

# How to use this dictionary

## Parts of an entry

- *Headword*—The term being defined is in bold type at the beginning of the entry.
- *Cross-references*—Listed after the last definition in an entry with “See also,” these terms are related in some way to the headword. They might be synonyms, antonyms, broader terms, or narrower terms.
- *Definitions*—The meaning of the headword is explained in the definition. For terms that have more than one definition (sense), the definitions are numbered and placed in order. GIS senses appear first. Senses from related fields follow and are given *field labels*.
- *Field label*—These are used to classify definitions by subject area. Only terms that come from outside GIS are given field labels. Field labels are set in brackets.
- *Illustration*—Illustrations appear after the definition they refer to and are labeled with the headword.

Headword → **rectilinear** 1. [MATHEMATICS] ← Field label

Definition → Characterized by straight lines, usually parallel to orthogonal axes.

Illustration → 

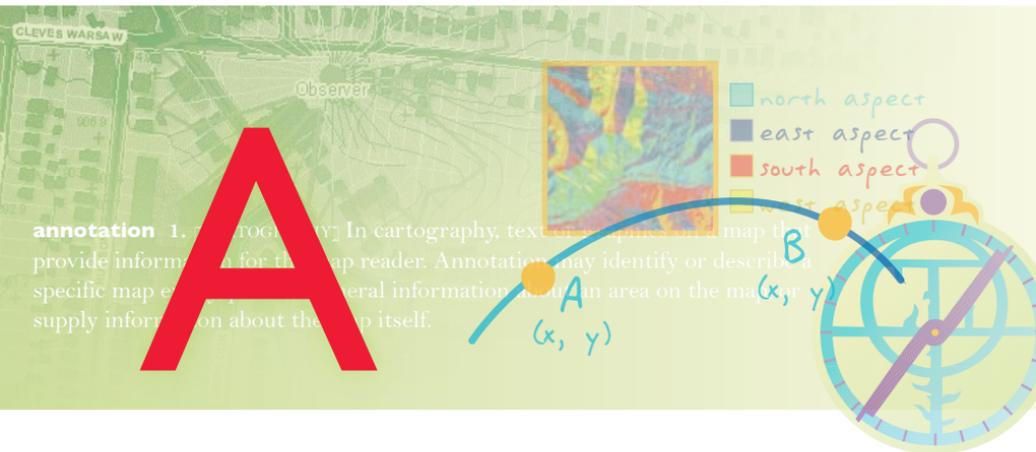
*rectilinear*

2. [CARTOGRAPHY] A map or image whose horizontal and vertical scales are identical. See also orthogonal. ← Cross-references



**A note about the order of terms and selection of headwords**

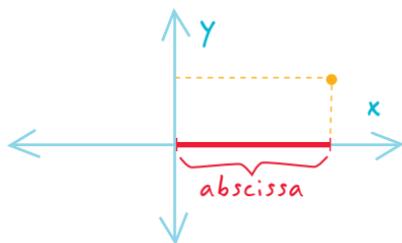
The terms in *A to Z GIS* are alphabetized letter by letter, according to lexicographical tradition. Spaces and hyphens between words are ignored. For example, baseline, basemap, and base station appear in that order. (A word by word alphabetization would place them in the following order: base station, baseline, basemap). The letter by letter system is advantageous for readers who may not know whether a compound is considered one word or two. Headwords for definitions have been selected based on usage, especially in cases where more than one spelling or form of a word exists, or with acronyms and abbreviations.



**annotation** 1. [CARTOGRAPHY] In cartography, text on a map that provides information for the map reader. Annotation may identify or describe a specific map element or provide general information about an area on the map. 2. To supply information about the map itself.

**abbreviation** A shortened form of a word or phrase which represents the whole. Abbreviations are commonly a letter or group of letters taken from the complete form of the word, such as the usage of *St.* in place of *Street*.

**abscissa** [CARTOGRAPHY] In a rectangular coordinate system, the distance of the x-coordinate along a horizontal axis from the vertical or y-axis. For example, a point with the coordinates (7,3) has an abscissa of 7. *See also* ordinate.



abscissa

**absolute accuracy** [CARTOGRAPHY] The degree to which the position of an object on a map conforms to its

correct location on the earth according to an accepted coordinate system.

**absolute coordinates** [CARTOGRAPHY] Coordinates that are referenced to the origin of a given coordinate system. *See also* coordinates.

