Vector
• Point, line, or polygon feature types
• Multi-part files
Raster
• Continuous coverage, usually in square pixels
• .jpg, .tiff, .gif, .bmp, .png
Grid

Projections
The projection is the mathematical algorithm that defines how to present the round earth on a flat map. Conic, Cylindrical, Azimuthal (hybrids too) Tangent/Secant (touch once or twice) Transverse? (angle)

Geodesy, not limited to spheroid, geoid, ellipsoid and datum
Geodesy is the branch of mathematics concerned with the shape and area of the earth and with the location of points on it.
Spheroid - "a sphere-like but not perfectly spherical body." - Oxford Dictionary
        ○ Oblate Spheroid - a little rounder in the middle
Geoid - "The geoid is an imaginary sea level surface that undulates (has a wavy surface) over all of the earth; it isn't just for the oceanic areas, It also extends through the land masses. -USGS
Ellipsoid - "An ellipsoid is a three-dimensional geometric figure that resembles a sphere, but whose equatorial axis is slightly longer than its polar axis"- PennState.
Datum - A datum is a set of reference points on the earth's surface against which position measurements are made, and (often) an associated model of the shape of the earth (reference ellipsoid) to define a geographic coordinate system.

Geomatics
Geomatics is defined as the "discipline concerned with the collection, distribution, storage, analysis, processing, presentation of geographic data or geographic information". It consists of products, services and tools involved in the collection, integration and management of geographic (geospatial) data. It is also known as geomatic(s) engineering (geodesy and geoinformatics engineering or geospatial engineering). Surveying engineering was the widely used name for geomatic(s) engineering in the past.

Geo-primitives
Geometric primitives are the representations used and computations performed in a GIS that concern the spatial aspects of the data, data objects described by coordinates.

Geo-processing
Geographic data processing, a collection of spatial analysis functions.

Historical Cartography
Cartography is the science and practice of making maps

History of GIS
GIS's origins lie in thematic cartography

Dot Density
A dot density map is a type of thematic map that uses a dot symbol to represent a certain quantity of a variable of interest. The number of dots per unit area on the map is proportional to the density of the variable in that area. Dot density maps are used to visualize spatial patterns and to show the distribution of a variable over a particular region. These maps can be useful for identifying clusters or concentrations of the variable, as well as for comparing the relative density of the variable across different areas.

Geo/Database terminology & components
• Geodatabase
  • For organizing and managing data of various types
  • Allows topology

Euclidean Distance
Euclidean Distance gives the distance from each cell in the raster to the closest source.
For example, in a two-dimensional space, the Euclidean distance between the points (x1, y1) and (x2, y2) is given by the formula:

distance = sqrt((x1 - x2)^2 + (y1 - y2)^2)

Flow Direction/Accumulation
Flow Direction Creates a raster of flow direction from each cell to its downslope neighbor, or neighbors, using the D8, Multiple Flow Direction (MFD), or D-Infinity (DINF) method.
Flow Accumulation Creates a raster of accumulated flow into each cell. A weight factor can optionally be applied.

Flow Map
A flow map is a type of thematic map that is used to visualize the movement of people, goods, or other objects from one location to another. Flow maps typically use arrows to show the direction and magnitude of the flow between different locations. The length of the arrows is proportional to the quantity of the flow, and the direction of the arrows indicates the direction of the movement. Flow maps can be used to analyze and understand various types of spatial movement, such as the flow of goods between cities, the migration of people between countries, or the spread of an infectious disease. Flow maps are commonly used in spatial analysis and transportation planning.

Fishnet (Gridded Perspective View)

A gridded perspective view is a type of map projection that is used to create a three-dimensional representation of the Earth's surface. It is called a "gridded" perspective view because it uses a grid of lines to represent the Earth's surface, with the grid lines converging at a single point to create a sense of depth and perspective. Gridded perspective views are commonly used in spatial analysis to visualize the shape and topography of the Earth's surface. They can be used to create detailed, realistic-looking maps of mountainous or hilly regions, and they are often used in applications such as geology, forestry, and aviation.

