Topic No: 09 Spatial analysis: Overlay analysis, Neighborhood function:

Spatial analysis

Spatial analysis or spatial statistics includes any of the formal techniques which study entities using their topological, geometric, or geographic properties. Spatial analysis includes a variety of techniques, many still in their early development, using different analytic approaches and applied in fields as diverse as astronomy, with its studies of the placement of galaxies in the cosmos, to chip fabrication engineering, with its use of "place and route" algorithms to build complex wiring structures. In a more restricted sense, spatial analysis is the technique applied to structures at the human scale, most notably in the analysis of geographic data.

Complex issues arise in spatial analysis, many of which are neither clearly defined nor completely resolved, but form the basis for current research. The most fundamental of these is the problem of defining the spatial location of the entities being studied.

Classification of the techniques of spatial analysis is difficult because of the large number of different fields of research involved, the different fundamental approaches which can be chosen, and the many forms the data can take.

Overlay analysis:-

One basic way to create or identify spatial relationships is through the process of s patial overlay. Spatial overlay is accomplished by joining and viewing together separate data sets that share all or part of the same area. The result of this combination is a new data set that identifies the spatial relationships.

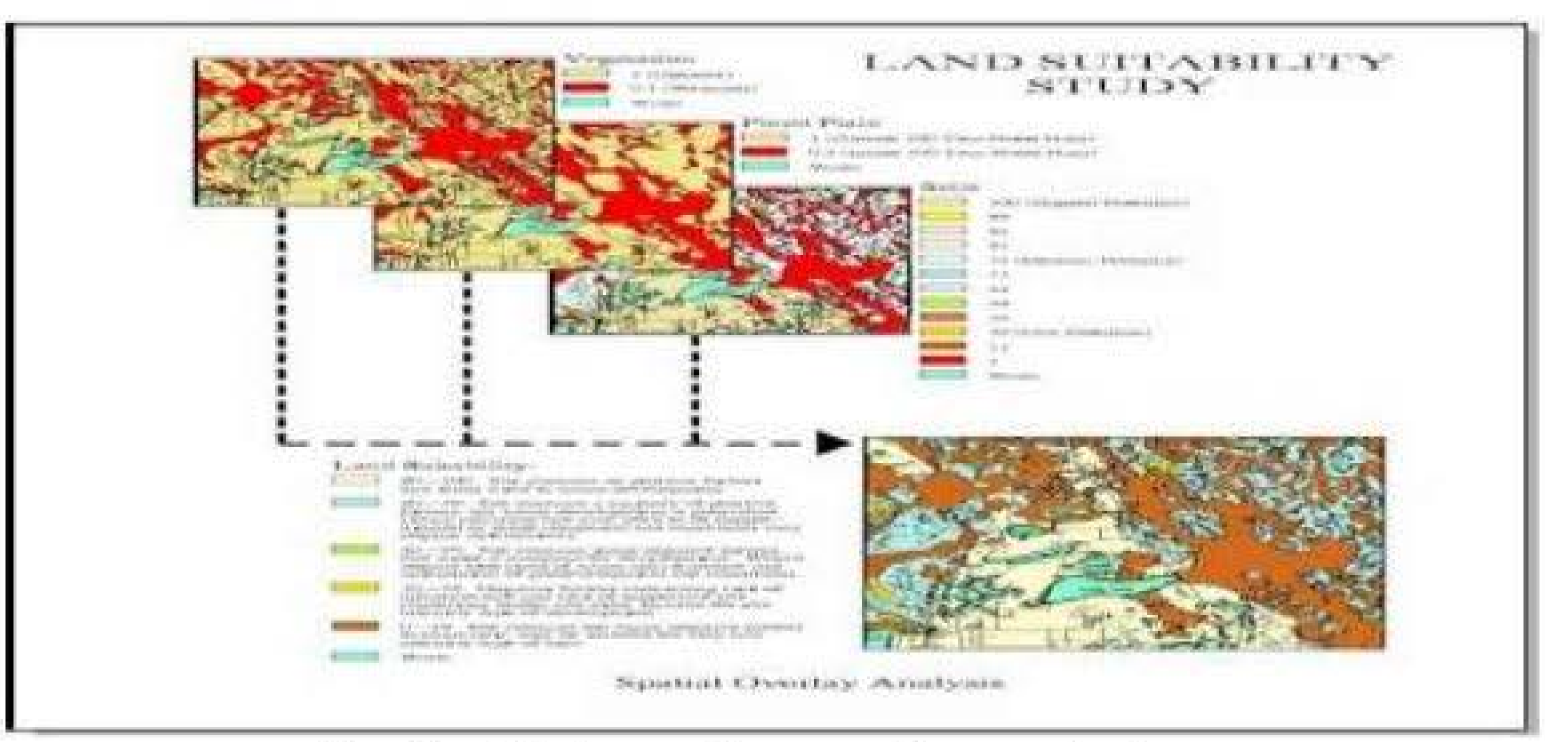


Fig No: 18 shows the overlay analysis

The power of spatial overlay is illustrated by the project highlighted in the figure below. Three layers of data were used in the analysis which was designed to identify the development potential of land within the County. Polygons (enclosed areas) were assigned a rating based on vegetation type, soil type and whether they were in the 100-year floodplain. Then the three layers were combined to create a new layer which contained all the previous information. Finally, a comprehensive rating was determined by performing a weighted average of the three separate rating items. The result was a map contrasting suitable and unsuitable areas for development based on the land characteristics.