**absolute mode** *See* digitizing mode.

**absorption** [REMOTE SENSING] The amount of electromagnetic energy lost through interactions with gas molecules and matter during its passage through the atmosphere.

**abstraction** A simplified idea of a real-world object or system.

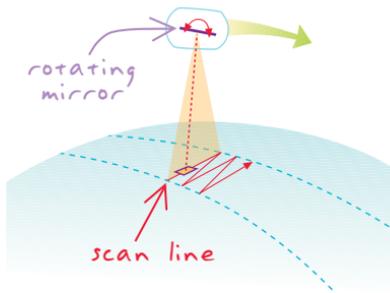
**accessibility** 1. An aggregate measure of the degree of ease with which a place, person, or thing can be reached, depending on factors such as slope, traffic, distance, and so on. 2. The degree to which Web sites, software, or computers provide equivalent information and functionality to a variety of people, including those

## accuracy—address locator

with disabilities or visual impairment. *See also* impedance.

**accuracy** [MATHEMATICS] The degree to which a measured value conforms to true or accepted values. Accuracy is a measure of correctness. It is distinguished from precision, which measures exactness. *See also* precision, uncertainty.

**across-track scanner** [REMOTE SENSING] A remote-sensing tool with an oscillating mirror that moves back and forth across a satellite's direction of travel, creating scan line strips that are contiguous or that overlap slightly, thereby producing an image. *See also* along-track scanner.



across-track scanner

**active remote sensing** [REMOTE SENSING] A remote-sensing system, such as radar, that produces electromagnetic radiation and measures its reflection back from a surface. *See also* passive remote sensing, remote sensing.

**acutance** [REMOTE SENSING] A measure, using a microdensitometer or other instrument, of how well a photographic system shows sharp

edges between contiguous bright and dark areas.

**address** [SURVEYING] A designation of the location of a person's residence or workplace, an organization, or a building, consisting of numerical and text elements such as a street number, street name, and city arranged in a particular format.

**address data** Data that contains address information used for geocoding. Address data may consist of one individual address or a table containing many addresses. *See also* geocoding.

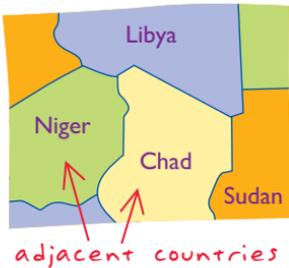
**address element** One of the components that comprise an address. House numbers, street names, street types, and street directions are examples of address elements.

**address geocoding** *See* geocoding.

**address locator** [ESRI SOFTWARE] A dataset in ArcGIS that stores the address attributes, associated indexes, and rules that define the process for translating nonspatial descriptions of places, such as street addresses, into spatial data that can be displayed as features on a map. An address locator contains a snapshot of the reference data used for geocoding, and parameters for standardizing addresses, searching for match locations, and creating output. Address locator files have a .loc file extension. In ArcGIS 8.3 and previous versions, an address locator was called a geocoding service.

**address matching** A process that compares an address or a table of addresses to the address attributes of a reference dataset to determine whether a particular address falls within an address range associated with a feature in the reference dataset. If an address falls within a feature's address range, it is considered a match and a location can be returned.

**adjacency** 1. [GEOGRAPHY] A type of spatial relationship in which two or more polygons share a side or boundary.



adjacency 1

2. [MATHEMATICS] The state or quality of lying close or contiguous.

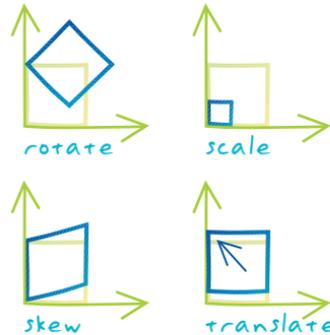
**adoption** The process of appropriating a technology and putting it into use for one's own purposes; the act by an individual, organization, or community of choosing a technology and putting it into effect. *See also* diffusion.

**Advanced Very High Resolution Radiometer** *See* AVHRR.

**aerial photograph** [REMOTE SENSING] A photograph of the earth's surface taken from a platform flying above the

surface but not in orbit, usually an aircraft. Aerial photography is often used as a cartographic data source for base-mapping, locating geographic features, and interpreting environmental conditions. *See also* orthophotograph, oblique photograph, vertical photograph.

