

REMOTE SENSING AND GIS

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REMOTE SENSING

Remote Sensing is the Science and art of acquiring information about the Earth's surface feature from a distance with out coming in physical contact with the object or feature of interest. This is done by sensing and recording reflected or emitted energy and processing analyzing and applying that information.

In the Remote Sensing process, from beginning to end following seven elements are involved.

1. **Energy Source (Sun/Self):** The first requirement for remote sensing is to have an energy source which illuminates or provides electromagnetic energy to the target of interest.
2. **Radiation and the Atmosphere:** As the energy travels from its source to the target, it will come in contact with and interact with the atmosphere it passes through. This interaction may take place a second time as the energy travels from the target to the sensor.
3. **Interaction with the Target:** Once the energy makes its way to the target through the atmosphere, it interacts with the target depending on the properties of the both target and the radiation.
4. **Recording of energy by the sensor:** After the energy has been emitted from the target, we require a sensor (remote- not in contact with the target) to collect and record the electromagnetic radiation.
5. **Transmission, Reception and Processing:** The energy recorded by the sensor kept in balloons, aircrafts or satellites has to be transmitted to a receiving and processing station where the data are processed into an image.
6. **Interpretation and Analysis:** The processed image is interpreted, visually/ digitally/ electronically to extract information about the target which was illuminated.
7. **Application:** The final element of the remote sensing process is achieved when we apply the information we have been able to extract from the imagery about the target in order to better understand it, reveal some new information or assist in solving a particular problem.

Remote Sensing Satellites

Satellites are mainly of two types. 1) Polar Orbiting type 2) Geostationary. Polar Satellite passes over the poles of earth and is used mainly for the remote sensing purpose i.e., for mapping and photography. These satellites are placed at a height of 600 to 1000km from earth.

Geo stationary satellite remains positioned over the same spot on earth. These are mainly used for communication purposes and are located at about 36000km from earth.

Remote Sensing satellites are employed for Earth's observation. They observe planet for changes in everything from temperature to forestation to ice sheet coverage. Data is used in agriculture, water resources, urban development, mineral prospecting, environment, forestry, drought and flood forecasting and ocean resources. IRS class satellites are Indian remote sensing satellites.

GEOGRAPHIC INFORMATION SYSTEM (GIS)

GIS stands for Geographical Information System.

GEOGRAPHIC implies that locations of the data items are known, or can be calculated, in terms of Geographic coordinates (Latitude, Longitude).

INFORMATION implies that the data in a GIS are organized to yield useful knowledge, often as coloured maps and images, but also as statistical graphics, tables, and various on-screen responses to interactive queries.

SYSTEM implies that a GIS is made up from several inter-related and linked components with different functions. Thus, GIS have functional capabilities for data capture, input, manipulation, transformation, visualization, combinations, query, analysis, modelling and output.

So in short GIS is a computer based system designed to accept large volume of spatial data derived from a variety of sources and to store, retrieve, analyses, manipulate and display these data according to use specifications.

