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 Mar 7, 2011

Brushing and Linking

Brushing
- Interactively select subset of data
- See selected data in other views
- Two things (normally views) must be linked to allow for brushing
Baseball statistics [from Wills 95]

- How long in majors
- Avg assists vs avg putouts (fielding ability)
- Avg career HRs vs avg career hits (batting ability)
- Distribution of positions played
- Select high salaries

Topics

- Dynamic Queries
- Generalized Selection

Dynamic Queries

SELECT house
FROM east bay
WHERE price < 1,000,000 AND bedrooms > 2
ORDER BY price

Query and results

Issues

1. For programmers
2. Rigid syntax
3. Only shows exact matches
4. Too few or too many hits
5. No hint on how to reformulate the query
6. Slow question-answer loop
7. Results returned as table

HomeFinder

[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

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**FilmFinder**

[Ahlberg and Schneiderman 93]

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**FilmFinder**

[Ahlberg and Schneiderman 93]

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**FilmFinder**

[Ahlberg and Schneiderman 93]

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**Alphaslider**

[Ahlberg and Schneiderman 94]

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**Cellphones**

http://www.myrateplan.com/cellphones/
**Attribute explorer** [Spence and Tweedie 98]

- The Attribute Explorer

**Zipdecode** [from Fry 04]

[http://acg.media.mit.edu/people/fry/zipdecode/](http://acg.media.mit.edu/people/fry/zipdecode/)

**NameVoyager**

[http://www.babynamewizard.com/voyager](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]
**Pros and cons**

**Pros**
- Controls useful for both novices and experts
- Quick way to explore data

**Cons**
- Simple queries
- Lots of controls
- Amount of data shown limited by screen space

Who would use these kinds of tools?

**Generalized Selection**

**Visual Queries**

Model selections as declarative queries

- Applicable to dynamic, time-varying data
- Retarget selection across visual encodings
- Perform operations on query structure

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

“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 < 20000) AND (.1 < internet AND internet < .2)

Legend: Select Attributes
(region = ‘The Americas’)

This is not a sentence.
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 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
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

Peaks, valleys, & slopes

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