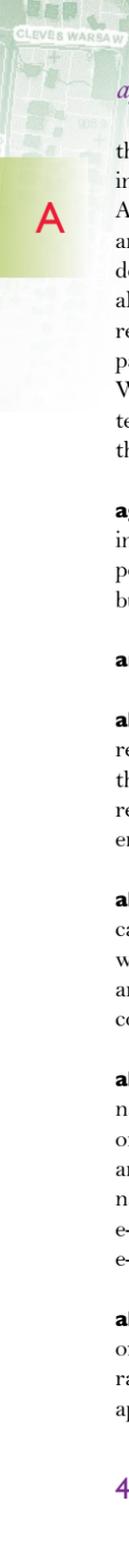
**affine transformation** [MATHEMATICS] A geometric transformation that scales, rotates, skews, and/or translates images or coordinates between any two Euclidean spaces. It is commonly used in GIS to transform maps between coordinate systems. In an affine transformation, parallel lines remain parallel, the midpoint of a line segment remains a midpoint, and all points on a straight line remain on a straight line. *See also* transformation.



affine transformation

**agent** In modeling, an entity within a model that conducts transactions to simulate the actions of a human, group of humans, animal, or other actor. *See also* agent-based model.

**agent-based model** A simulation of the large-scale consequences of



## aggregation—along-track scanner

the decisions and interactions of individual members of a population. An agent-based model consists of an environment or framework that defines the scope and rules of actions, along with a number of agents representing one or more actors whose parameters and behaviors are defined. When the model is run, the characteristics of each agent are tracked through time and space. *See also* agent.

**aggregation** The process of collecting a set of similar, usually adjacent, polygons (with their associated attributes) to form a single, larger entity.

**air station** *See* exposure station.

**albedo** [PHYSICS] A measure of the reflectivity of an object or surface; the ratio of the amount of radiation reflected by a body to the amount of energy striking it.

**algorithm** [COMPUTING] A mathematical procedure used to solve problems with a series of steps. Algorithms are usually encoded as a sequence of computer commands.

**alias** [COMPUTING] An alternative name specified for fields, tables, files, or datasets that is more descriptive and user-friendly than the actual name. On computer networks, a single e-mail alias may refer to a group of e-mail addresses.

**aliasing** The jagged appearance of curves and diagonal lines in a raster image. Aliasing becomes more apparent as the size of the raster

pixels is increased or the resolution of the image is decreased.

**alidade** **1.** [SURVEYING] A peep sight mounted on a straightedge and used to measure direction. **2.** [SURVEYING] The part of a theodolite containing the telescope and attachments. *See also* theodolite.

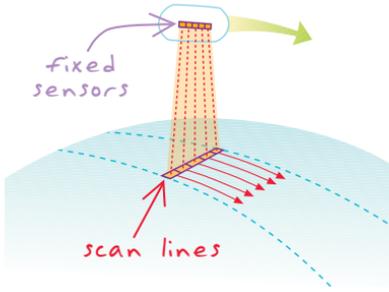
**aligned dimension** [SURVEYING] A drafting symbol that runs parallel to the baseline and indicates the true distance between beginning and ending dimension points. *See also* linear dimension.

**allocation** In network analysis, the process of assigning entities or edges and junctions to features until the feature's capacity or limit of impedance is reached. For example, streets may be assigned to the most accessible fire station within a six-minute radius, or students may be assigned to the nearest school until it is full.

**almanac** **1.** [GPS] In GPS, a file transmitted from a satellite to a receiver that contains information about the orbits of all satellites included in the satellite network. Receivers refer to the almanac to determine which satellite to track. **2.** [ASTRONOMY] An annual publication containing weather forecasts, information on astronomical events, and miscellaneous facts, arranged according to the calendar of a given year.

**along-track scanner** [REMOTE SENSING] A remote-sensing tool with a line of many fixed sensors that record

reflected radiation from the terrain along a satellite's direction of movement, creating scan-line strips that are contiguous or that overlap slightly, thereby producing an image. *See also* cross-track scanner.



long-track scanner

**alphanumeric grid** [CARTOGRAPHY]

A grid of numbered rows and lettered columns (or vice versa) superimposed on a map, used to find and identify features. Alphanumeric grids are commonly used as a reference system on local street maps.

**alternate key** An attribute or set of attributes in a relational database that provides a unique identifier for each record and could be used as an alternative to the primary key. *See also* key.