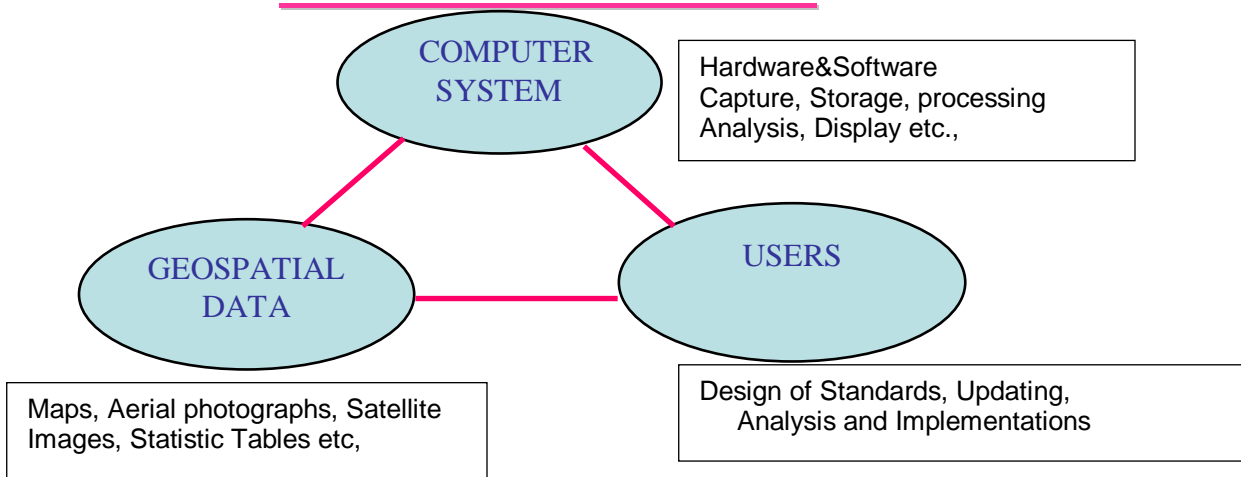
Geographical objects include natural phenomena such as railways, canals, roads, rivers, soil type etc. Conventionally, mapping, map analysis, measurements were done manually. With the advent of computer technology software were written to handle geographic data on the computers. This has resulted in GIS which represents now rapidly developing field lying at the intersection of many

disciplines namely cartography, geography, photogrammetry, remote sensing, statistics, surveying etc.

Following are the main data sources for the input to GIS.

Paper maps – Toposheets, Plots / cadastral, Cartographic maps, Satellite data, Aerial photos, Field data (GPS), Total station survey maps, GIS derived maps, Reports, Census data etc.

KEY COMPONENTS OF GIS

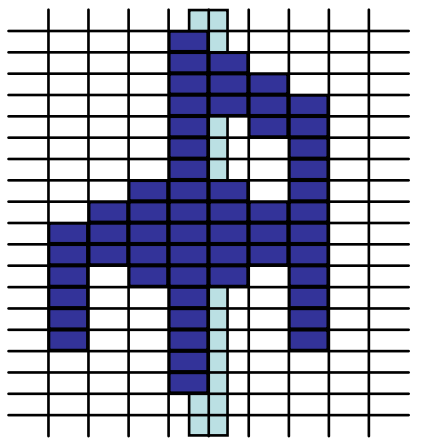


In GIS geographic data are represented in a particular manner and the approach is called model. There are two models- Raster and Vector.

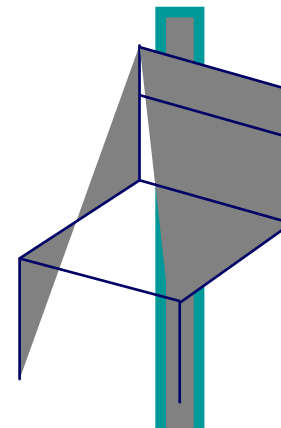
Raster format : The geographic data are divided in grid cells

Vector format : Data represented in points, lines and polygons

DATA MODEL AND STRUCTURE



RASTER MODEL



VECTOR MODEL

GIS PACKAGES

Commercial GIS software packages are Arc-Info, Arc-GIS, Map-Info, SPANS, GRAM++.

GIS APPLICATIONS

Water resource planning, Land use planning, Environmental applications, Cadastral mapping, Urban & regional planning,, Route selection of highways, Mineral exploration, Census and related statistical mapping, Natural resource mapping, Surveying etc are general application areas of GIS.

Basin planning, WR and Irrigation potential assessment, Identification of WRD project sites, EIA studies and environmental monitoring, Command area monitoring and Disaster management are some of the GIS applications related to Water Resources. Distance, Adjacency and Proximity analysis can be performed in GIS. Distance analysis refers to the ability to calculate distances from a map or along a transportation network. Adjacency analysis refers to the ability to determine which of the map features are adjacent to other map features. Proximity analysis refers to the ability to determine which map features are near to the referred map features. All available GIS packages can estimate aerial distances and a more limited set can estimate distances along road network.

CURRENT AND FUTURE ROLE OF GIS

Users should periodically examine the requirement for GIS and whether their system continues to meet those needs. GIS is yet to be used in large way for terrain visualization, 3D- analysis, resource information and organization planning.

