify areas for property development in a much easier way.
- Spatial data can be used for routing and scheduling. What route should I take to distribute my goods efficiently to 30 retail outlets.
- Spatial data is a good medium for storing, modifying & distributing information that has locational relevance. Road Map showing location of tourist spots and Utilities map of a city are some examples.
- Spatial data is being used world wide for a variety of applications as diverse as insurance, health, disaster management, retail business, agriculture and archaeology.

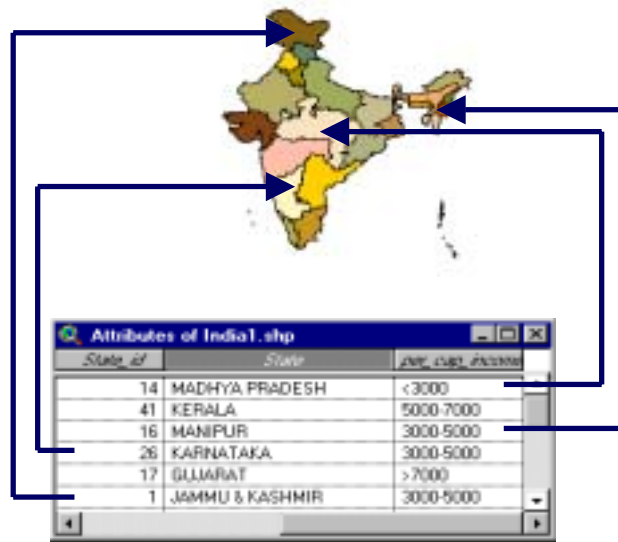
What is GIS ?

Geographic Information System (GIS) consists of software, hardware, spatial data, tabular data and user defined rules for decision-making. GIS transforms data into information on spatial interactions of entities that occupy space in the natural and built environment.

Data - Spatial & Tabular

Spatial Data: Any entity that has location and can be shown on a map. E.g., Boundaries of States of India.

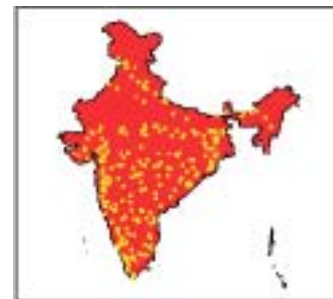
Tabular Data: Attributes of the spatial entity. E.g., State wise Per Capita Income.



Representation of Spatial Data

Spatial Data can be represented as any of the following

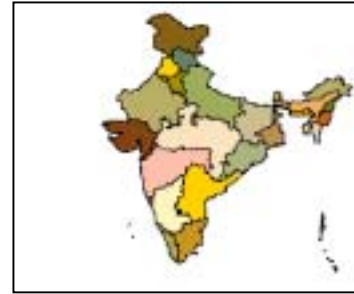
Point: An example is location of dams.



Line: An example is Canal.



Polygon. An example is State Boundary Map.



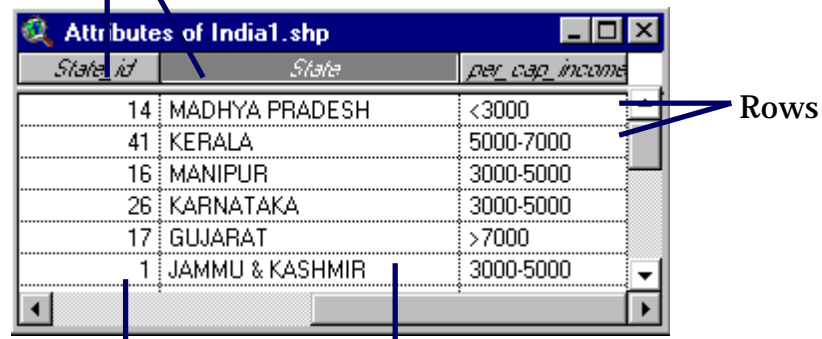
Spatial data representing different type of objects can be represented on various layers.

Data on a layer can be analyzed to study relationship between objects on that layer or in relation to objects of other layers.

Representation of Tabular Data

A table consists of rows and columns. Text, Number, Sound, and Picture can be represented as Tabular Data. Different attributes of spatial data can be represented in various columns of one or more tables.

