GEOG 204

LECTURE 9

1

Data For Decision Support

- This was a cardinal objective in the development of GIS
  - Computers are effective at processing large amounts of data
  - GIS is of often part of the decision making process
- Effective use of data and GIS functionalities is essential
  - GIS allows spatial data to be misused and functionalities misapplied. Caution is essential.

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Data For Decision Support

- Consider the case of emergency management decisions. Data for
  - Preparedness
    - Transportation
    - First responders and services
    - Communications
  - Vulnerabilities
    - Flood plains
    - Landslide susceptibility
  - Mitigation

How can these data be misused?

How can related functions be misapplied?

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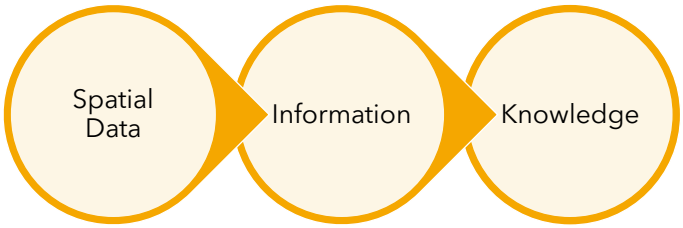
Data For Decision Support



GIS

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Data For Decision Support

Spatial Data

- Vector data
- Raster data

Information

- A representation of the data
- Processed Data
- E.g. A map, a graph

Knowledge

- Useful information
- Comes from:
  - comprehension of information
  - experience
- Represents understanding and insights
- Learned
- E.g. Wetlands hold sensitive ecosystems

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Data For Decision Support

- The process of GIS-based decision making
  1. The question, problem, objective
  2. Data acquisition, exploration, preparation
  3. Analysis methods and functions
  4. Results and refinements
  5. Presentation
  6. Information and knowledge synthesis
  7. Decision making and knowledge accumulation

- How does this compare with your experience?

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Data preparation and integration

Exploration

- Examine the metadata.
  - Spatial resolution, accuracy, coordinate system, when the data was collected and by whom, data use constraints, and other important information.
- Examine all the layer for alignment, scale, extent
- Explore and understand the attributes for each layer and records noting outliers and missing data

Preparation

- Sample tasks
  - Projecting data
  - Spatial extent
  - Creating and cleaning up attributes
  - Interoperability

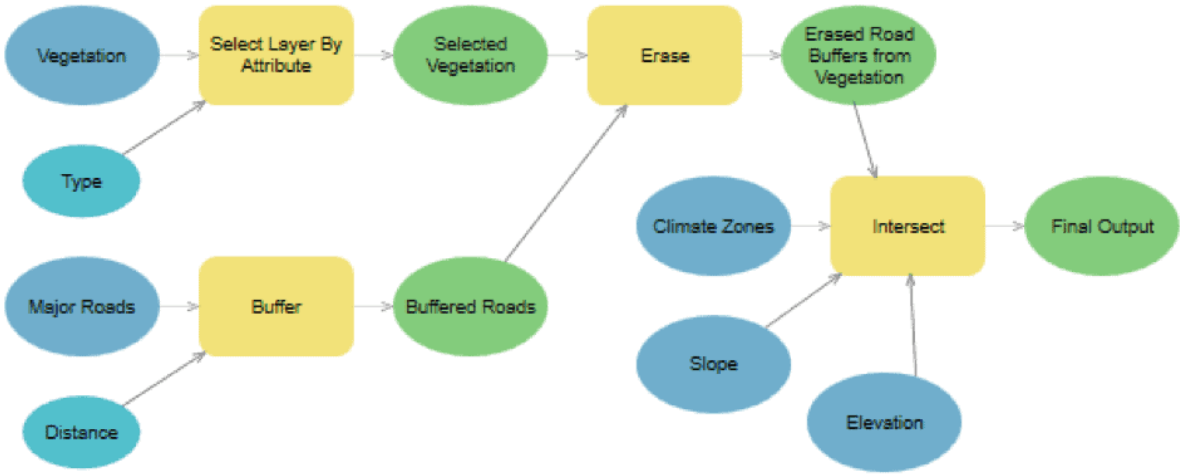
Integration

- Assembly of datasets
- Vector, Raster, Tabular
- Ascertain output formats

Spatial analysis

- Methods are problem dependent
- Understand the goal/question/problem
- Factors/causes/drivers that explain the problem
- Example:
  - Problem – Ideal place for a housing development?
  - Factors –land cover, relative slope, distance to existing roads and streams, and soil composition
  - Methods – overlay analysis

Spatial Analysis – build your workflow



Source: ESRI

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Geospatial Outputs for decision making

- Decisions are made by people
  - Based on information/insights provided and accumulated knowledge
- Often, GIS analysts will only present the outputs
- The form of the outputs should satisfy the objective and user needs

