Cartographic Visualization

Cartographic Visualiztion

- Generally: using InfoVis techniques to stretch cartography to new and interesting horizons
- Visualization involving geographic information and layout
- OR Visualization informed by the rules and conventions of cartography

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From Metaphor to Method: Cartographic Perspectives on Information Visualization (Skupin 2000)

- InfoVis often uses mapping and landscape metaphors
- But, tends to ignore history of cartographic ideas already in existence
- Skupin is a Geography professor…

Key Cartographic Techniques for InfoVis

- The Distance Model
- Map Projection
- Cartographic Generalization

The Distance Model

- *First Law of Geography*: "Everything is related to everything else, but closer things are more closely related" (Waldo Tobler)
- The power of spatial positioning is well discussed in InfoVis

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Distance Model (con't)

- Scale: different features are evident at different scales
    - Dependant on sample resolution
- Content: proximity can mean a lot of things
    - *Similarity*
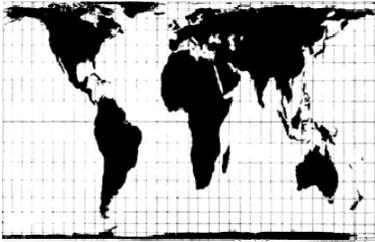   - *Functional Distance (eg, travel time)*

Map Projection

- How to fit multi-dimensional data into 2D space?
- InfoVis has many methods available, eg. Self-Organizing Maps (SOM)
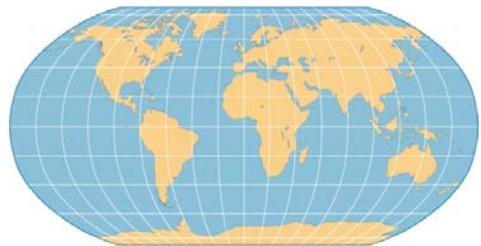- **But** all projection distorts! Beware!

Mercator Projection

Gall-Peters Projection

Robinson Projection

Cartographic Generalization

- Maintaining meaning over range of scales
- University courses taught on just this subject!
- Not too many general rules provided

Geographic Visualization: Designing Manipulable Maps for Exploring Temporally Varying Georeferenced Statistics (MacEachren et al 1998)

- How to display time-dependant geographic data informatively?
- Specifically regional health data (mortality rates etc) for series of years
- Informed by cartographic principles

Cartographic Principles in Design

- Animation of maps to show time series data
- Representing multiple non-geographic variables on a map
  - Problem: spatial location is already taken!
- Interactivity

HealthVis

- Can control type of data and method of display
- Can step through or play data for change over time
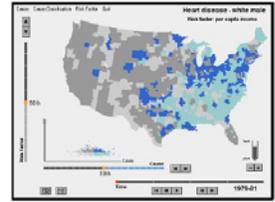
Evaluation of System

- Usability analysis somewhat unusual: comparison of exact number of times each action done
- Overall result: if right setting used, useful patterns in data were found
- System left too much to the user, had to fiddle with parameters to find useful patterns

Problems with Cartographic Visualization

- The history of cartography is not a scientific one (for the most part)
- Largely based on intuition & rules of thumb
- Good for making a single map, for a few main purposes
- Very hard for automatically created dynamic maps

Advantages of Cartographic Visualization

- We intuitively understand the metaphor
- Easy to leverage familiar cartographic conventions & users pre-existing knowledge
- As we already know, spatial position is where it's at!

Conclusion

- A lot of useful knowledge to be found in cartography
- But work has to be done to apply it properly to InfoVis problems

References

- MacEachren, A.M. Boscoe, F.P. Haug, D. Pickle, L.W. (1998). Geographic visualization: designing manipulable maps for exploring temporally varying georeferenced statistics *Information Visualization. Proceedings 1998*, 87 – 94.
  - Found at <http://doi.ieeecomputersociety.org/10.1109/INFVIS.1998.729563>
- Skupin, Andre. (2000). From Metaphor to Method: Cartographic Perspectives on Information Visualization. *Proc. InfoVis 2000*, 91-97.

Questions?