Neighborhood function:

Neighborhood functions create output values for each cell location based on the location value and the values identified in a specified neighborhood. The neighborhood can be of two types: moving or search radius.

Moving neighborhoods can either be overlapping or non-overlapping. Overlapping neighborhood functions are also referred to as focal functions and generally calculate a specified statistic within the neighborhood. For example, you may want to find the mean or maximum value in a 3 x 3 neighborhood. Variations of the overlapping neighborhood statistics function are the high and low pass filter functions to smooth and accentuate data. The non-overlapping neighborhood functions, or block functions, allow for statistics to be calculated in a specified non-overlapping neighborhood. Block functions are particularly useful for changing the resolution of a raster to a coarser cell size. The values assigned to the coarser cells can be based on another calculation, such as the maximum value in the coarser cell as opposed to using the default nearest neighbor interpolation.

Neighborhood operations are a method of analyzing data in a GIS environment. They are especially important when a situation requires the analysis of relationships between locations, rather than interpret the characteristics at individual locations.

The Scanning Cell and its Neighbourhood:

Neighborhood operations are commonly called 'Focal Functions' since each operation performed generates a value for the 'focus' of a neighborhood. The neighborhood focus is generally called the scanning cell and its neighbors – that is the cells surrounding it – are known as the scanning neighborhood. The scanning neighborhood can take on various sizes and shapes, which are defined by selecting the appropriate options in the GIS package. The most common neighborhood shapes are:

