Ch 3: Task Abstraction
Paper: Design Study Methodology

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CPSC 547, Information Visualization
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http://www.cs.ubc.ca/~tmm/courses/547-15
News

• headcount update: 29 registered; 24 Q2, 22 Q3
  – signup sheet: anyone here for the first time?
• marks for day 2 and day 3 questions/comments sent out by email
  – see me after class if you didn’t get them
  – order of marks matches order of questions in email
    • Q2: avg 83.9, min 26, max 98
    • Q3: avg 84.3, min 22, max 98
  – if you spot typo in book, let me know if it’s not already in errata list
    • but don’t count it as a question
    • not useful to tell me about typos in published papers
• three questions total required
  • not three questions per reading (6 total)! not just one!
VAD Ch 3: Task Abstraction

Why?

Actions

- Analyze
  - Consume
    - Discover
    - Present
    - Enjoy
  - Produce
    - Annotate
    - Record
    - Derive

Search

<table>
<thead>
<tr>
<th>Target known</th>
<th>Target unknown</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location known</td>
<td>Location unknown</td>
</tr>
<tr>
<td>····</td>
<td>Location unknown</td>
</tr>
<tr>
<td>····</td>
<td>Location unknown</td>
</tr>
</tbody>
</table>

Query

- Identify
- Compare
- Summarize

Targets

- All Data
  - Trends
  - Outliers
  - Features

- Attributes
  - One
    - Distribution
    - Extremes
  - Many
    - Dependency
    - Correlation
    - Similarity

- Network Data
  - Topology
    - Paths
  - Spatial Data
    - Shape

[Fig 3.1]
High-level actions: Analyze

• consume
  – discover vs present
    • classic split
    • aka explore vs explain
  – enjoy
    • newcomer
    • aka casual, social

• produce
  – annotate, record
  – derive
    • crucial design choice
Derive

• don’t just draw what you’re given!
  – decide what the right thing to show is
  – create it with a series of transformations from the original dataset
  – draw that

• one of the four major strategies for handling complexity

```
trade balance = exports - imports
```
Actions: Mid-level search, low-level query

• what does user know?  
  – target, location

• how much of the data matters?  
  – one, some, all

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<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Location known</td>
<td><img src="image" alt="Lookup" /></td>
<td><img src="image" alt="Browse" /></td>
</tr>
<tr>
<td>Location unknown</td>
<td><img src="image" alt="Locate" /></td>
<td><img src="image" alt="Explore" /></td>
</tr>
</tbody>
</table>

Search

Query

Identify

Compare

Summarize
Why: Targets

- **ALL DATA**
  - Trends
  - Outliers
  - Features

- **ATTRIBUTES**
  - One
    - Distribution
    - Extremes
  - Many
    - Dependency
    - Correlation
    - Similarity

- **NETWORK DATA**
  - Topology
    - Paths

- **SPATIAL DATA**
  - Shape
Analysis example: Compare idioms

**SpaceTree**

**TreeJuxtaposer**


**What?**

**Why?**

**How?**

**Tree**

**Actions**
- Present
- Locate
- Identify

**Targets**
- Path between two nodes

**SpaceTree**

**Encode**
- Navigate
- Select
- Filter
- Aggregate

**TreeJuxtaposer**

**Encode**
- Navigate
- Select
- Arrange
Analysis example: Derive one attribute

- **Strahler number**
  - centrality metric for trees/networks
  - derived quantitative attribute
  - draw top 5K of 500K for good skeleton

Chained sequences

- output of one is input to next
  - express dependencies
  - separate means from ends
Design Study Methodology

Reflections from the Trenches and from the Stacks

joint work with:
Michael Sedlmair, Miriah Meyer

http://www.cs.ubc.ca/labs/imager/tr/2012/dsm/
Design Studies: Lessons learned after 21 of them

- Cerebral genomics
- MizBee genomics
- Pathline genomics
- MulteeSum genomics
- Vismon fisheries management
- QuestVis sustainability
- WiKeVis in-car networks
- MostVis in-car networks
- Car-X-Ray in-car networks
- ProgSpy2010 in-car networks
- RelEx in-car networks
- Cardiogram in-car networks
- AutobahnVis in-car networks
- VisTra in-car networks
- Constellation linguistics
- LibVis cultural heritage
- Caidants multicast
- SessionViewer web log analysis
- LiveRAC server hosting
- PowerSetViewer data mining
- LastHistory music listening
Methodology for Problem-Driven Work

• definitions

• 9-stage framework

• 32 pitfalls and how to avoid them
Methodology

ingredients

Methods

recipes

Methodology
Design studies: problem-driven vis research

• a specific real-world problem
  – real users and real data,
  – collaboration is (often) fundamental

• design a visualization system
  – implications: requirements, multiple ideas

• validate the design
  – at appropriate levels

• reflect about lessons learned
  – transferable research: improve design guidelines for vis in general
    • confirm, refine, reject, propose
When To Do Design Studies

- **Task Clarity**
  - Fuzzy
  - Crisp

- **Information Location**
  - Head
  - Computer

- **Design Study Methodology**
  - Suitable
  - Not Enough Data

- **Algorithm Automation Possible**
Nine-Stage Framework

**PRECONDITION**
personal validation

**CORE**
inward-facing validation

**ANALYSIS**
outward-facing validation

- learn
- winnow
- cast
- discover
- design
- implement
- deploy
- reflect
- write
How To Do Design Studies

• definitions

• 9-stage framework

• 32 pitfalls and how to avoid them
Pitfall Example: Premature Publishing

algorithm innovation

design studies

Must be first!

Am I ready?


http://www.alaineknipes.com/interests/violin_concert.jpg
Further reading: Books

  – Chap 3: Task Abstraction

• Information Visualization: Using Vision to Think. Stuart Card, Jock Mackinlay, and Ben Shneiderman.
  – Chap 1
Further reading: Articles


• What does the user want to see?: what do the data want to be? A. Johannes Pretorius and Jarke J. van Wijk. Information Visualization 8(3):153-166, 2009.


• TreeJuxtaposer: Scalable Tree Comparison using Focus+Context with Guaranteed Visibility Tamara Munzner, Francois Guimbretiere, Serdar Tasiran, Li Zhang, and Yunhong Zhou. SIGGRAPH 2003.


Further reading: Design studies


Next Time

- to read
  - VAD Ch. 6: Rules of Thumb
    - paper type: evaluation

- reminder: my office hours are Tue right after class