**altitude** 1. [CARTOGRAPHY] The height or vertical elevation of a point above a reference surface. Altitude measurements are usually based on a given reference datum, such as mean sea level. 2. The height above the horizon, measured in degrees, from which a light source illuminates a surface. Altitude is used when calculating a hillshade, or for controlling the position of a light source in a scene. *See also* elevation.

**AM/FM** *Acronym for automated mapping/facilities management.* GIS or CAD-based systems used by utilities and public works organizations for storing, manipulating, and mapping facility information such as the location of geographically dispersed assets.

**ambiguity** In GIS, a state of uncertainty in data classification that exists when an object may appropriately be assigned two or more values for a given attribute. For example, coastal areas experiencing tidal fluctuations may be dry land at some times and under water at other times. Ambiguity may be caused by changeable conditions in reality, by incomplete or conflicting definitions of attributes, or by subjective differences in the evaluation of data. It may also be caused by disputes, as when two parties claim ownership of the same tract of land. *See also* vagueness, uncertainty.

**American National Standards Institute** *See* ANSI.

**American Standard Code for Information Interchange** *See* ASCII.

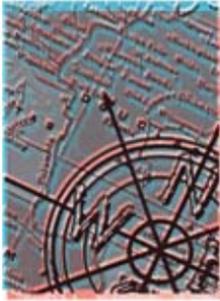
**AML** [ESRI SOFTWARE] *Acronym for ARC Macro Language.* A proprietary, high-level programming language created by ESRI for generating end-user applications in ArcInfo Workstation. *See also* high-level language.

**amoeba** *See* complex market area.

**anaglyph** A stereo image made by superimposing two images of the same area. The images are displayed

## analog—anisotropy

**A** in complementary colors, usually red and blue or green. When viewed through filters of corresponding colors, the images appear as one three-dimensional image.



anaglyph

**analog 1.** Represented continuously rather than in discrete steps; having value at any degree of precision.

**2.** In electronics, having a continuously variable signal, or a circuit or device that carries such signals.

*See also* digital.

**analog image** An image represented by continuous variation in tone, such as a photograph. *See also* image, digital image, aerial photograph.



analog image

**analysis** A systematic examination of a problem or complex entity in order to provide new information from what is already known.

**analysis mask** *See* mask.

**analysis of variance** [STATISTICS]

A statistical procedure used to evaluate the variance of the mean values for two or more datasets in order to assess the probability that the data comes from the same sample or statistical population.

**ancillary data 1.** [DIGITAL IMAGE

PROCESSING] Data from sources other than remote sensing, used to assist in analysis and classification or to populate metadata.

**2.** Supplementary data.

**angular unit** [GEODESY]

The unit of measurement on a sphere or a spheroid, usually degrees. Some map projection parameters, such as the central meridian and standard parallel, are defined in angular units. *See also* linear unit.

**anisotropic** Having nonuniform spatial distribution of movement or properties, usually across a surface. *See also* anisotropy, isotropic.

**anisotropy** [STATISTICS]

A property of a spatial process or data in which spatial dependence (autocorrelation) changes with both the distance and the direction between two locations. *See also* anisotropic, isotropy, autocorrelation.

**annotation 1.** [CARTOGRAPHY] In cartography, text or graphics on a map that provide information for the map reader. Annotation may identify or describe a specific map entity, provide general information about an area on the map, or supply information about the map itself.



annotation 1

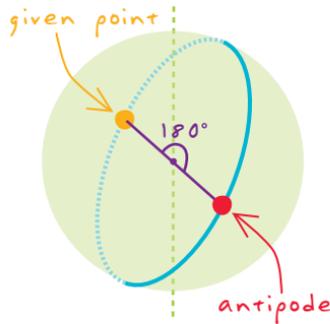
**2.** [ESRI SOFTWARE] In ArcGIS, text or graphics that can be individually selected, positioned, and modified. Annotation may be manually entered or generated from labels. Annotation can be stored as features in a geodatabase or as map annotation in a data frame. *See also* label. \*For more information about annotation, see Cartographic text in ArcGIS software: Annotation, labeling, and graphic text on page 245.

**ANOVA** *See* analysis of variance.

**ANSI** *Acronym for American National Standards Institute.* The private, non-profit organization that develops U.S. industry standards through consensus and public review.

**antipode** [GEODESY] Any point on the surface of a sphere that lies 180 degrees (opposite) from a given point on the same surface, so that a

line drawn between the two points through the center of the sphere forms a true diameter.



antipode

**anywhere fix** [GPS] A position that a Global Positioning System (GPS) receiver can calculate without knowing its own location or the local time.

