Introduction to GIS

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Course: Geographic Information System
Lecture 9

GEOGRAPHIC DATA

Spatial and Non-Spatial data

There are two important components of geographic database: its geographic position and its attributes or properties. In other words, spatial data (where is it?) and attribute data (what is it?)

- **Analogue Data**: A physical product displaying information visually on paper like maps, aerial photos, imageries, tabular data and written report etc.

- **Digital Data**: Information derived from computer

Basic types of spatial Data

Maps model the real world with ***points, lines, and polygons***. Symbols and labels describe the descriptive information about the geographic features.

Points

Points define the discrete locations of geographic features which are too small to illustrate as lines or polygons such as well or telephone poles. Points can be used to illustrate the locations of mountain peak or discrete elevation points.

Lines

Lines represent the linear features of geographic object too narrow to illustrate as polygons, such as streets and streams that have length but no area. Moreover, contour lines are represented as the lines

By using different symbols and labels, descriptive information of linear features are illustrated. For example: Roads are drawn with various line widths and patterns and colors to represent different road types, e.g., highway as wide solid red colour line, blue lines are used to illustrate the streams. The symbol  can be used to illustrate the railway.

City streets are labeled with names and often address ranges.

Polygons

Polygons are closed features that represent the shape and location of homogeneous features such as landuse, forest types. Tone of the colour can be applied to illustrate the density of population, green color can be used to represent vegetation and blue colour can be used to illustrate lake.

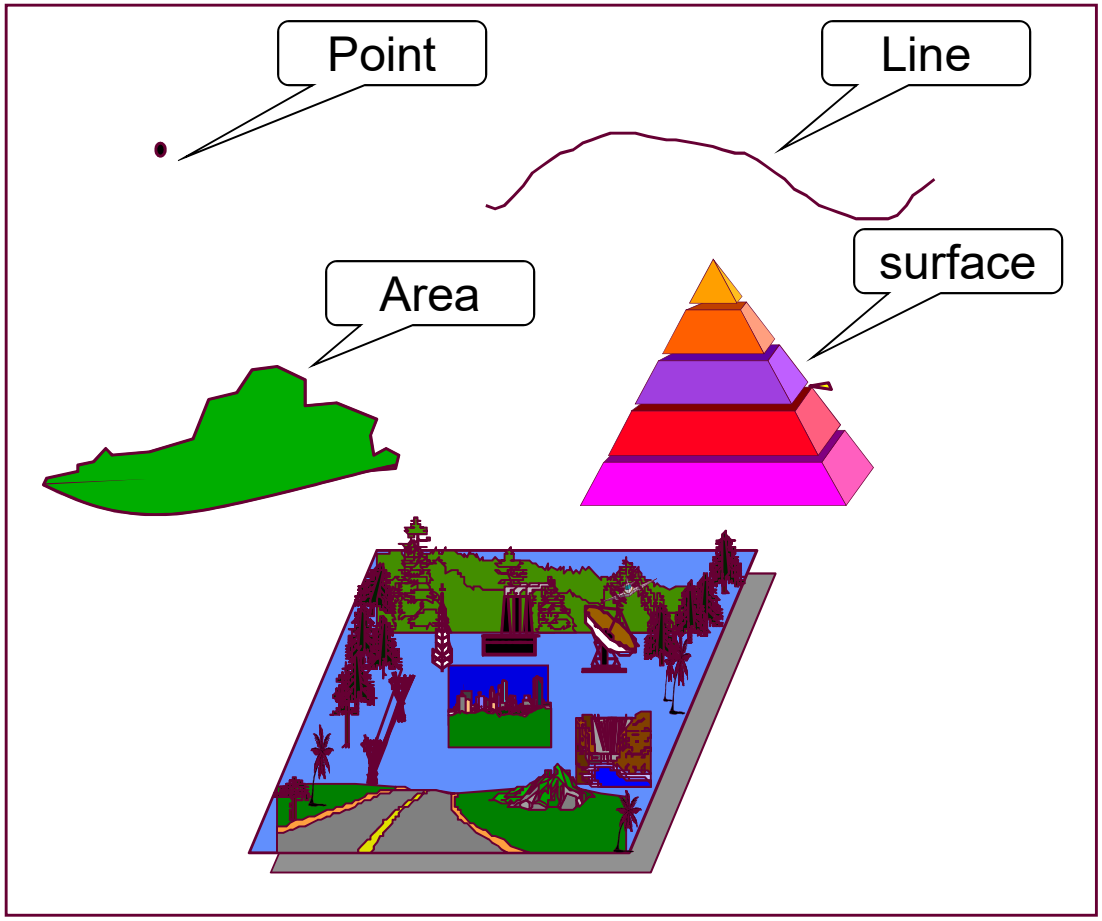
Surfaces

A surface represents the elevation, presence or absence of something for every point on the piece of earth. The elevation models are best examples to illustrate as the surfaces.