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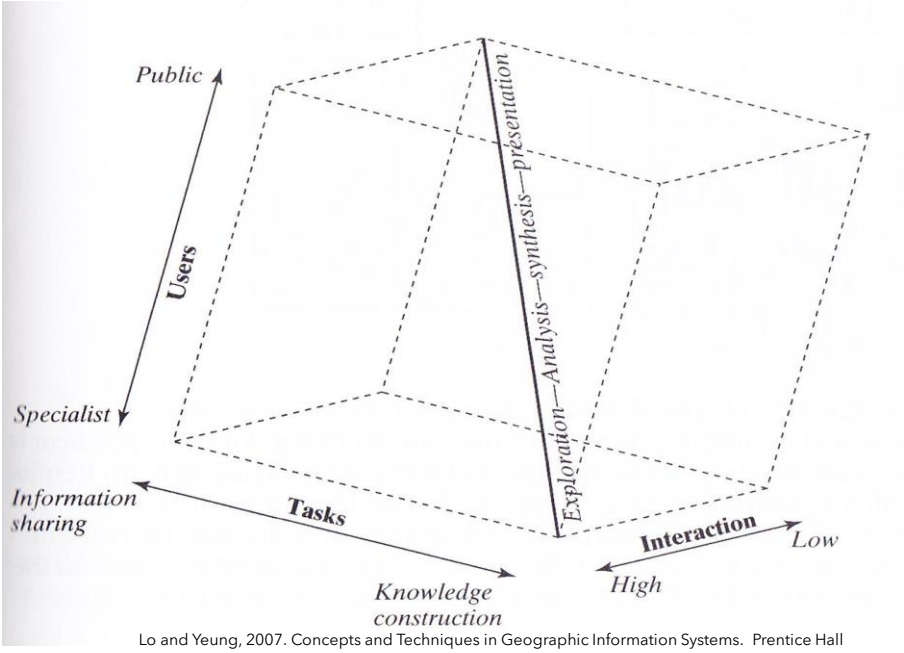

Lo and Yeung, 2007. Concepts and Techniques in Geographic Information Systems. Prentice Hall

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Geospatial visualization

- Some techniques for the visualisation of geospatial information
  - 2D plots
  - 3D plots
  - 3D planimetric views
  - 3D perspective views
  - Animations

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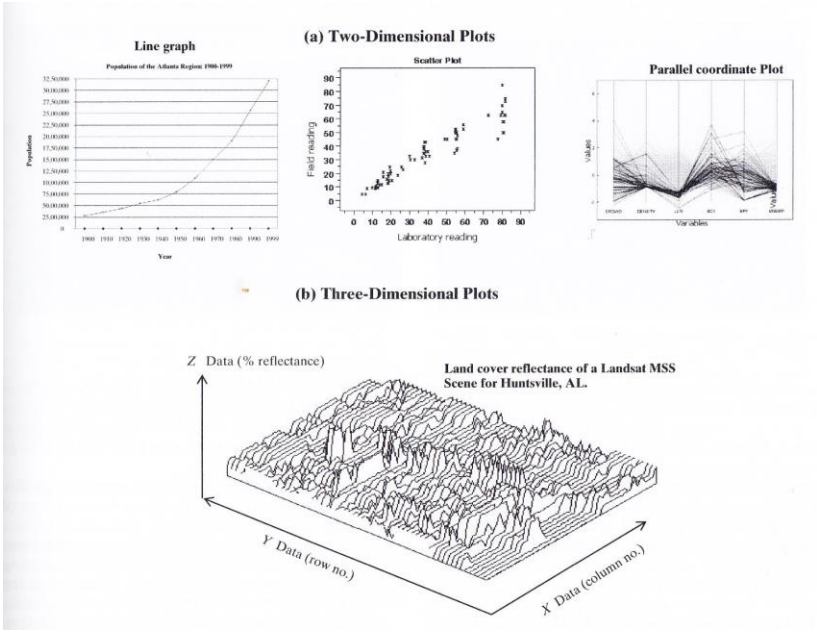

Lo and Yeung, 2007. Concepts and Techniques in Geographic Information Systems. Prentice Hall c