Graduated Symbol
A graduated symbol is a type of map symbol that is used to visualize the magnitude of a variable over a particular area. In a graduated symbol map, the size of the symbol is proportional to the value of the variable, with larger symbols representing higher values and smaller symbols representing lower values.
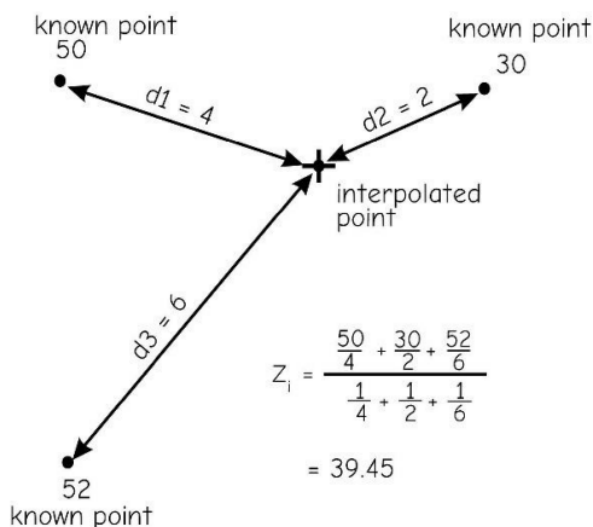
Ground Truth
Ground truth is often used as a reference or baseline against which other measurements or estimates can be compared to assess their accuracy or precision. For example, in remote sensing, ground truth data may be collected by field observations or other means to validate the accuracy of satellite images or other remotely sensed data.

Hillshade
A hillshade is a type of map that is used to visualize the topography of an area. It is created by applying a shading effect to a digital elevation model (DEM) of the area, with the shading simulating the effect of sunlight on the terrain. Hillshades are commonly used in spatial analysis to show the shape and relief of the land, and they can be useful for identifying features such as mountains, valleys, and ridges. Hillshades are often combined with other map layers, such as vegetation or land use, to create more detailed and informative maps.

IDW
An interpolation method that computes the unknown value as the weighted sum of the known values

known point
50

known point
30

d1 = 4

d2 = 2

interpolated point

d3 = 6

$$Z_i = \frac{\frac{50}{4} + \frac{30}{2} + \frac{52}{6}}{\frac{1}{4} + \frac{1}{2} + \frac{1}{6}}$$

= 39.45

52
known point

Interpolation

Interpolation is the process of estimating unknown values that fall between known values

Isarithmic

An isarithmic map is a type of thematic map that is used to visualize the spatial distribution of a variable that varies continuously over an area. Isarithmic maps use isoline symbols, such as contour lines or color gradients, to represent the variable. The isolines on an isarithmic map are equally spaced and are calculated based on the values of the variable in the area. Isarithmic maps are commonly used to show the distribution of variables such as elevation, temperature, or precipitation. They can be useful for analyzing spatial patterns and trends in the variable, and for comparing the values of the variable across different areas.

Zonal Statistics

Zonal statistics is a method used in spatial analysis to summarize the values of a variable within a defined area, or zone. In zonal statistics, the values of the variable are extracted from a raster dataset, and then they are aggregated using a statistic such as the mean, median, or mode. The resulting summary statistic can then be assigned to the zone, and it can be used to create a thematic map or to perform further analysis. Zonal statistics are commonly used to summarize the values of variables such as land cover, population density, or precipitation within administrative units or other predefined areas.

Intersect

returns any target layer features that at least partially overlay features the source layer.

Terrain analysis

Terrain analysis involves the use of spatial data and tools to analyze and understand the physical characteristics of the land, such as its elevation, slope, aspect, and curvature. Terrain analysis is commonly used in applications such as geology, hydrology, environmental management, and civil engineering, to understand the effects of the terrain on natural processes and human activities.

Isopleth

isopleth is a line drawn on a map through all points having the same value of some measurable quantity.

Absorption

Kriging

Like IDW, Kriging is a weighted average technique, except that the weighting formula in Kriging uses much more sophisticated math. Kriging measures distances between all possible pairs of sample points and uses this information to model the spatial autocorrelation for the particular surface you're interpolating.

Accuracy

Accuracy: a measurement of the agreement of a standard assumed to be correct and (for classification) a classified image of unknown quality. High accuracy = low bias.

