SPA215:
Introduction to Geographic Information Systems

Topic 1
Intro GIS: Definition, history and applications

Topic 2:

GIS Data: Spatial data and attribute data

Topic 3:

Cartography: mapping and presenting GIS data

Topic 4:

GIS analysis: Introduction to vector and raster analysis

Topic 5:

Data acquisition: Getting data into the computer

Topic 6:

Coordinate Systems and Projections: Mapping the Earth

Topic 7:

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Topic 2:
GIS Data: Spatial data and attribute data

Abstracting reality

- Abstraction is the conceptual process of reducing the real world into themes.
- In an urban setting, the real world might be simplified to buildings, roads, railways, gardens etc.
- A familiar of example of abstraction is a paper map. On a map the real world is simplified into information about specific features such as elevation, roads, rivers, buildings and land use.

Discrete and continuous

- Discreet data had distinct boundaries (roads, building)
- Continuous data varies continuously without distinct spots (temp, elevation
- Computer limitations - continuous data must be discretised
- What this all means is that a very early on in the abstraction process, GIS practitioners have to decide whether the themes they wish to have represented are discrete or continuous.
- We generally represent discrete themes by using the vector data model and continuous themes by using the raster data model.

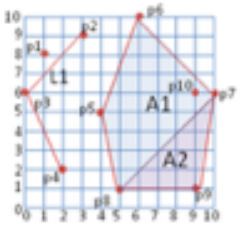
- Drawing an outline around a building to define its boundaries, produced a two-dimensional area known as a polygon.

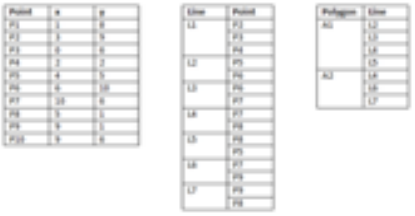
Data models

Vector

- Points, lines and polygons
- **Points** are represented as pairs of spatial coordinates
- **Lines** are represented as a list of spatial coordinate pairs
- **Polygons** are represented as a list of spatial coordinate pairs that form closed loops
- Defined by a series of point locations and connecting links
- For a GIS to reproduce a digital map, it is therefore essential to store objects' coordinates in some kind of data file. These files keep track of the location of points, lines and polygons so that this information can be used to draw the map.
- Because coordinates are numeric, they are easily stored and interpreted by the computer.

- Three basic vector models exist: the spaghetti model, the topological model and the object-based model.
- The **spaghetti model** stores features as independent objects, unrelated to each other. It is a simple and straightforward model.
- The spaghetti model stores the coordinate information for points, lines and polygons
- However the spaghetti model has no way of inherently knowing how lines and points are connected, whether two polygons border each other, or whether a point lies within a polygon. This is known as topological information.





- The **topological model** stores features as well as information about how the features are spatially related to each other.
- Topology is concerned with relationships between spatial objects, but not their physical shape. It is a technique used to record and manipulate the logical relationships of spatial features.
- The most common topological relationships are **adjacency** (do two parcels share a common boundary), **connectivity** (are two roads connected to each other) and **containment** (is a house within a school zone).
- One major benefit of topology is that each coordinate pair is only stored once, removing duplication and potential errors.