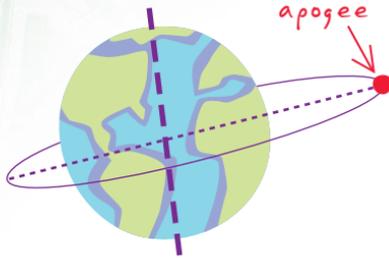
**AOI** *See* area of interest.

**aphylactic projection** *See* compromise projection.

**API** [PROGRAMMING] *Acronym for application programming interface.* A set of interfaces, methods, protocols, and tools that application developers use to build or customize a software program. APIs make it easier to develop a program by providing building blocks of prewritten, tested, and documented code that are incorporated into the new program. APIs can be built for any programming language.

**apogee** [ASTRONOMY] In an orbit path, the point at which the object in orbit is farthest from the center of the body being orbited. *See also* perigee.

## appending—architecture



apogee

**appending** Adding features from multiple data sources of the same data type into an existing dataset. *See also* merging.

**applet** A small program that usually executes from within a Web browser. Applets are compatible with most platforms, and can also be used within applications or devices that support applets.

**application 1.** The use of a GIS to solve problems, automate tasks, or generate information within a specific field of interest. For example, a common agricultural application of GIS is determining fertilization requirements based on field maps of soil chemistry and previous crop yields. **2.** [COMPUTING] A computer program used for a specific task or purpose, such as accounting or GIS.

**application programming interface** *See* API.

**application server** [COMPUTING] A computer program that receives user requests through a client application and returns results to the client. *See also* three-tier configuration.

**arbitrary symbol** [CARTOGRAPHY] A symbol that has no visual similarity to the feature it represents—for example, a circle used to represent a city, or a triangle used to represent a school. *See also* mimetic symbol.



arbitrary symbol

**arc 1.** On a map, a shape defined by a connected series of unique x,y coordinate pairs. An arc may be straight or curved.



arc 1

**2.** A coverage feature class that represents lines and polygon boundaries. One line feature can contain many arcs. Arcs are topologically linked to nodes and to polygons. Their attributes are stored in an arc attribute table (AAT). Nodes indicate the endpoints and intersections of arcs; they do not exist as independent features. Together, the from-node and the to-node define the direction of the arc. *See also* path.

**architecture** [COMPUTING] The internal design of an application or software package; the way software or

hardware components are organized into a functioning unit.

**archive** [COMPUTING] A collection of information or data that is stored on a permanent medium such as CDs, discs, or tapes. Information is archived to ensure its security or persistence.

**ARC Macro Language** *See* AML.

**ArcObjects** [ESRI SOFTWARE] A library of software components that make up the foundation of ArcGIS. ArcGIS Desktop, ArcGIS Engine, and ArcGIS Server are all built using the ArcObjects libraries.

**arc second** *See* second.

**area 1.** [MATHEMATICS] A closed, two-dimensional shape defined by its boundary or by a contiguous set of raster cells. **2.** [MATHEMATICS] A calculation of the size of a two-dimensional feature, measured in square units. *See also* polygon.

**areal scale** *See* scale.

**area of interest** [CARTOGRAPHY] The extent used to define a focus area for either a map or database production.

**argument 1.** [COMPUTING] A value or expression passed to a function, command, or program. **2.** [MATHEMATICS] An independent variable of a function.

**arithmetic expression** [MATHEMATICS] A number, variable, function, or combination of these, with operators or parentheses, or both, that

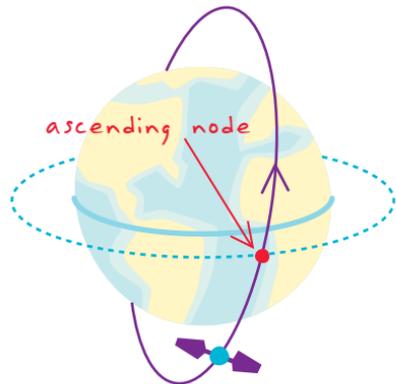
can be evaluated to produce a single number. *See also* expression.