Columns



State_id	State	per_cap_income
14	MADHYA PRADESH	<3000
41	KERALA	5000-7000
16	MANIPUR	3000-5000
26	KARNATAKA	3000-5000
17	GUJARAT	>7000
1	JAMMU & KASHMIR	3000-5000

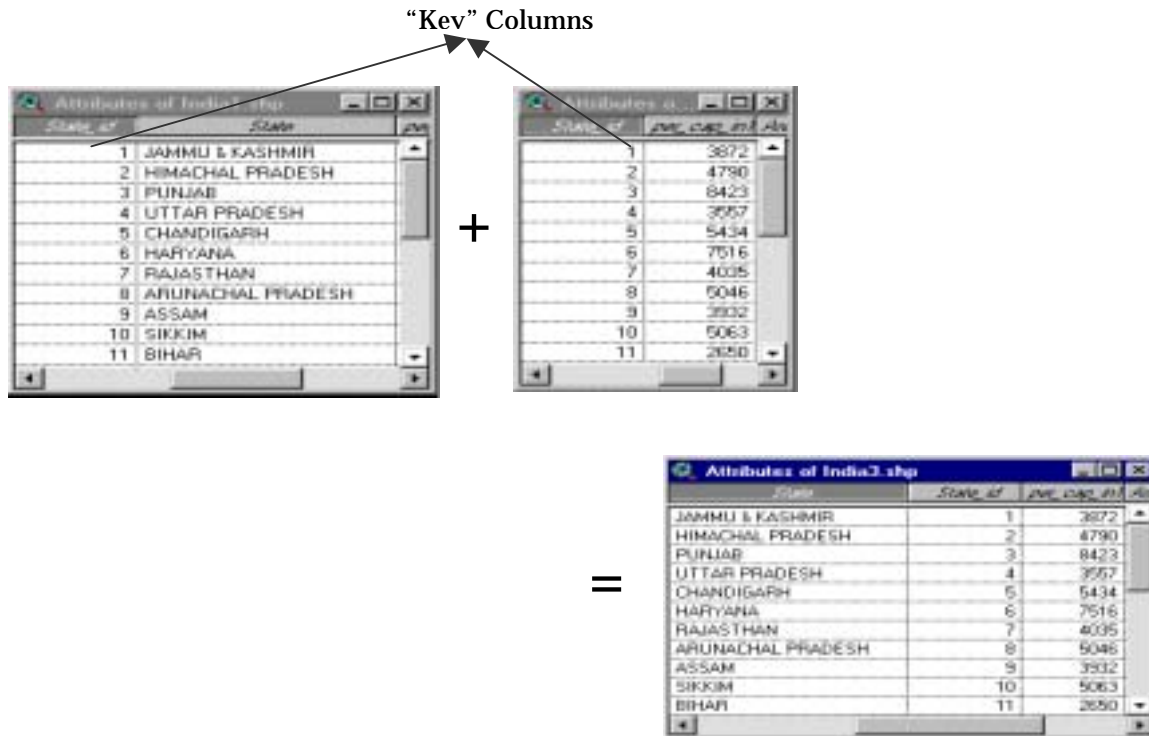
Rows

Number

Text

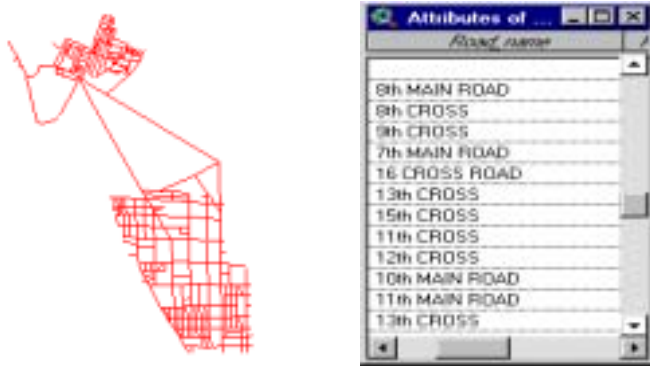
Integration of Tabular Data

Two tables can be joined into one table based on a common “key” column between the two tables.



