

Lecture 2: Design Studies

Information Visualization
CPSG 533C, Fall 2007

Tamara Munzner

UBC Computer Science

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News

- questions
 - one question per reading, up to max of 5
 - plan (ASCII) text not Word/PDF/etc
- reserve books
 - in CS reading room (ICICS/CS 2nd floor)
 - www.cs.ubc.ca/local/reading/about
 - 24-hr lib access possible
- proxy server
 - note instructions on web page for accessing IEEE DL material

Papers Covered

Ware, Chapter 1: Foundation for a Science of Data Visualization
Cluster and Calendar based Visualization of Time Series Data.
Jarke J. van Wijk and Edward R. van Selow
Proc. InfoVis 99, pp.4-9
<http://www.win.tue.nl/~vnmw/ijcv.pdf>
Using Multilevel Call Matrices in Large Software Projects.
Frank van Ham
Proc. InfoVis 2003, pp.227-232
<http://www.win.tue.nl/~vham/DLcallmatrix.pdf>
Constellation: Linguistic Semantic Networks
Tamara Munzner
Interactive Visualization of Large Graphs and Networks (PhD thesis) Chapter 5, Stanford University, 2000, pp.87-122
http://graphics.stanford.edu/papers/munzner_thesis

Design Study

- describe task
- justify solution
- refine until satisfied

Design Study Definition

Design study papers explore the choices made when applying infovis techniques in an application area, for example relating the visual encodings and interaction techniques to the requirements of the target task. Although a limited amount of application domain background information can be useful to provide a framing context in which to discuss the specifics of the target task, the primary focus of the case study must be the infovis content. Describing new techniques and algorithms developed to solve the target problem will strengthen a design study paper, but the requirements for novelty are less stringent than in a Technique paper.

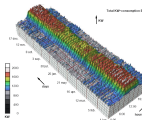
(InfoVis'07) <http://www.infvis.org/infovis2007/CPT/>

Cluster-Calendar, van Wijk

- data: N pairs of (value, time)
 - N large: 50K
- tasks
 - find standard day patterns
 - find how patterns distributed over year, week, season
 - find outliers from standard daily patterns
 - want overview first, then detail on demand
- possibilities
 - predictive mathematical models
 - details lost, multiscale not addressed
 - scale-space approaches (wavelet, fourier, fractal)
 - hard to interpret, known scales lost
 - 3D mountain: x hours, y value, z days
- excellent example, emulate for project writeups!

3D Time-series Data

- 3D extrusion pretty but not useful
 - daily, weekly patterns hard to see



(van Wijk and van Selow, Cluster and Calendar based Visualization of Time Series Data, InfoVis99, <http://www.win.tue.nl/~vnmw/ijcv.pdf>)

Hierarchical Clustering

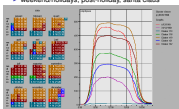
- start with all M day patterns
 - compute mutual differences, merge most similar: M-1
 - continue up to 1 root cluster
- result: binary hierarchy of clusters
- choice of distance metrics
- choice of dendrogram display common
 - but shows structure of hierarchy, not time distribution



(van Wijk and van Selow, Cluster and Calendar based Visualization of Time Series Data, InfoVis99, <http://www.win.tue.nl/~vnmw/ijcv.pdf>)

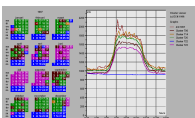
Link Clusters and Calendar

- 2D linked clusters-calendars shows patterns
 - number of employees
 - office hours, Fridays (inland summer, school break)
 - weekend/holidays, post-holiday, santa claus



(van Wijk and van Selow, Cluster and Calendar based Visualization of Time Series Data, InfoVis99, <http://www.win.tue.nl/~vnmw/ijcv.pdf>)

Power Consumption



(van Wijk and van Selow, Cluster and Calendar based Visualization of Time Series Data, InfoVis99, <http://www.win.tue.nl/~vnmw/ijcv.pdf>)

Lessons

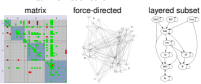
- derived space: clusters
- visual representation of time: calendar
 - linked display
 - interactive exploration
- clear task analysis guided choices
 - reject standard 3D extrusion
 - reject standard dendrogram
- critique
 - color choice not so discriminable
 - especially legend

Lessons

- derived space: clusters
- visual representation of time: calendar
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Multilevel Call Matrices, van Ham

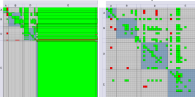
- large software project, implementation vs. spec
- link matrix vs. node network



(van Ham, Using Multilevel Call Matrices in Large Software Projects, InfoVis03 <http://www.win.tue.nl/~vham/DLcallmatrix.pdf>)

Matrices

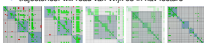
- uniform, recursive, stable
- subdivide by total component count
- visible subcomponent count



(van Ham, Using Multilevel Call Matrices in Large Software Projects, InfoVis03 <http://www.win.tue.nl/~vham/DLcallmatrix.pdf>)

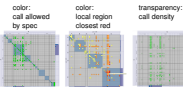
Zooming

- abstraction levels
- linear interpolation plus crossfade
- trajectories: will read van Wijk 03 in nav lecture



(van Ham, Using Multilevel Call Matrices in Large Software Projects, InfoVis03 <http://www.win.tue.nl/~vham/DLcallmatrix.pdf>)

Additional Encoding

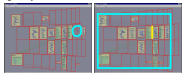


- histograms: size distribution

(van Ham, Using Multilevel Call Matrices in Large Software Projects, InfoVis03 <http://www.win.tue.nl/~vham/DLcallmatrix.pdf>)

Information Density

grid adjustment



Navigation icons: back, forward, search, etc.

Task-Oriented Design



task-specific methods



Navigation icons: back, forward, search, etc.

Readings for Next Time

A Review and Taxonomy of Distortion-Oriented Presentation Techniques, Y.K. Leung and M.D. Apperly, ACM Transactions on Computer-Human Interaction, Vol. 1, No. 2, June 1994, pp. 135-160. (<http://www.acm.edu/people/leung/papers/LAung94.pdf>)

A Fishy Follow-up: Further Reflection on Focus + Context, George W. Furnas, SIGCHI 2006.

The Hyperbolic Browser: A Focus + Context Technique for Visualizing Large Hierarchies, John Lamping and Barbara Ris, Proc. SIGCHI '95. (<http://oleegee.nj.nec.com/lamping@olee.nec.com/context.html>)

TreeLandscape: Scalable Tree Comparison using Focus+Context with Guaranteed Visibility, Maurice Quémener, Taoxin Zhang, and Zhou, SIGCHI 2003. (<http://www.cs.ubc.ca/~lmm/papers/1/>)

SpaceTree: Supporting Exploration in Large Node Link Trees, Design Evaluation and Empirical Evaluation, Catherine Plaisant, Jesse Grosznan, and Ben B. Bederson, Proc. InfoVis 2002. (<http://hp.cs.cmu.edu/pub/hcl/Reports-Abstracts-@biblography/2002-09.html/2002-05.pdf>)

Navigation icons: back, forward, search, etc.