**arithmetic operator** *See* operator.

**array 1.** [GPS] A set of objects that are connected to function as a unit. An array of satellites is used to pinpoint locations on the earth. **2.** [MATHEMATICS] In computing, a fundamental data structure consisting of a variable with multiple, sequentially indexed, cells that can each store a value of the same type. Each cell of the array acts as a variable, and the cells are referenced by an index value for each array dimension. One-dimensional arrays, called vectors, and two-dimensional arrays, called matrices, are most common, but arrays may have more dimensions. *See also* matrix, variable.

**artificial neural network** *See* neural network.

**ascending node** [ASTRONOMY] The point at which a satellite traveling south to north crosses the equator. *See also* descending node.



ascending node

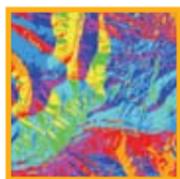
## ASCII— asynchronous request

**ASCII** *Acronym for American Standard Code for Information Interchange.* The de facto standard for the format of text files in computers and on the Internet that assigns a 7-bit binary number to each alphanumeric or special character. ASCII defines 128 possible characters.

**aspatial data** *See* nonspatial data.

**aspatial query** *See* attribute query.

**aspect** **1.** The compass direction that a topographic slope faces, usually measured in degrees from north. Aspect can be generated from continuous elevation surfaces. For example, the aspect recorded for a TIN face is the steepest downslope direction of the face, and the aspect of a cell in a raster is the steepest downslope direction of a plane defined by the cell and its eight surrounding neighbors.



■ north aspect  
■ east aspect  
■ south aspect  
■ west aspect

aspect 1

**2.** [CARTOGRAPHY] The conceptual center of a projection system. *See also* slope.

**aspect ratio** [COMPUTING] The ratio of the width of an image to its height. The aspect ratio of a standard computer monitor is 4:3 (rectangular).

**association** [COMPUTING] In UML, the relationship between two classes.

In an association, instances of the classes in question usually exist together, but can exist on their own. *See also* class, UML.

**assumed bearing** [SURVEYING]

A bearing measured from an arbitrarily chosen reference line called an assumed meridian. *See also* bearing.

**astrolabe** [ASTRONOMY] An instrument that measures the vertical angle between a celestial body and the horizontal plane at an observer's position. The astrolabe was replaced by the sextant in the fifteenth century for navigation, but modern versions are still used to determine local time and latitude. *See also* sextant.



astrolabe

**asynchronous** Not synchronous; that is, not occurring together or at the same time.

**asynchronous request** [COMPUTING]

A request from a client application that does not require a response from the server for the client application to continue its process.

**atlas** [CARTOGRAPHY] A collection of maps usually related to a particular area or theme and presented together. Examples of atlases include world atlases, historical atlases, and biodiversity atlases.

**atlas grid** *See* alphanumeric grid.

**atmospheric window** [REMOTE SENSING] Parts of the electromagnetic spectrum that can be transmitted through the atmosphere with relatively little interference.

**atomic clock** [PHYSICS] A clock that keeps time by the radiation frequency associated with a particular atomic reaction. Atomic clocks are used in official timekeeping.

**attenuation** [REMOTE SENSING] The dimming and blurring effects in remotely sensed images caused by the absorption and scattering of light or other radiation that passes through the earth's atmosphere.

**attribute** **1.** Nonspatial information about a geographic feature in a GIS, usually stored in a table and linked to the feature by a unique identifier. For example, attributes of a river might include its name, length, and sediment load at a gauging station. **2.** In raster datasets, information associated with each unique value of a raster cell.

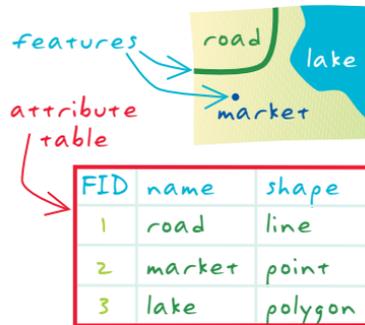
**3.** [CARTOGRAPHY] Information that specifies how features are displayed and labeled on a map; for example, the graphic attributes of a river might include line thickness, line length, color, and font for labeling.

**attribute data** Tabular or textual data describing the geographic characteristics of features. *See also* nonspatial data.

