

GIS: Geographic Information System



A geographic information system (GIS) is a computer system for capturing, storing, checking, and displaying data related to positions on Earth's surface. By relating seemingly unrelated data, GIS can help people understand spatial patterns and relationships. GIS represents features on the earth—buildings, cities, roads, rivers, and states—on a computer. People use GIS to visualize, question, analyze, and understand data about the world and human activity. Often, this data is viewed on a map, which can reveal patterns, point out problems, and show connections that may not be apparent in tables or text.

Many different types of information can be compared and contrasted using GIS. The system can include data about people, such as population, income, or education level. It can include information about the landscape, such as the location of streams, different kinds of vegetation, and different kinds of soil. It can include information about the sites of factories, farms, and schools; or storm drains, roads, and electric power lines. With GIS technology, people can compare the locations of different things in order to discover how they relate to each other.

Data Formats

GIS applications include both hardware and software systems. These applications may include cartographic data, photographic data, digital data, or data in spreadsheets.



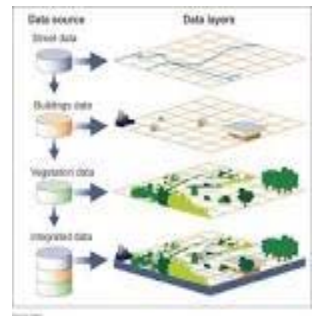
Cartographic data is already in map form, and may include such information as the location of rivers, roads, hills, and valleys. Cartographic data may also include survey data which can be directly entered into a GIS. Photographic interpretation is also a major part of GIS. Photo interpretation involves analyzing aerial photographs and assessing the features that appear. Digital data can also be entered into GIS, like computer data collected by satellites that show land use—the location of farms, towns, and forests. Remote sensing provides another tool that can be integrated into a GIS. Remote sensing includes imagery and other data collected from satellites, balloons, and drones.

GIS technology allows all these different types of information, no matter their source or original format, to be overlaid on top of one another on a single map. GIS uses location as the key index variable to relate these seemingly unrelated data.

Data Capture

Putting information into GIS is called data capture. Data that are already in digital form, such as most tables and images taken by satellites, can simply be uploaded into GIS. Maps, however, must first be scanned, or converted to digital format.

The two major types of GIS file formats are raster and vector. Raster formats are grids of cells or pixels. Raster formats are useful for storing GIS data that vary, such as elevation or satellite imagery. Vector formats are polygons that use points (called nodes) and lines. Vector formats are useful for storing GIS data with firm borders, such as school districts or streets.



GIS Maps

Once all of the desired data have been entered into a GIS system, they can be combined to produce a wide variety of individual maps, depending on which data layers are included. One of the most common uses of GIS technology involves comparing natural features with human activity.



For instance, GIS maps can display what manmade features are near certain natural features, such as which homes and businesses are in areas prone to flooding. GIS technology also allows to “dig deep” in a specific area with many kinds of information. Maps of a single city or neighborhood can relate such information as average income, book sales, or voting patterns. Any GIS data layer can be added or subtracted to the same map.

One important use of time-based GIS technology involves creating time-lapse photography that shows physical processes occurring over long periods of time, such as the movement of ocean or air currents that help scientists better understand how moisture and heat energy move around the globe. GIS systems can also produce three-dimensional images, which can help geologists study earthquake faults.

GIS technology makes updating maps much easier than updating maps created manually. Updated data can simply be added to the existing GIS program. A new map can then be printed or displayed on screen. This skips the traditional process of drawing a map, which can be time-consuming and expensive.

GIS Jobs

People working in many different fields use GIS technology. GIS technology can be used for scientific investigations, resource management, and development planning. Many retail businesses use GIS to help them determine where to locate a new store. Scientists use GIS to compare population statistics to resources such as drinking water, and biologists use GIS to track animal migration patterns.

City, state, and federal officials use GIS to help plan their response in the case of a natural disaster such as an earthquake or hurricane. GIS maps can show these officials what neighborhoods are most in danger, where to locate emergency shelters, and what routes people should take to reach safety.

Engineers use GIS technology to support the design, implementation, and management of communication networks for the phones we use, as well as the infrastructure necessary for Internet connectivity. Other engineers may use GIS to develop road networks and transportation infrastructure.