Spatial Enabling of Tabular Data - Geo Coding

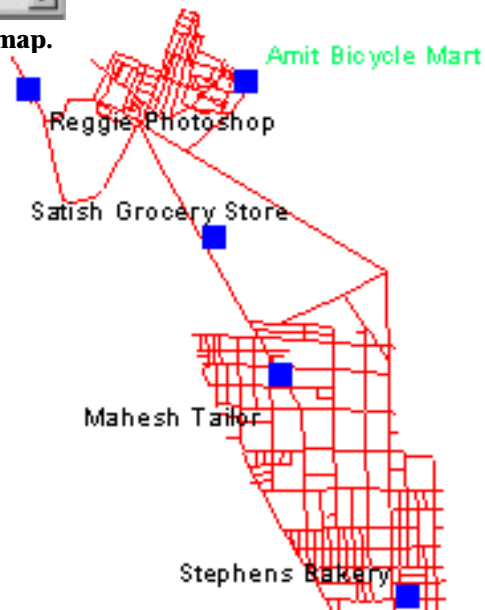
With geo coding, you can display the tabular data containing addresses as points on a map and find their locations on a map easily. For e.g., it allows location of fire stations by entering their addresses and location of customers and thereby site facilities where the customers are concentrated.



Road Map. Each street segment is listed in the corresponding table

Customer Name	Address?
Stephens Bakery	5th CROSS
Mahesh Tailor	8th Main Road
Reggie Photoshop	Tunkur Road
Satish Grocery Store	Pipe Line Rd
Amit Bicycle Mart	H M T Road

Find location of these shops on the map.

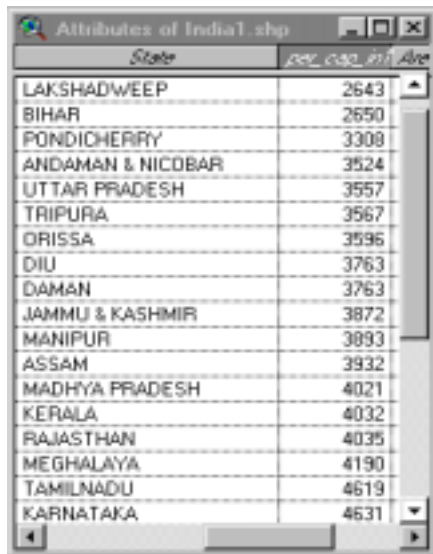


The non-spatial shop data has been spatially enabled with respect to street location

Analysis - Display & Pattern Recognition

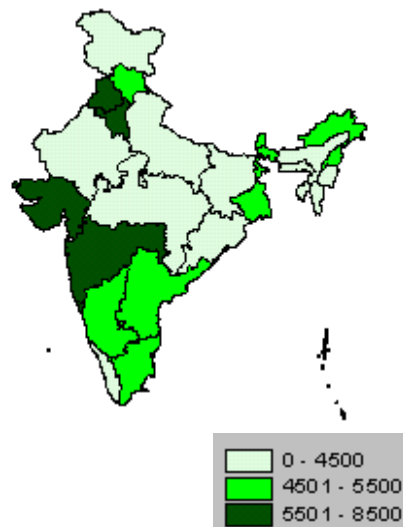
Display of spatial data, where data elements are displayed in relationship with other elements, gives more information than is apparent with display of the same data in other modes of presentation, e.g., in a table.

Tabular Presentation of State wise Per-Capita Income



State	per. cap. in. Ave
LAKSHADWEEP	2643
BIHAR	2650
PONDICHERRY	3308
ANDAMAN & NICOBAR	3524
UTTAR PRADESH	3557
TRIPURA	3567
ORISSA	3596
DIU	3763
DAMAN	3763
JAMMU & KASHMIR	3872
MANIPUR	3893
ASSAM	3932
MADHYA PRADESH	4021
KERALA	4032
RAJASTHAN	4035
MEGHALAYA	4190
TAMILNADU	4619
KARNATAKA	4631

Spatial Presentation of State wise Per-Capita Income



With spatial presentation of the data it is apparent that the most of the high per-capita income states are located adjacent to each other. They lie in Western & Southern India.

Analysis - Thematic Mapping

The spatial data objects are displayed based on categorization of one of the attributes. This not only aids in conveying information but also discovers spatial relationships.



Single Colour



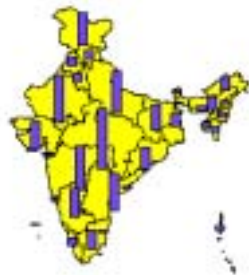
Unique Colour



Graduated Colours



Dot Density



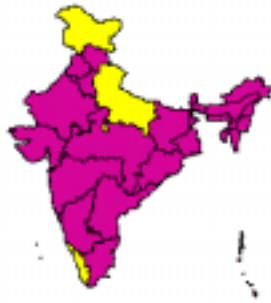
Bar Chart



Graduated Symbol

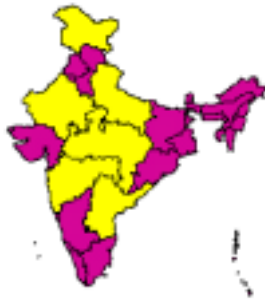
Analysis - Tabular Query & Selection

Elements in a table or map can be selectively picked and displayed. The elements can be picked individually. Or selection can be based on some parameters meeting desired values.