Surfaces are typically represented on the maps as the series of isolines. Elevation contours, rainfall, temperature can be represented as the surface of isolines.

Surfaces can be represented as the Raster Elevation Model and Vector Elevation Model.

Geometry of Spatial Data



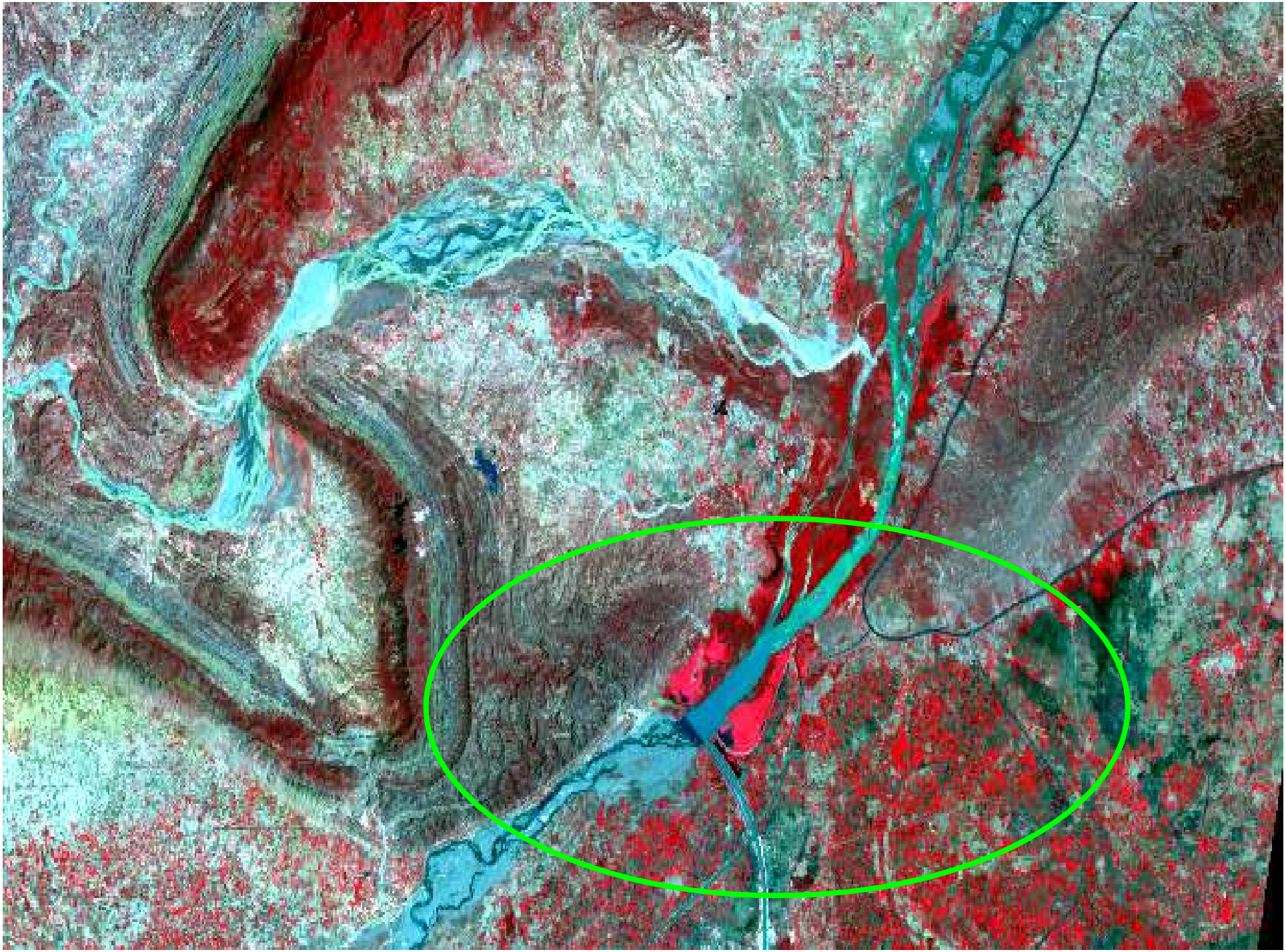
REPRESENTATION OF GEOGRAPHIC DATA

Vector Graphics:

- Images are built-up from points, lines(segments) and areas (Polygons).
- Each defined by pair of X-Y co-ordinates.
- Preparing a map by digitization is converted into vector data in computer.

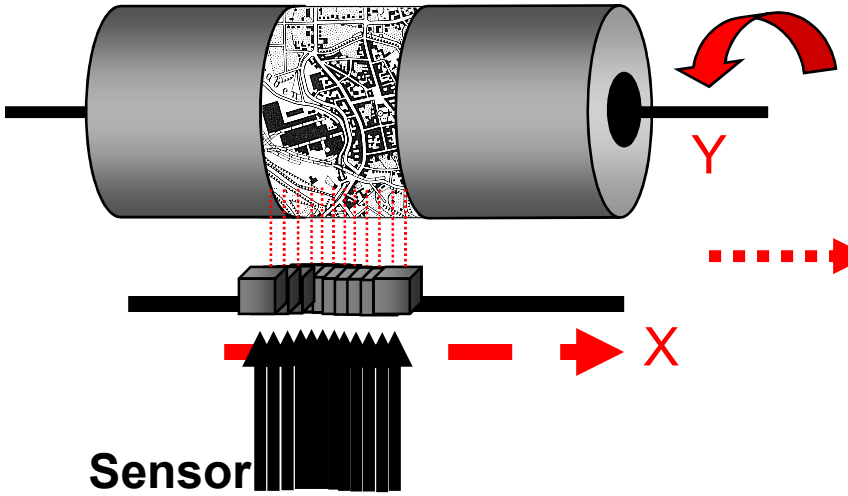
Raster Graphics:

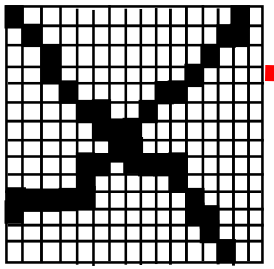
- Images are built-up from cells which is called as Pixels.
- In raster graphics, the smaller the area of land that each cell represents, the higher the resolution of the data and higher the spatial accuracy, ultimately the larger the files needed to store the data.



SPATIAL DATA INPUT

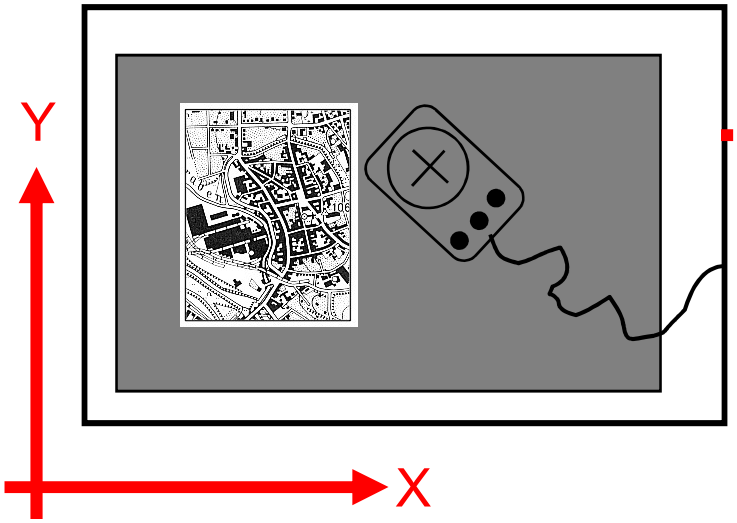
Scanning (automatic digitizing)

