M.Sc. Remote Sensing and GIS RT-202

Geographic Information System

Unit-III

3.2 Vector Based Spatial Data Analysis – Part-II

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…Cont.
Multilayer Analysis

- In a GIS, an **overlay** is the process of taking two or more different thematic maps of the same area and placing them on top of one another to form a new map.

- Following Figure "A Map Overlay Combining Information from Point, Line, and Polygon Vector Layers, as Well as Raster Layers". Inherent in this process, the overlay function combines not only the spatial features of the dataset but also the attribute information as well.

CUSTOMERS

STREETS

PARCELS

ELEVATION

LAND
USAGE

REAL
WORLD
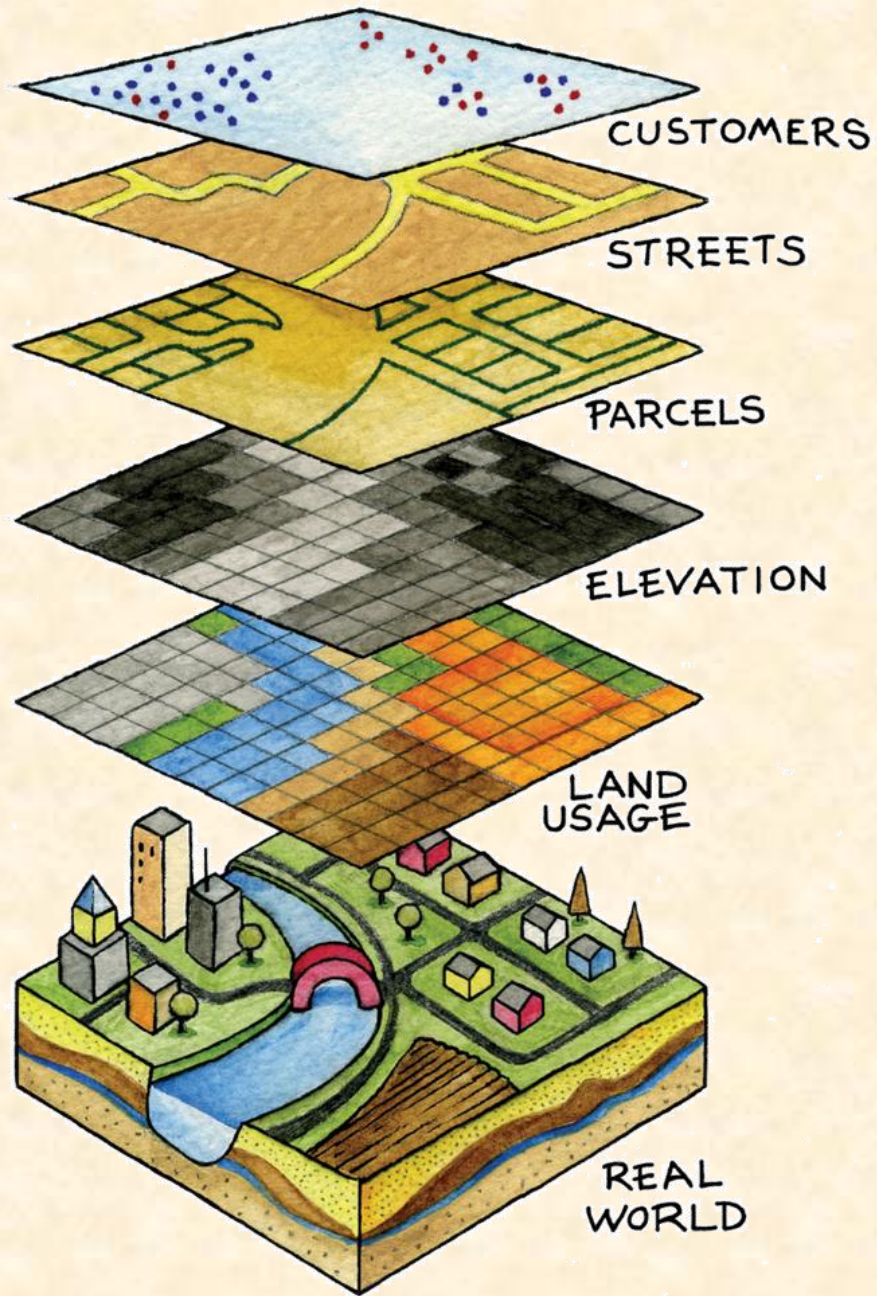
Overlay Operation

- Several basic overlay processes are available in a GIS for vector datasets:
  - point-in-polygon,
  - polygon-on-point,
  - line-on-line,
  - line-in-polygon,
  - polygon-on-line,
