Interaction II

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CS 294-10: Visualization
Fall 2014

Announcements
Assignment 3: Visualization Software

Create a **small** interactive visualization application – you choose data domain and visualization technique.

1. Describe data and storyboard interface
2. Implement interface and produce final writeup
3. Submit the application and a final writeup on the wiki

Can work alone or in pairs
Final write up due before class on **Oct 15, 2014**

Last Time: Interaction
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[Graphics and Graphic Information Processing, Bertin 81]
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**Graphics and Graphic Information Processing, Bertin 81**
Sorting

Sorting by rows and columns

When might this be useful?
[Perin, Dragicevic, and Fekete 2014]
Bertin Matrices

Research question

↓

Table

↓

1. Encode table cells visually
2. Group similar rows and columns to reveal patterns

Group similar rows and columns

Choose a row with a particular visual aspect. Move to extremity of matrix.

Move similar rows close, opposite rows to bottom. (Creates two opposing groups and a middle group)

Repeat for columns

Iterate
Visual encodings

Quantity of ink is proportional to the normalized data value

Reordering methods

Manual

Automatic

bertifier.com
Trellis
[Becker, Cleveland, and Shyu 96]
Dynamic Queries

NameVoyager

http://www.babynamewizard.com/voyager
Keshif

Direct manipulation

1. Visual representation of objects and actions
2. Rapid, incremental and reversible actions
3. Selection by pointing (not typing)
4. Immediate and continuous display of results

How quick does it need to be? (rules of thumb)
- 0.1s: Instantaneous
- 1.0s: Flow of thought uninterrupted
- 10s: Keeping user’s attention on dialogue

[Miller 1968]

https://www.cs.umd.edu/hcil/keshif/
Generalized Selection

Visual Queries
Model selections as declarative queries

(-118.371 ≤ lon AND lon ≤ -118.164) AND (33.915 ≤ lat AND lat ≤ 34.089)
Visual Queries

Model selections as declarative queries
Applicable to dynamic, time-varying data
Retarget selection across visual encodings
Perform operations on query structure

“Select items like this one.”
Generalized Selection

Point to an example and define an abstraction based on one or more properties [Clark, Brennan]

“Blue like this”
“The same shape as that”

Abstraction may occur over multiple levels
Generalized Selection

Provide *generalization mechanisms* that enable users to *expand a selection query* along *chosen dimensions* of interest

Expand selections via *query relaxation*
**Query Builder**

**Click: Select Items**
(id = 'China')

**Drag: Select Range**
(2000 < gni AND gni < 10000) AND (.1 < internet AND internet < .2)

**Legend: Select Attributes**
(region = 'The Americas')
Query Builder

(id = ‘China’)

Query Visualizer

Interactor

Query Relaxer
Query Relaxation

Generalize an input query to create an expanded selection, according to:

1. A semantic structure describing the data
2. A traversal policy for that structure
Relaxation using Hierarchies

Relax using abstraction hierarchies of the data
Traverse in direction of increasing generality

Examples

A Priori: Calendar, Categories, Geography
Data-Driven: Nearest-Neighbor, Clustering
Relaxation of Networks

Relaxation using Attributes

If no explicit semantic structure is available, treat data itself as a “flat” hierarchy

Select all items with matching values along the attributes chosen for relaxation
Lesson

Consider how the structure and/or semantics of the data might be leveraged to aid analysis

Extension: look beyond data features to incorporate perceptual features of the display

Perceptual Annotation [Kong & Agrawala 09]
Other Input Modalities

Multi-touch

- Tables, wall displays, tablets, whiteboards

Does it facilitate visual analysis?
What affordances are gained/lost?
Kinetica

[Rzeszortarski and Kittur 2014]

Framework
Grouping points

Filtering points
Filtering points

Summary

Most visualizations are interactive
- Even passive media elicit interactions

Good visualizations are task dependant
- Choose the right space
- Pick the right interaction technique

Human factors are important
- Leverage human strengths
- Assist to get past human limitations