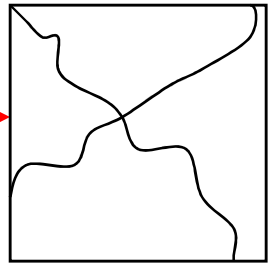




Raster model

Manual digitizing



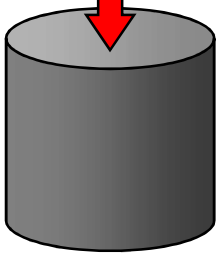


Vector model

Editing

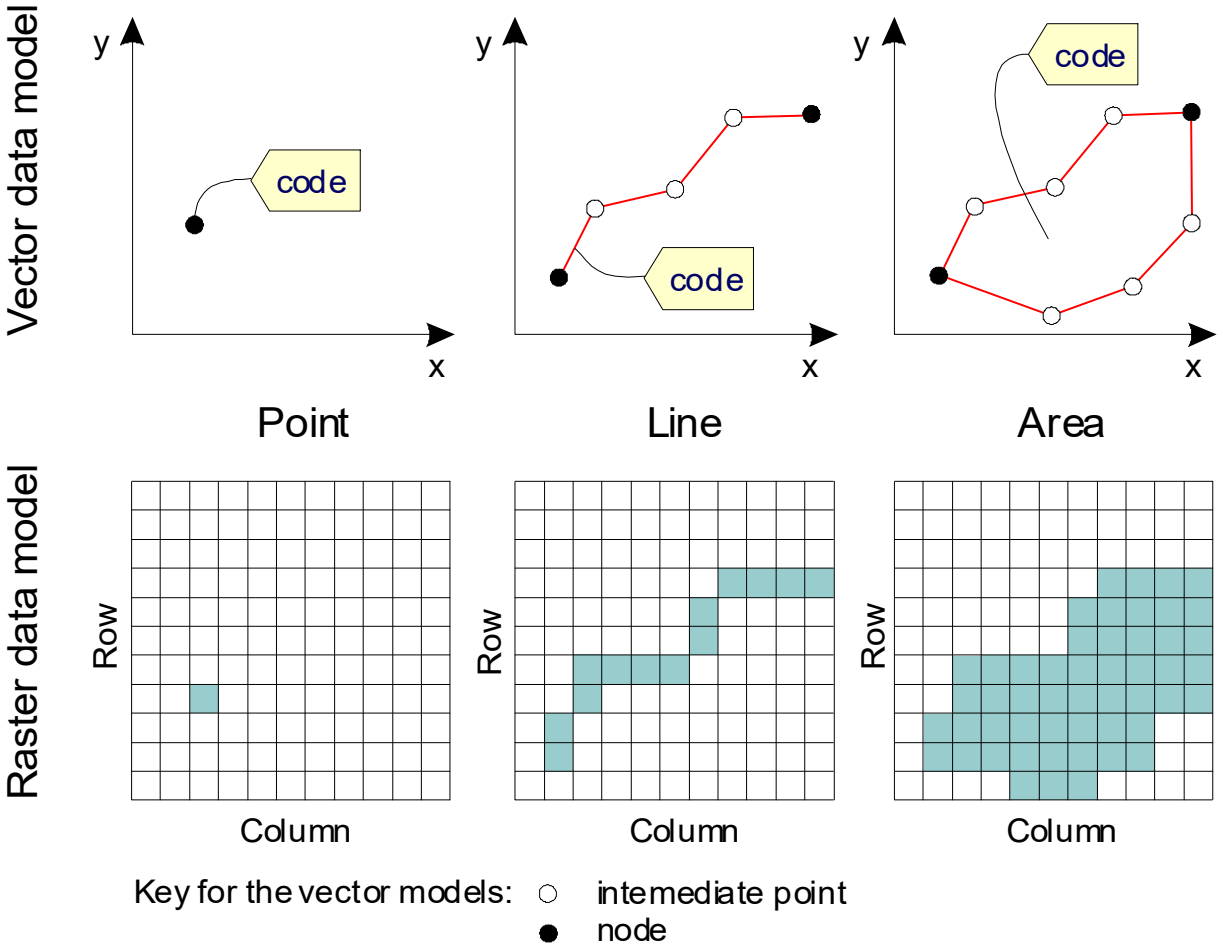
- Improving
- Vectorizing
- Apply attributes