  - polygon-on-polygon.

  As you may be able to divine from the names, one of the overlay dataset must always be a line or polygon layer, while the second may be point, line, or polygon. The new layer produced following the overlay operation is termed the "output" layer.

Point-in-Polygon Overlay

- The point-in-polygon overlay operation requires a point input layer and a polygon overlay layer. Upon performing this operation, a new output point layer is returned that includes all the points that occur within the spatial extent of the overlay.

- In addition, all the points in the output layer contain their original attribute information as well as the attribute information from the overlay.

- For example, suppose you were tasked with determining if an endangered species residing in a national park was found primarily in a particular vegetation community.
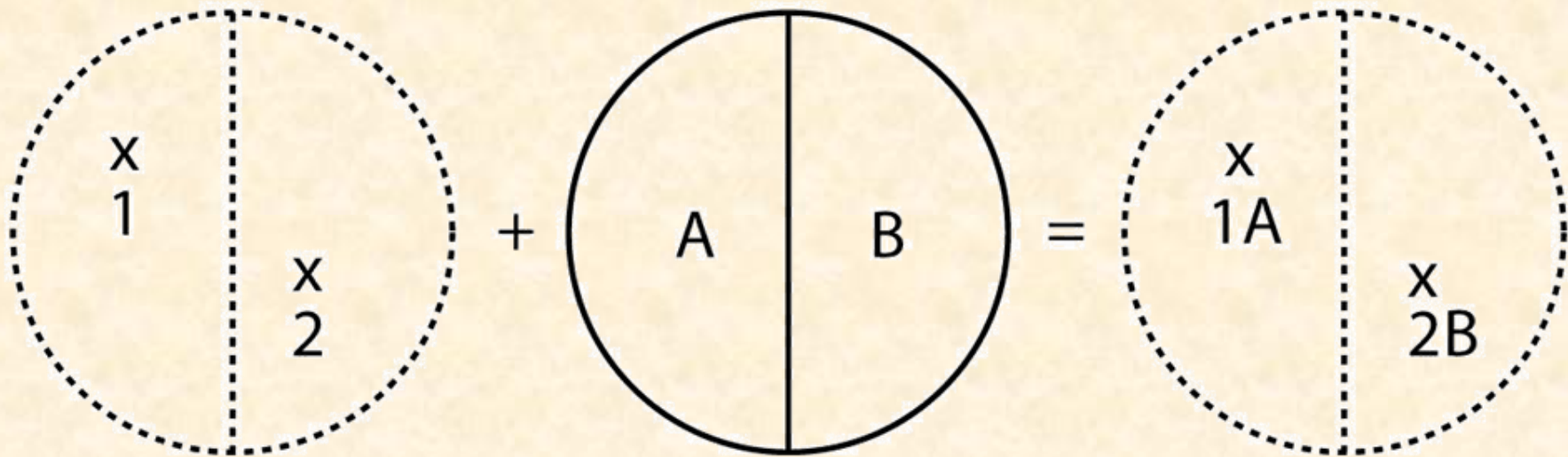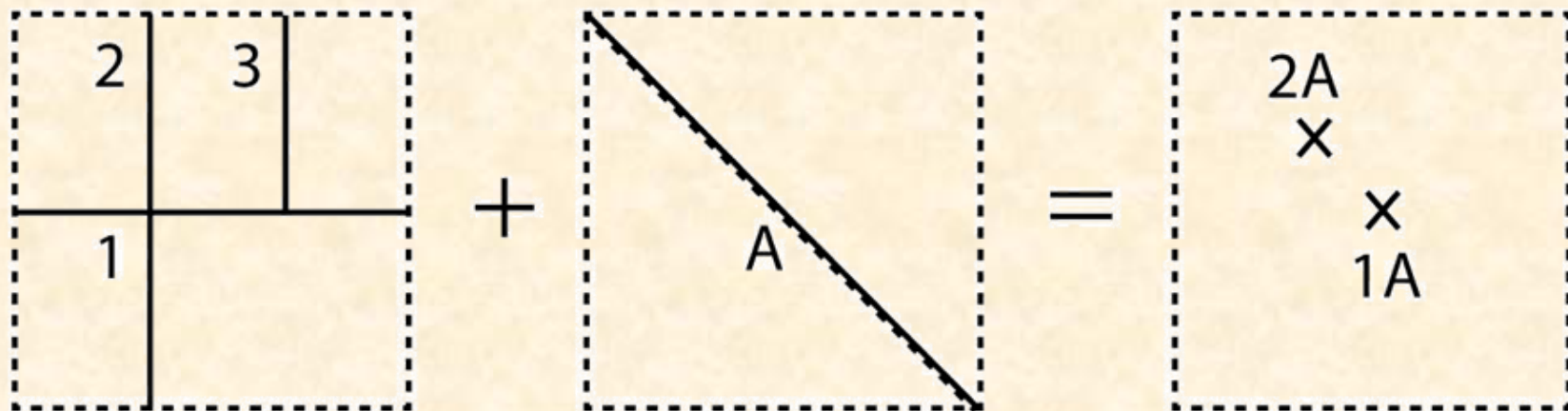
Polygon-on-Point Overlay