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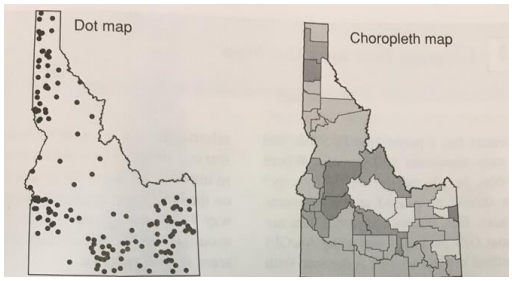
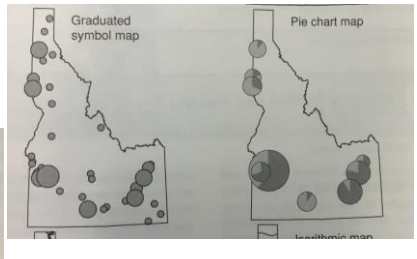
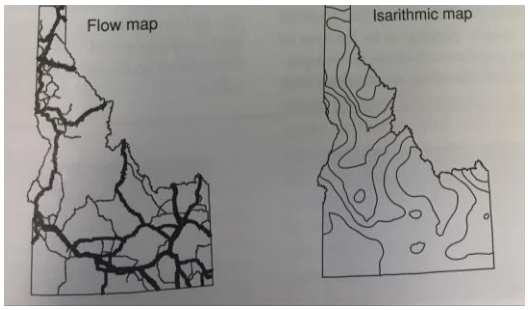


Six common types of quantitative maps





Kang-tsung Chang, 2012. Introduction to Geographic Information Systems. McGraw Hill, New York

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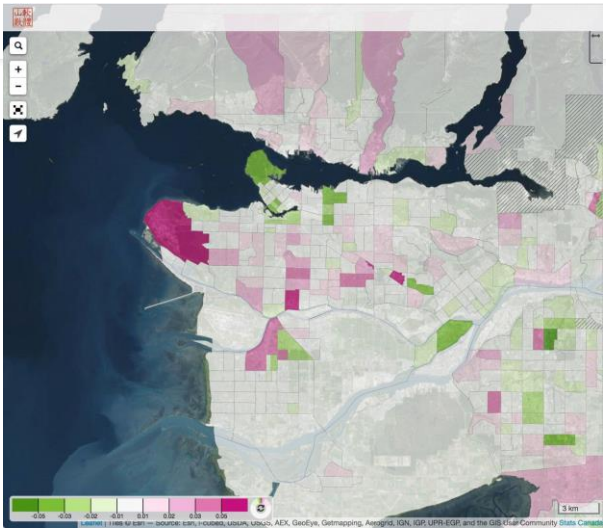
Choropleth



https://doodles.mountainmath.ca/blog/2017/04/10/surprise/

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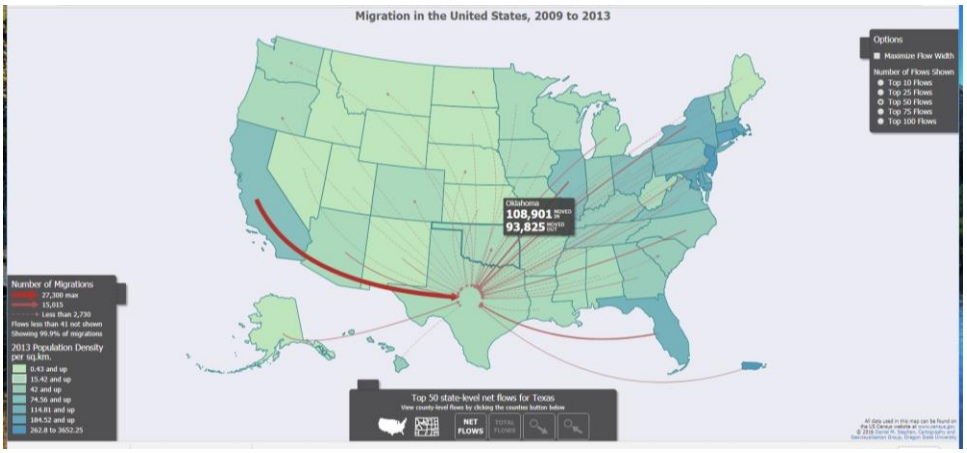
Flow maps



http://usmigrationflowmapper.com/

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Geospatial visualization

- 3D planimetric view
  - Shaded relief assumes a theoretical viewpoint directly above the earth
  - 3D planimetric relief shows landforms "standing up" in partial profile.
  - It closely resembles how mountains appear to humans on the surface of earth