**attribute key** *See* primary key.

**attribute query** A request for records of features in a table based on their attribute values. *See also* attribute.

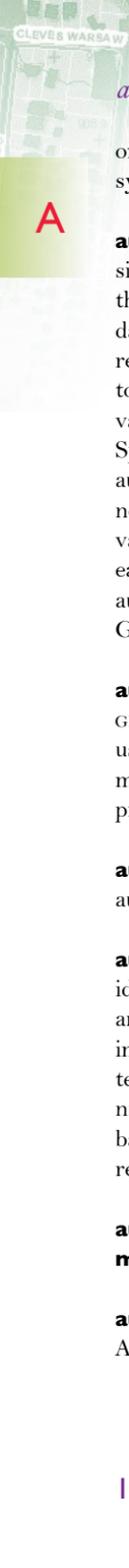
**attribute table** A database or tabular file containing information about a set of geographic features, usually arranged so that each row represents a feature and each column represents one feature attribute. In raster datasets, each row of an attribute table corresponds to a certain zone of cells having the same value. In a GIS, attribute tables are often joined or related to spatial data layers, and the attribute values they contain can be used to find, query, and symbolize features or raster cells.



attribute table

**authalic projection** *See* equal-area projection.

**authentication** [COMPUTING] The process of validating the identity



## *autocorrelation—axis*

of a user who logs on to a computer system, network, or Web site.

**autocorrelation** The correlation or similarity of values, generally values that are nearby in a dataset. Temporal data is said to exhibit serial autocorrelation when values measured close together in time are more similar than values measured far apart in time. Spatial data is said to exhibit spatial autocorrelation when values measured nearby in space are more similar than values measured farther away from each other. *See also* correlation, spatial autocorrelation, Tobler's First Law of Geography.

**automated cartography** [CARTOGRAPHY] The process of making maps using computer systems that carry out many of the tasks associated with map production. *See also* GIS.

**automated digitizing** *See* autovectorization.

**automated feature extraction** The identification of geographic features and their outlines in remote-sensing imagery through postprocessing technology that enhances feature definition, often by increasing feature-to-background contrast or using pattern recognition software.

**automated mapping/facilities management** *See* AM/FM.

**automated text placement** An operation in which text is

automatically placed on or next to features on a digital map by a software application according to rules set by the software user.

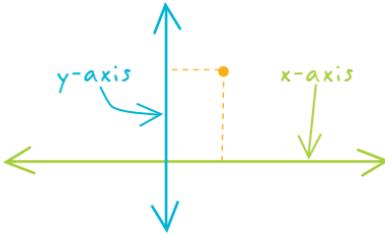
**automation scale** The scale at which nondigital data is made digital; for example, a map digitized at a scale of 1:24,000 has an automation scale of 1:24,000. The data can be rendered at different display scales. *See also* display scale.

**autovectorization** The creation of vector data from raster data through automated tracing of pixels that are in close proximity and of the same or similar value. *See also* vectorization, digitizing.

**availability** The degree of ease with which a dataset or other object may be found or obtained.

**AVHRR** [REMOTE SENSING] *Acronym for Advanced Very High Resolution Radiometer.* A scanner flown on National Oceanic and Atmospheric Administration (NOAA) polar-orbiting satellites for measuring visible and infrared radiation reflected from vegetation, cloud cover, shorelines, water, snow, and ice. AVHRR data is often used for weather prediction and vegetation mapping.

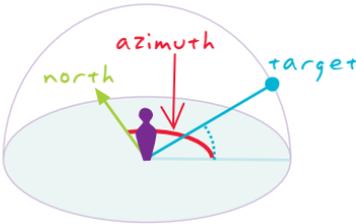
**axis 1.** [CARTOGRAPHY] A line along which measurements are made in order to determine the coordinates of a location.



axis 1

**2.** [CARTOGRAPHY] In a spherical coordinate system, the line that directions are related to and from which angles are measured. **3.** [ASTRONOMY] The imaginary line through the poles about which a rotating body turns.

**azimuth 1.** [CARTOGRAPHY] The horizontal angle, measured in degrees, between a baseline drawn from a center point and another line drawn from the same point. Normally, the baseline points true north and the angle is measured clockwise from the baseline.



azimuth 1

**2.** A compass direction. For example, in some GIS software, the direction from which a light source illuminates a surface is called the azimuth. **3.** [NAVIGATION] The horizontal angle, measured in degrees, between a

reference line drawn from a point and another line drawn from the same point to a point on the celestial sphere. Normally, the reference line points true north and the angle is measured clockwise from the reference line.

**azimuthal projection** [CARTOGRAPHY] A map projection that transforms points from a spheroid or sphere onto a tangent or secant plane. The azimuthal projection is also known as a planar or zenithal projection.