- The polygon-on-point overlay operation is the opposite of the point-in-polygon operation. In this case, the polygon layer is the input, while the point layer is the overlay.

- The polygon features that overlay these points are selected and subsequently preserved in the output layer.

- For example, given a point dataset containing the locales of some type of crime and a polygon dataset representing city blocks, a polygon-on-point overlay operation would allow police to select the city blocks in which crimes have been known to occur and hence determine those locations where an increased police presence may be warranted.
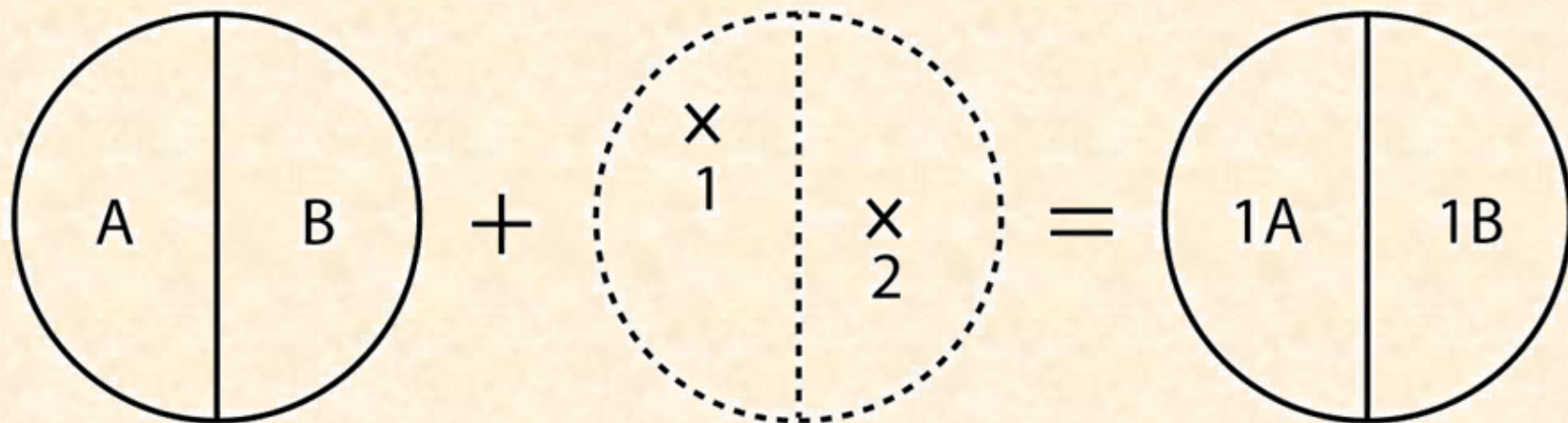
Line-on-Line Overlay

