

Daljinska detekcija i računarska obrada slike

Sadržaj

- **Struktura prostornih podataka i atributa**
- Šta je raster?
- Rasterski slojevi
- Veličina ćelija rasterskih podataka
- Representing features in a raster dataset
- Discrete and continuous data
- Rasterski model podataka
- Zapis rasterskog formata
- Optimizacija u smeštanju, indeksne strukture, Streaming i piramidalne strukture
- Osnove procesiranja snimaka – algoritmi i transformacije
- Uvod u daljinsku detekciju
- Karakteristike elektromagnetskog zračenja
- Izvori energije i principi radijacije
- Spektralna refleksija
- Senzori i platforme

Struktura prostornih podataka i atributa

- GIS Spatial Data Models (Vector/Raster)
- Data Input
- Data Storage and Organization
 - Database Structures

What is a Data Model?

- A logical construct for the storage and retrieval of information
- Spatial data models manage and display location data
- Attribute data models allow quick access and cross-referencing of non-spatial data

GIS as a representation of reality

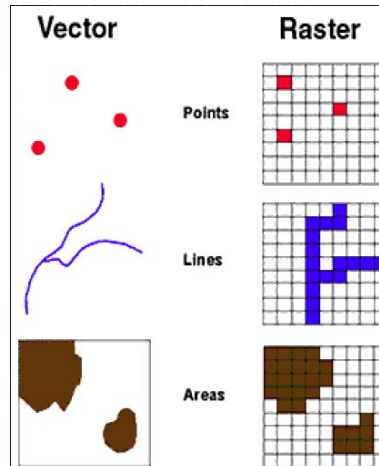
1. **Selection:** Select objects of the real world to be included in the digital model of the real world.
2. **Representation in a standard way:** The real world objects must be represented by “virtual” objects in the GIS.
3. **Quantification:** Computers store numeric values. These values are assigned to the features of the real world included in the GIS.

Maps as Numbers

- GIS requires that both attribute and spatial data be represented as numbers
- The GIS stores data using a type of data structure
- Files can be written in binary or as ASCII text
- Binary is faster to read and smaller, ASCII can be read by humans and edited but uses more space

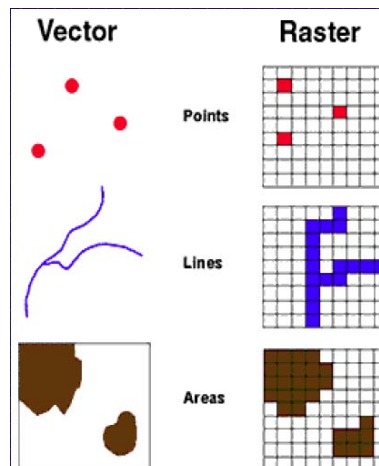
Spatial Data Models

- The two main spatial data models are **raster** and **vector**.
- A **raster data model** uses a grid as its model to hold the spatial data. Space is divided into a series of units, each of which represents a limited but defined amount of the earth's surface.



Spatial Data Models

- The two main spatial data models are **raster** and **vector**.
- The **resolution** of a raster GIS is the amount of earth surface represented by a single grid cell.



Raster Data Models

- **Advantages of a raster data model**
 - Very efficient for processing and analyzing multiple overlays.
 - Good representation of continuous, smoothlyvarying information.

Raster Data Models

- **Advantages of a raster data model**
 - Constant cell size and regular geometry facilitate some analysis and modeling tasks.
 - Best data format for satellite imagery and scanned aerial photos

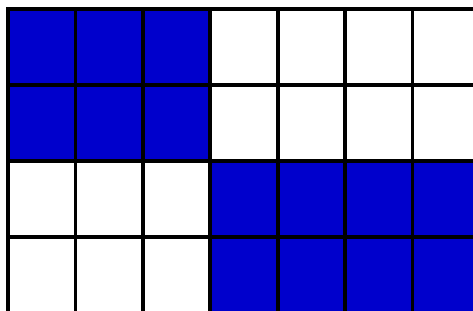
Raster Data Models

- **Disadvantages of raster data model**
 - Difficult to resolve fine details better captured by lines.