State	Area	Per Cap Income
GUJARAT	1.89	>7000
KERALA	0.42	5000-7000
JAMMU & KASHMIR	2.28	3000-5000
HIMACHAL PRADESH	0.57	3000-5000
PUNJAB	0.52	>7000
UTTAR PRADESH	2.96	<3000
CHANDIGARH	0.00	>7000
HARYANA	0.46	>7000

Selection by picking on table or map: Selection by pointing on graphics in the map or by pointing on records in the table.

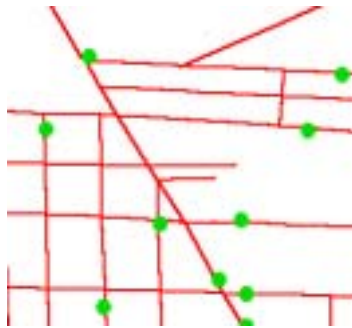


Select States having area larger than 2 lakh sq.km.

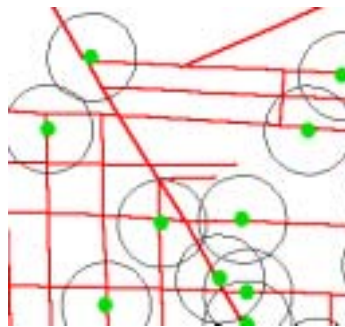
Selection by query: By keying in query - "Select States having area larger than 2 lakh sq.km." - the relevant states have been selected.

Analysis - Buffer

Selection of spatial objects within a certain distance of object of interest is required. This can be achieved by drawing a buffer of certain distance around the object and selecting objects on another layer.



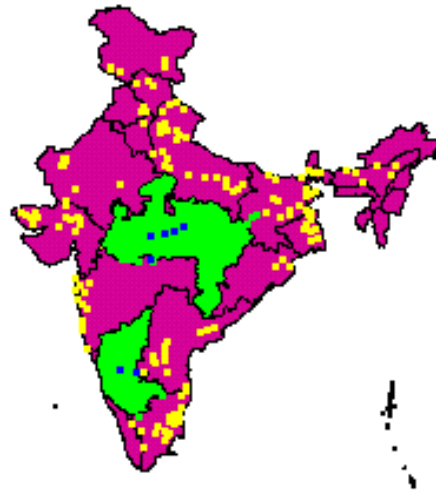
Road network and Dustbins in a part of Malleswaram Ward in Bangalore City



A buffer of 125m around the dust bins shows the road network outside the influence of dustbin zone.

Analysis - Spatial Selection

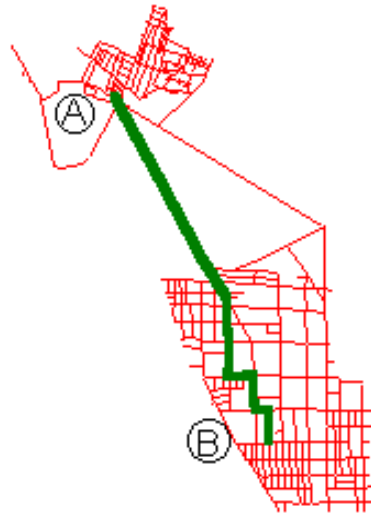
Sometimes selection of data elements is made based on its spatial relationship with other data elements. Eg., objects on layer 1 that fall completely inside objects of layer 2.



Wells (shown in yellow colour) lying inside States of Karnataka and Madhya Pradesh have been selected (shown in blue colour).

Analysis - Networks

Spatial data like road networks are very important for network analysis like finding 1. Shortest distance, 2. Optimal routing, and 3. Routing & Scheduling.



Users of GIS

- Market Planning
- Market Research
- Operations Management - Distribution and Retail Services
- Spatial Information Services - Tourist & Tour Operators
- Spatial Services Management - Real Estate
- Spatial Services Management - Land & Utilities Planning & Management
- Health Care Planning and Monitoring
- Education Management
- Telecom Service Providers
- Electricity Distribution Companies
- Watershed Management
- Banking
- Insurance
- Rural Marketing
- Retail Management
- & Many Others