Kurtosis

Kurtosis is a statistical measure that describes the shape of a distribution. In spatial analysis, kurtosis is used to describe the concentration of values around the mean of a dataset. For example, a distribution with high kurtosis is said to have a peaked shape, with many values concentrated near the mean, while a distribution with low kurtosis is said to be more flat, with values spread out over a wider range. In general, kurtosis is used to assess the "peakedness" or "flatness" of a spatial dataset, which can be useful for identifying patterns and trends in the data.

Aspect

Aspect is the direction of maximum slope. Aspect is typically stored as degrees. It is also the direction a point on a slope faces, typically the direction of the maximum slope.

Autocorrelation

The formal property that measures the degree to which near and distant things are related is spatial autocorrelation. It is also a relationship between proximity and measured attribute.

Buffer

Buffer: a zone of a user- specified width around a vector feature.

Cartography

"The science, art, and technology of making, using, and studying maps." – K. Clarke

Clip

Clip: cuts a piece out of the first input layer using the second layer as a "cookie cutter".

Clustering

clustering is a technique used to identify groups of similar objects or spatial locations that are close to one another. These groups, or clusters, can be identified based on a variety of different characteristics, such as the spatial proximity of the objects, the similarity of their attributes, or their overall spatial distribution. Clustering is a powerful tool for spatial data analysis, as it allows researchers to identify patterns and trends in the data that might not be apparent using other methods. It can also be used to make predictions about the spatial distribution of different phenomena, or to inform decision making in fields such as urban planning or public health.

Choropleth

A choropleth map (from Greek χῶρος ("area/region") + πλῆθος ("multitude")) is a thematic map in which areas are shaded or patterned proportionally to the value of a particular variable measured for each area.

Confusion Matrix
A confusion matrix is a table that is used to evaluate the performance of a classification model. In the context of spatial analysis, a confusion matrix can be used to evaluate the accuracy of a model that is used to classify spatial data into different categories

Curvature
• Plan curvature
        Planform curvature: rate of change of the aspect along a contour. Negative values are sidewardly convex; positive values sidewardly concave; 0 means the surface is linear.
• Profile curvature
        Profile curvature: rate of change of the slope at the maximum slope. Negative values are upwardly convex; positive values upwardly concave; 0 means the surface is linear

Data types
 • Discrete or Nominal (integer)
 • Ordinal (integer)
 • Continuous (integer or floating point)
 • Ratio/Interval

Dasymetric
A dasymetric map is a method of thematic mapping in which a choropleth map is refined by incorporating additional geographic information. In a dasymetric map, boundaries are modified to conform to known areas of homogeneity and are not restricted to administrative or statistical boundaries.

Dissolve
Remove redundant information from contiguous features.

Lidar
Lidar (LIght Detection And Ranging)
 – short-wavelength laser light (e.g., 0.90 μm)
– recording the light back-scattered from the terrain or atmosphere

Landsat

Mapping Technologies

Merge

Models

Precision
Precision: the "sharpness" of a measurement, e.g. RMSE of a continuous variable or categorical specificity of a nominal variable

Producer's Accuracy

Pythagorean Theorem

NDVI vs NDWI

OBIA

Occam's Razor

NASA

DBMS

DEM

ETL

GIS

GPS

GNSS MAUP

MMU

NAD83

PDOP

RMSE

RTK

SQL

TIN

USGS

UTM

Query

Scattering

Spline

Stratified Random Sampling

Stream Order

Semivariogram

Spline

Stochastic

Supervised Classification

TALDOGS

Thiessen Polygons

Tobler

Topography

Topographic Wetness Index

T-O Map

Union

User's Accuracy

Unsupervised Classification

Validation

Radiation

Residual

Resolution

RMSE

Watershed

Wavelength

Here are a few other things to consider:
Conversion between DMS and DD
Inverse distance between two points vs Inverse distance weighting between several points
Traverse a set of points given starting location, bearings, and distances
Calculate geodetic distance between two points (i.e., "Great Circle")
Calculate slope in a 3 x 3 raster grid
Calculate aspect in a 3 x 3 raster grid
Calculate NDVI