Raster Data Models

- **Disadvantages of raster data model**
 - Some spatial relationships are difficult to assess, such as, connectivity:



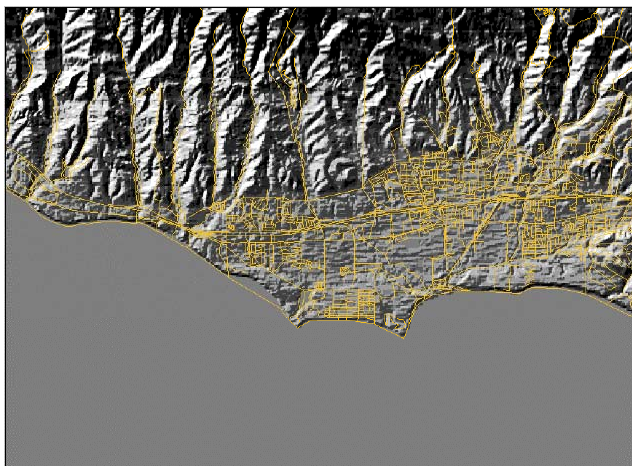
Raster Data Models

- **Disadvantages of raster data model**
 - Data volume and redundancy -- dense grid of data involves large memory requirements and computer power, though there may be little variation of values over a large area

Raster Data Models

- **Raster data compaction strategies:**
 - A. Run-length encoding
 - B. Raster Chain Codes
 - C. Block Codes
- All these entail some form of eliminating redundancy by using codes to represent repeated contiguous values

A DEM is a georeferenced raster data file



The mixed pixel problem



Water dominates

- W W G
- W W G
- W W G

Winner takes all

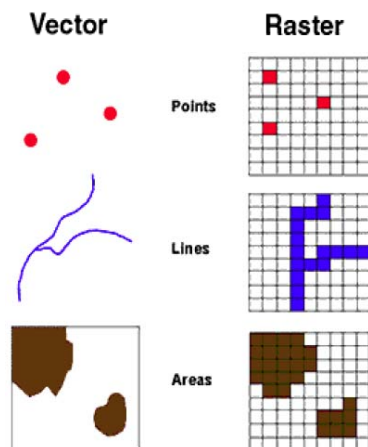
- W G G
- W W G
- W G G

Edges separate

- W E G
- W E G
- W E G

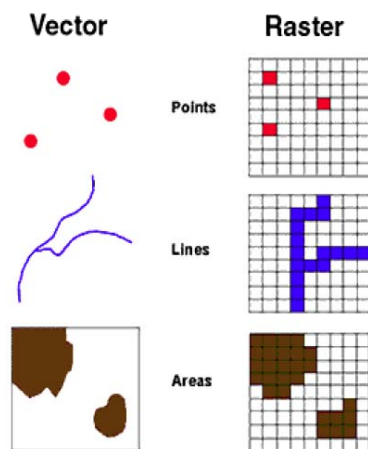
Vector Data Model

- A vector data model assumes space is continuous, rather than being quantized as smaller discrete units.
- Points are associated with a single set of coordinates



Vector Data Model

- Points are associated with a single set of coordinates
- Lines are connected sequences of coordinate pairs
- Areas are sequences of interconnected lines whose first and last coordinate points are the same



Vector Data Model

- Areas are lines are points are coordinates

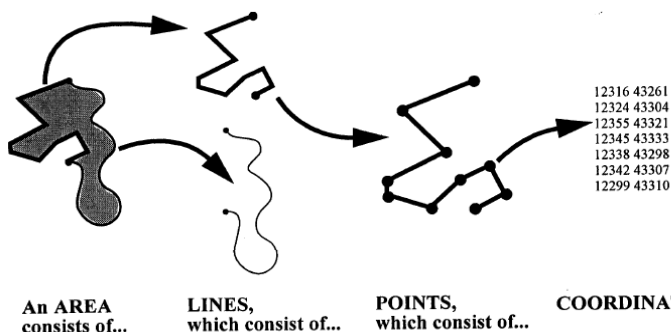


Figure 2.16 Geographic information has *dimension*. Areas are two-dimensional and consist of lines, which are one-dimensional and consist of points, which are zero-dimensional and consist of a coordinate pair.

Vector Data Model

- **Advantages:**
 - familiar and intuitive representation for many kinds of real world objects
 - efficient (in terms of memory and computing) representation of spatial data
 - very good resolution of linear and point features
 - facilitates Topological Analysis

Vector Data Model

- **Disadvantages of Vector Data Model:**
 - computationally-intensive when working with multiple overlays
 - not good at representing continuous surfaces
- **Which data model is the best?**
 - Depends on what type of analysis you are performing.

GIS Data Formats

- **Vector Data Formats:**
 - DLG (digital line graph: US Geological Survey)
 - TIGER (US Census Bureau)
 - ArcGIS Shapefile
- **Raster Data Formats:**
 - *Digital Image Formats*
 - TIF, GIF, JPEG (Usually not georeferenced)
 - *True Raster Format*
 - DEMs and satellite imagery (IMG, ENVI, HDF, GEOTIF)