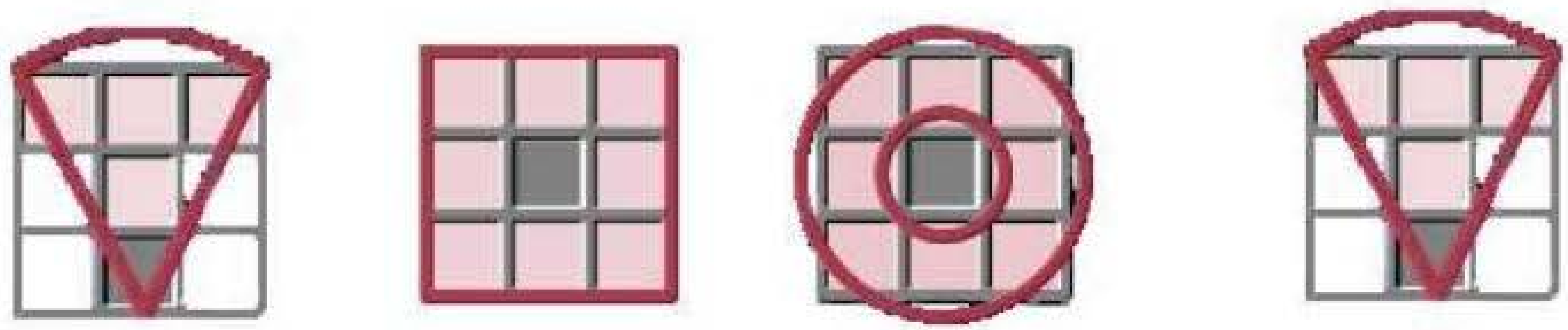


Fig No: 19 shows the Common neighborhood shapes

How Neighborhood Operations Work:

Neighborhood operations work by moving across a raster grid map, one cell at a time. As each cell is visited, it becomes the scanning cell and a new value is computed for that cell as a function of its scanning neighborhood. All computed values are then placed into the corresponding cells of the output map/theme

Topic No: 10 Networks, Overlay Analysis and Buffering:

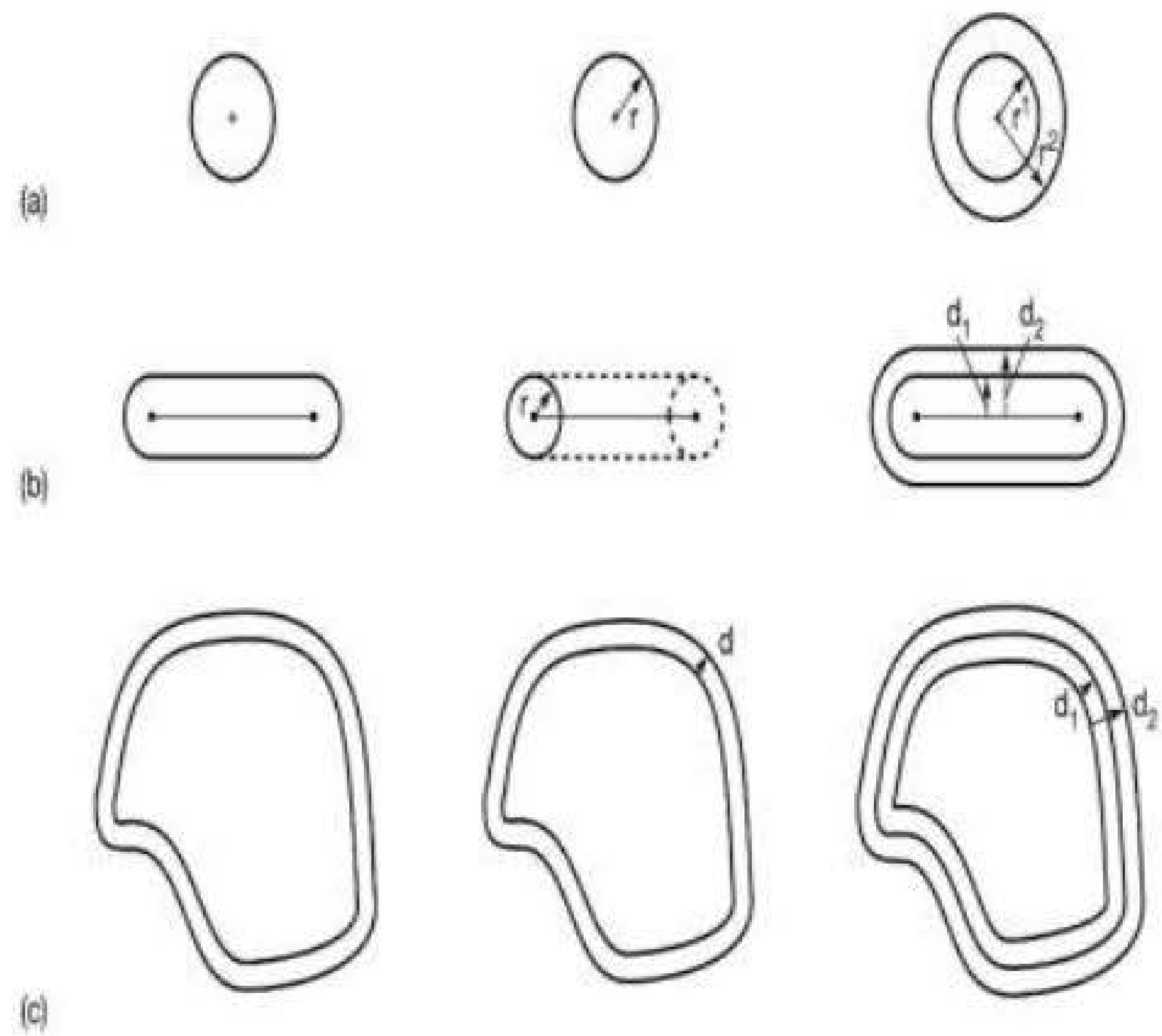
Measurements of a layer

- Distance (e.g., measure tool in ArcMap, a little "measure" icon on the main tool bar)
- Areas (sometimes stored in the attribute table) average)
- Geo statistics
- Histogram
- Trend analysis
- Semivariograms

(Variance based on nearby samples; a check for spat

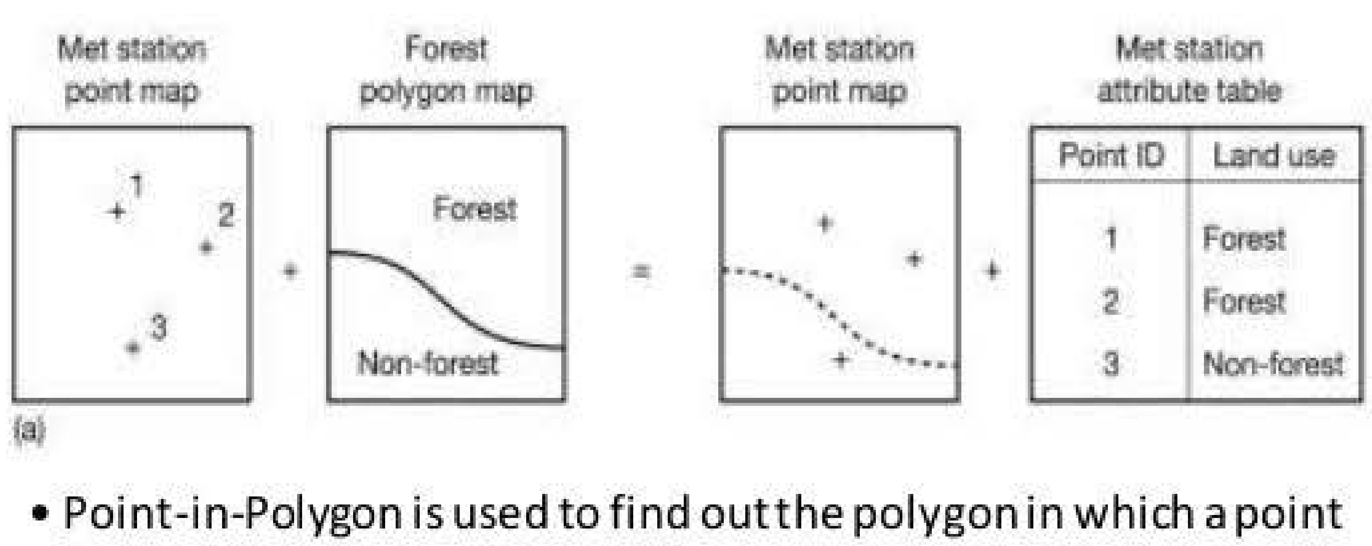
- In ArcMap,
- Customize, toolbars, geostatistical analyst
- Geostatistical analyst, explore data option

