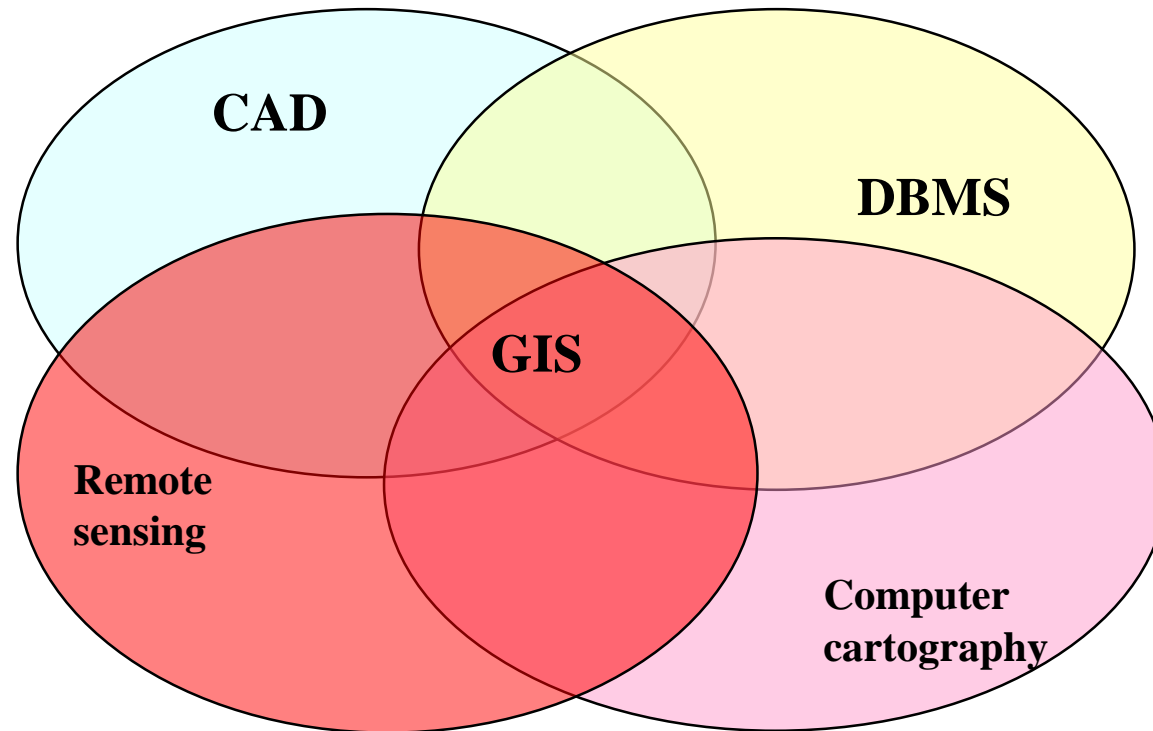


Related Technologies

- ▶ GISs are closely related to several other types of information systems, but it is the ability to manipulate and analyze geographic data that sets GIS technology apart.
- ▶ Although there are no hard and fast rules about how to classify information systems, the following discussion should help differentiate GIS from desktop mapping, computer-aided design (CAD), remote sensing, DBMS, and global positioning systems (GPS) technologies.



The relationship between GIS, computer-aid design, computer cartography, database management and remote sensing information systems.



- ▶ GIS is a convergence of technological fields and traditional disciplines
- ▶ GIS has been called an "enabling technology" because of the potential it offers for the wide variety of disciplines which must deal with spatial data



- ▶ Cartography
- ▶ Remote Sensing
- ▶ Photogrammetry
- ▶ Surveying
- ▶ Geodesy
- ▶ Statistics
- ▶ Operations Research
- ▶ Computer Science
- ▶ Mathematics
- ▶ Civil Engineering



- ▶ Heritage
 - Geography □
- ▶ Data Collection □
 - Remote Sensing □
 - Photogrammetry □
 - Surveying □
 - Geodesy □
 - GPS □
- ▶ Data Analysis □
 - Statistics □
 - Operations Research □
 - Computer Science □
 - Mathematics □
- ▶ Data Reporting □
 - Cartography □
 - Computer Graphics

Function of GIS

	Spatial DATA	Attribute DATA	Mapping	Preprocessing	Database	Spatial analysis	Modeling	Display	Application
Cartography	*	*	*					*	*
Remote Sensing	*	*	*			*		*	*
Photogrammetry	*		*				*	*	*
Surveying	*		*						
Geodesy		*	*						*
Statistics		*		*	*				
Computer Science		*		*	*	*	*		*
Mathematics				*			*		

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- ▶ broadly concerned with understanding the world and man's place in it
- ▶ long tradition in spatial analysis
- ▶ provides techniques for conducting spatial analysis



- ▶ concerned with the display of spatial information
- ▶ currently the main source of input data for GIS is maps
- ▶ provides long tradition in the design of maps which is an important form of output from GIS
- ▶ computer cartography (also called "digital cartography", "automated cartography") provides methods for digital representation and manipulation of cartographic features and methods of visualization

- ▶ images from space and the air are major source of geographical data
- ▶ remote sensing includes techniques for data acquisition and processing anywhere on the globe at low cost, consistent update potential
- ▶ many image analysis systems contain sophisticated analytical functions
- ▶ interpreted data from a remote sensing system can be merged with other data layers in a GIS

- ▶ using aerial photographs and techniques for making accurate measurements from them, photogrammetry is the source of most data on topography (ground surface elevations) used for input to GIS



- ▶ provides high quality data on positions of land boundaries, buildings, etc



- ▶ source of high accuracy positional control for GIS , GPS, remote sensing and surveying
- ▶ concentrates on placing objects accurately in a “global” context

- ▶ many models built using GIS are statistical in nature, many statistical techniques used for analysis
- ▶ statistics is important in understanding issues of error and uncertainty in GIS data

- ▶ advances in computer graphics provide hardware, software for handling and displaying graphic objects, techniques of visualization
- ▶ database management systems (DBMS) contribute methods for representing data in digital form, procedures for system design and handling large volumes of data, particularly access and update
- ▶ artificial intelligence (AI) uses the computer to make choices based on available data in a way that is seen to emulate human intelligence and decision-making – computer can act as an "expert" in such functions as designing maps, generalizing map features
- ▶ although GIS has yet to take full advantage of AI, AI already provides methods and techniques for system design

- ▶ Database management systems specialize in the storage and management of all types of data including geographic data.
- ▶ DBMSs are optimized to store and retrieve data and many GISs rely on them for this purpose.

- ▶ several branches of mathematics, especially geometry and graph theory, are used in GIS system design and analysis of spatial data

- ▶ CAD systems evolved to create designs and plans of buildings and infrastructure.
- ▶ This activity required that components of fixed characteristics be assembled to create the whole structure.
- ▶ These systems require few rules to specify how components can be assembled and very limited analytical capabilities.
- ▶ CAD systems have been extended to support maps but typically have limited utility for managing and analyzing large geographic databases.