Interaction II

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CS 448B: Visualization
Fall 2017

There are large gaps between white children and their black and Hispanic classmates. The gaps are largest in places with large economic disparities.
Last Time: Interaction

Gulfs of execution & evaluation

- Conceptual model
- Real world
- Execution
- Evaluation

[Norman 1986]
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1. **CLIENTELE FEMALE**: 2%
2. **LOCAL**: 2%
3. **U.S.A.**: 3%
4. **SOUTH AMERICA**: 4%
5. **EUROPE**: 5%
6. **M.EAST, AFRICA**: 6%
7. **ASIA**: 7%
8. **BUSINESSMEN**: 8%
9. **TOURISTS**: 9%
10. **DIRECT RESERVATIONS**: 10%
11. **AGENCY**: 11%
12. **AIR CREWS**: 12%
13. **CLIENTS UNDER 20 YEARS**: 13%
14. **20-35**: 14%
15. **35-55**: 15%
16. **MORE THAN 55**: 16%
17. **PRICE OF ROOMS**: 17%
18. **LENGTH OF STAY**: 18%
19. **OCCUPANCY**: 19%
20. **CONVENTIONS**: 20%

[Graphics and Graphic Information Processing, Bertin 81]
Trellis
[Becker, Cleveland, and Shyu 96]
Dynamic Queries

HomeFinder

The yellow dots above are homes in the DC area for sale. You may get more information on a home by selecting it. You may drag the '9' and '1' distance markers to your office or any other location you want to live near. Select distances, bedrooms, and price ranges by dragging the corresponding slider bars on the right. Select specific home types and services by pressing the labeled buttons on the right.

[Ahlberg and Schneiderman 92]
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 in need to be? *(rules of thumb)*
- 0.1s: Instantaneous
- 1.0s: Flow of thought uninterrupted
- 10s: Keeping user’s attention on dialogue

[Miller 1968]

FilmFinder

[Miller 1968]

[Ahlberg and Schneiderman 93]
FilmFinder

[Ahlberg and Schneiderman 93]

Alphaslider

Title: Moonstruck

[Ahlberg and Schneiderman 94]
FilmFinder

[Ahlberg and Schneiderman 93]

Zipdecode [from Fry 04]

http://acg.media.mit.edu/people/fry/zipdecode/
NameVoyager

http://www.babynamewizard.com/voyager

TimeSearcher [Hochheiser & Schneiderman 02]

Based on Wattenberg’s [2001] idea for sketch-based queries of time-series data.
3D dynamic queries [Akers et al. 04]
Announcements

Assignment 3: Dynamic Queries

Create a small interactive dynamic query application similar to Homefinder, but for SF Tree Data.

1. Implement interface and produce final writeup
2. Submit the application and a final writeup on canvas

Can work alone or in pairs
Due before class on Oct 30, 2017
Generalized Selection

Visual Queries

Model selections as declarative queries

\([-118.371 \leq \text{lon} \leq -118.164) \land (33.915 \leq \text{lat} \leq 34.089)\)
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

This is not a sentence.
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')
Interactor

Query Builder

Query Visualizer

(id = 'China')

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

Other Input Modalities
Multi-touch

- Tables, wall displays, tablets, whiteboards

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

Kinetica

Kinetica
Naturalistic Multi-touch Data Visualization

Jeffrey M. Rzeszotarski, Aniket Kittur
Human-Computer Interaction Institute
Carnegie Mellon University
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