- A line-on-line overlay operation requires line features for both the input and overlay layer. The output from this operation is a point or points located precisely at the intersection(s) of the two linear datasets.

- For example, a line-in-polygon overlay can take an input layer of interstate line segments and a polygon overlay representing city boundaries and produce a linear output layer of highway segments that fall within the city boundary. The attribute table for the output interstate line segment will contain information on the interstate name as well as the city through which they pass.

Polygon-on-Line Overlay

- The polygon-on-line overlay operation is the opposite of the line-in-polygon operation. In this case, the polygon layer is the input, while the line layer is the overlay. The polygon features that overlay these lines are selected and subsequently preserved in the output layer.

- For example, given a layer containing the path of a series of telephone poles/wires and a polygon map contain city parcels, a polygon-on-line overlay operation would allow a land assessor to select those parcels containing overhead telephone wires.
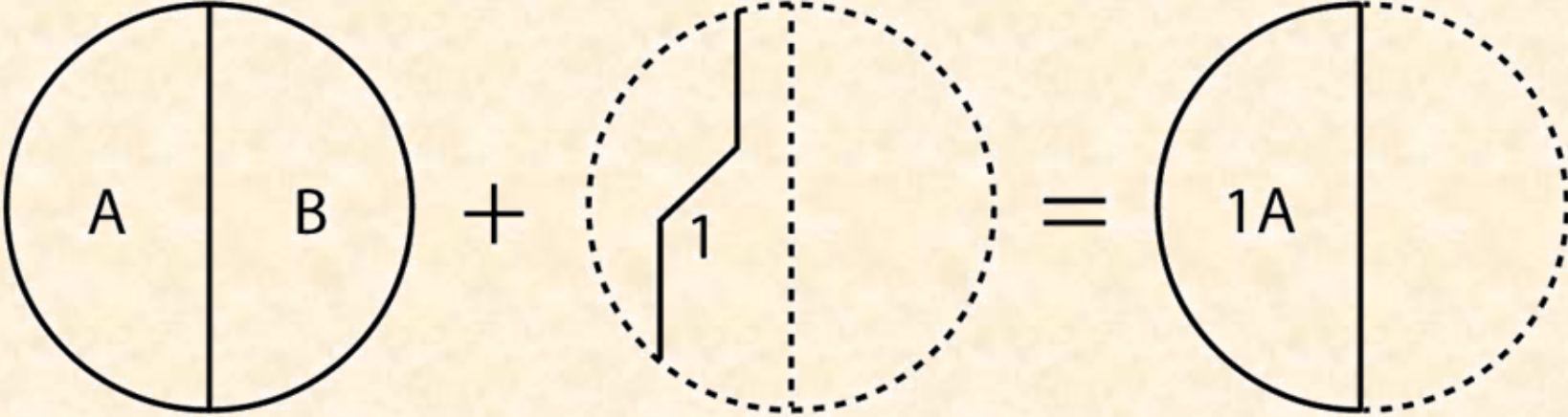
Polygon-in-Polygon Overlay

- The polygon-in-polygon overlay operation employs a polygon input and a polygon overlay. This is the most commonly used overlay operation. Using this method, the polygon input and overlay layers are combined to create an output polygon layer with the extent of the overlay. The attribute table will contain spatial data and attribute information from both the input and overlay layers.

- For example, you may choose an input polygon layer of soil types with an overlay of agricultural fields within a given county. The output polygon layer would contain information on both the location of agricultural fields and soil types throughout the county.