- Improving
- Apply attributes

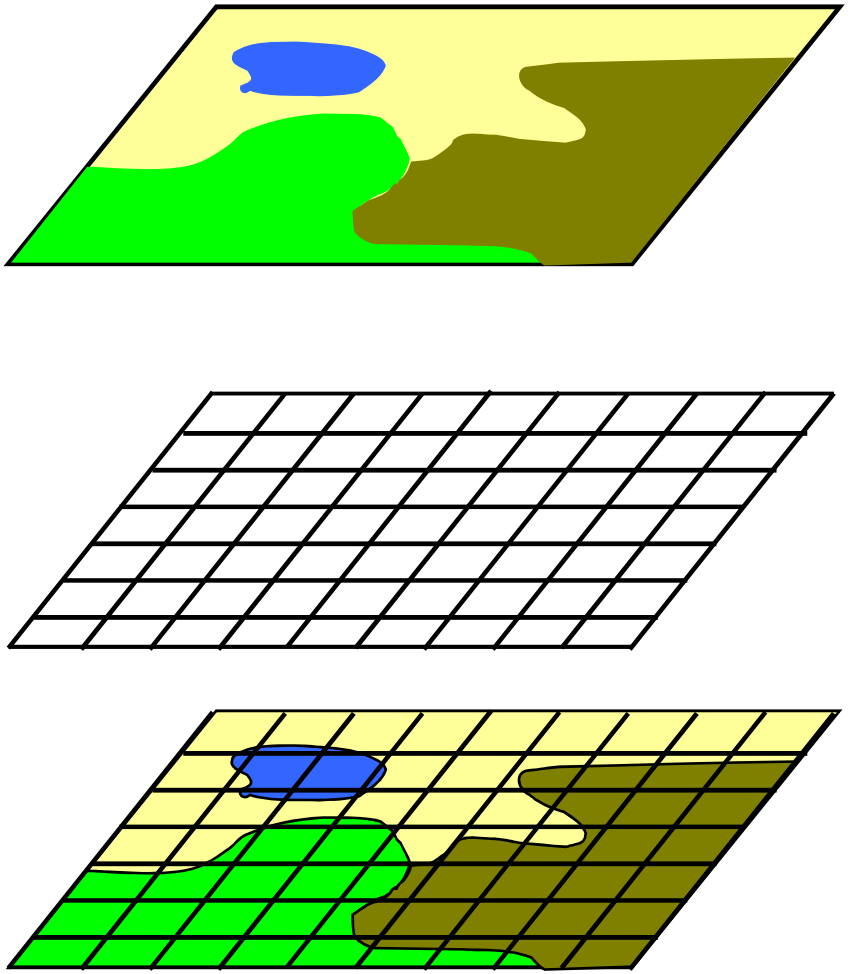


Digital Landscape Model

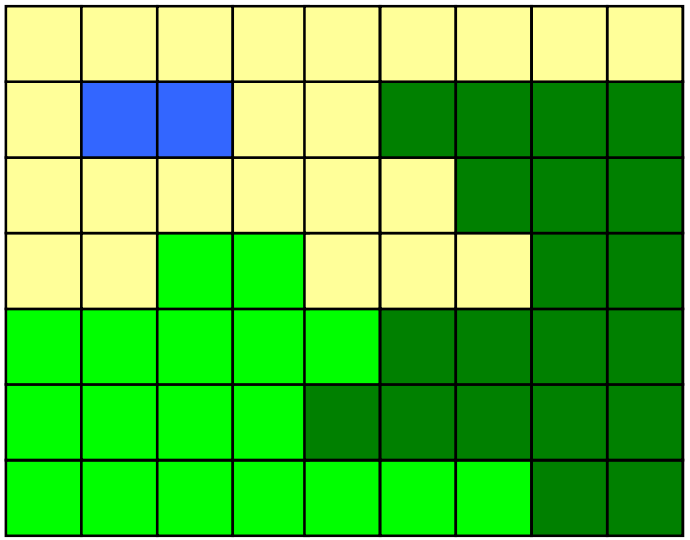
Vector and Raster representations of points, lines and areas



Features



Raster model)



Advantages and Disadvantages of the Raster and Vector Data Models

RASTER MODEL

Advantages

- easy and efficient overlaying
- compatible with RS imagery
- same grid cells for several attributes

Disadvantages

- inefficient use of computer storage
- errors in perimeter, area, and shape
- difficult network analysis
- inefficient projection transformations
- loss of information when using large cells
- less accurate (although attractive) maps

VECTOR MODEL

Advantages

- efficient for network analysis
- efficient projection transformation
- accurate map output

Disadvantages

- complex data structure
- difficult overlay operations
- not compatible with RS imagery