Buffer zones around (a) point, (b) line, and (c) area



- Buffer at a specified distance; At a distance from an attribute field; and As multiple rings at a defined increment.
- In ArcMap: Geoprocessing, buffer; In ArcToolbox: Analysis tools, Proximity, Buffer;

Vector Overlay – Point-in-Polygon



- Point-in-Polygon is used to find out the polygon in which a point Falls.
- Example: Which land cover does each meteorological station fall into?
- Why is there a problem in the alternative order – polygon to point? Hint: What would the attribute table look like?

Buffering

Buffering usually creates two areas: one area that is within a specified distance to selected real world features and the other area that is beyond. The area that is within the specified distance is called the buffer zone.

A buffer zone is any area that serves the purpose of keeping real world features distant from one another. Buffer zones are often set up to protect the environment, protect residential and commercial zones from industrial accidents or natural disasters, or to prevent violence. Common types of buffer zones may be greenbelts between residential and commercial areas, border zones between countries (see figure buffer zone), noise protection zones around airports, or pollution protection zones along rivers.

in a GIS Application, buffer zones are always represented as vector polygons enclosing other polygon, line or point features

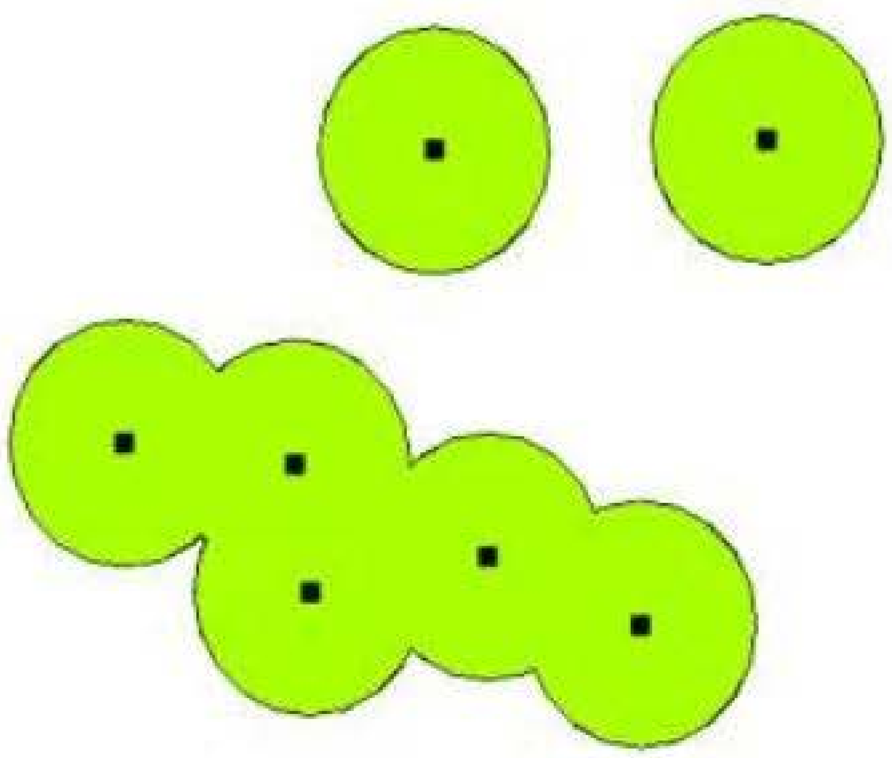


Fig No: show the buffer of the Points

Variations in buffering

There are several variations in buffering. The **buffer distance** or buffer size **can vary** according to numerical values provided in the vector layer attribute table for each feature. The numerical values have to be defined in map units according to the Coordinate Reference System (CRS) used with the data