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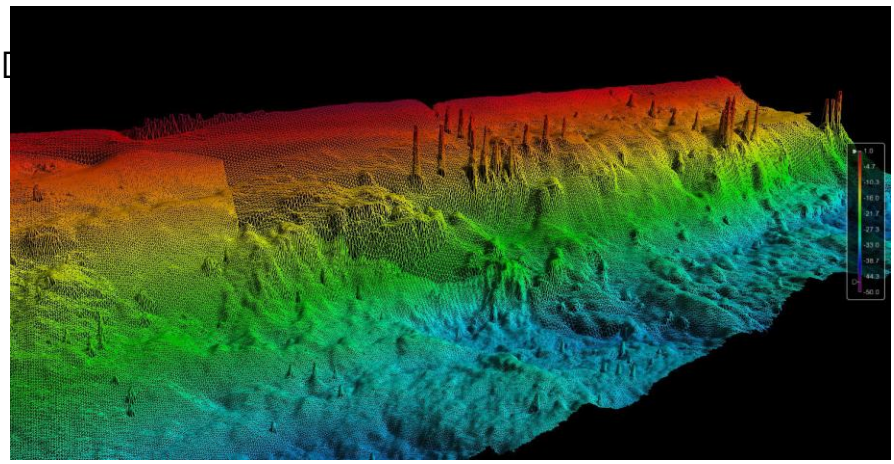
Geovisualization

- 3D



http://caris.com/products/hips-sips/

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Geovisualization

- **Cartograms**
  - Cartograms are maps that lack planimetric correctness, and distort area for to display some specific attribute
    - To reveal patterns that might not be readily apparent on conventional map
    - To promote legibility
  - The geometry of the spatial object, in terms of areal extent, location, and topology is subservient to the attribute of interest

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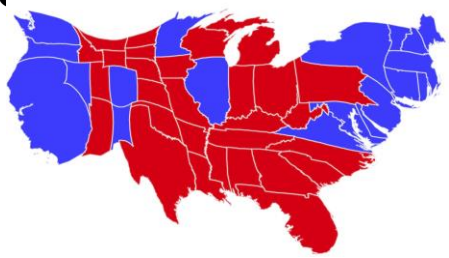
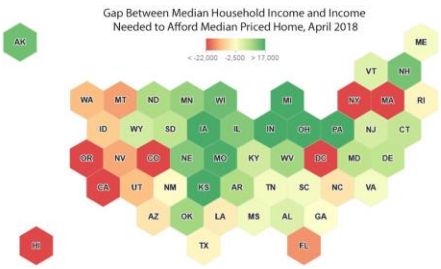
Geospatial visualization

- **Cartograms**





https://www.esri.com/arcgis-blog/products/arcgis-online/mapping/how-to-build-a-cartogram-in-microsoft-office-and-arcgis-online/

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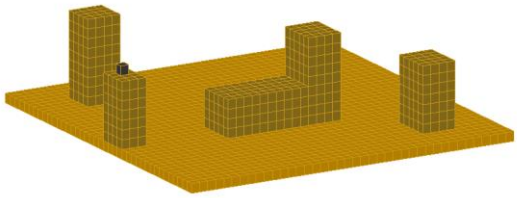
Geospatial visualization

- 3D Animation



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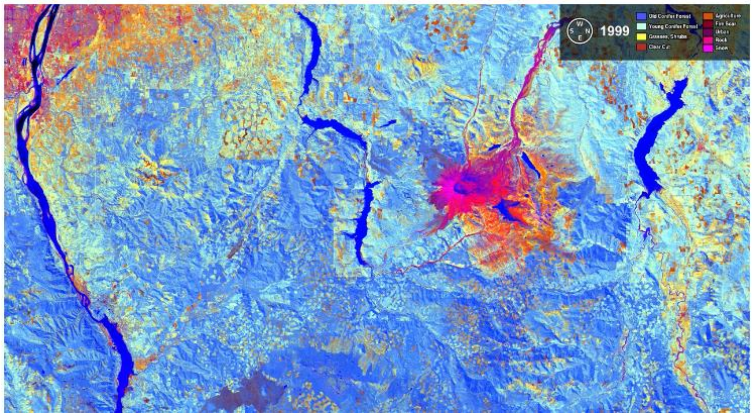
Geospatial visualization

- Animation



https://svs.gsfc.nasa.gov/30009

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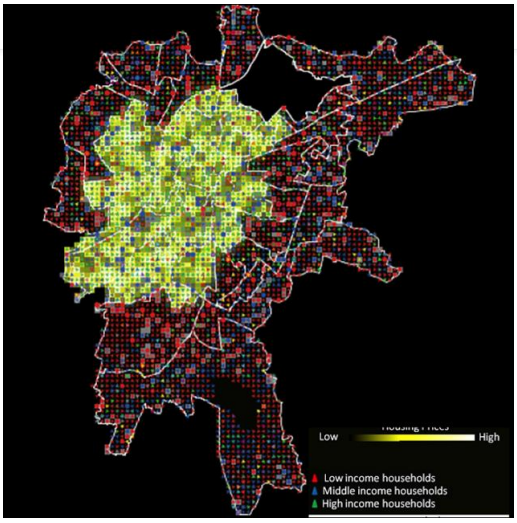
Geospatial visualization



Patel, A., Crooks, A.T. and Koizumi, N. (2018).

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