Lecture 7: Single View Methods
Information Visualization
CPSC 533C, Fall 2011
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Required Readings
Chapter 5: Single View Methods
Trellis paper moved to Multiple Views on Monday

Further Reading
Milestones in the History of Thematic Cartography, Statistical Graphics, and Data Visualization.
Friendly and Denis.
http://www.math.yorku.ca/SCS/Gallery/milestone/
Multi-Scale Banking to 45 Degrees. Heer and Agrawala.
Overview Use in Multiple Visual Information Resolution Interfaces. Lam, Munzner, and Kienzle.
IEEE CG&A, 1994

Principles, Methods, and Techniques...
part 1: principles (3 chapters)
why underlying many design decisions
data, visual encoding, interaction
part 2: methods (4 chapters)
what are the axes of the (current) design space
taxonomy of design considerations
how many views? single, multiple
how to reduce what’s shown? data, dimensions
part 3: techniques (3 lectures, [4 lectures...])
analyze techniques by which methods/principles used
tables, graphs, (text/logs), spatial
grouped by data type to follow nested model
technique level design happens after data type chosen at abstraction level

... and Practice
part 4: practice (2 lectures)
problem identification and task abstraction
validation at problem, abstraction, technique levels
research process/papers

Experiment
which lecture style works best?
summarize chapters thoroughly
fast several lectures
if book doing its job, maybe other choices viable!
summarize lightly
also bring up other ideas/approaches
more time for discussion
trying this today
end of class: get feedback from you

Spatial Position
most statistical graphics
bar chart, histogram

Single View Methods
all information integrated in one view
basic visual encodings
spatial position
color
other channels
pixel-oriented techniques
visual layering
global compositing
item-level stacking
glyphs

Statistical Graphics
heavy focus on spatial position for visual encoding
long history for paper-based views of data
springboard for infovis
http://www.datavis.ca/milestones/
many ways to make interactive (more later)
many ways to refine/improve/combine

Spatial Position Cycle
Spatial Position

Choosing Aspect Ratios
FFT the data, smooth by
convolve with Gaussian
find interesting
spikes/ranges in power spectrum
cull nearby regions if too
similar, ensure overview shown
create trend curves for
each aspect ratio

Multiscale Banking to 45
frequency domain analysis
find interesting
regions at multiple scales

Bar vs Line Charts
line implies trend, do not use for categorical data

Line Charts
invented by William Playfair (1759-1823)
also bar charts, pie charts, ...

Banking to 45 Degrees
previous work by Cleveland
perceptual principle: most
accurate angle judgement at 45
degrees
pick line graph aspect ratio
(height/width) accordingly

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Select 5 slides:
• female
• male
• 0
• 10
• 20
• 30
• 40
• 50
• 60
• Height (inches)

Female Male0
10
20
30
40
50
60
70
80
90
100
Height (inches)

10-year-olds 12-year-olds0
10
20
30
40
50
60
70
80
90
100
Height (inches)

4 chapters...

Scatterplots
- encode two input variables with spatial position
- show positive/negative/no correlation between variables
- show clusters: clumpiness/density, shape, overlap

VisDB Windows
- grouped dimensions
- separate dimensions

Visual Layering
- beyond simple use of visual channels

Visual Layering: Constellation
- global composting, dynamic layers
- video

Colormap Taxonomy
- http://www.colorbrewer.org

Rainbows: The Good, The Bad, The Ugly

Study: Control Room Scenario
Which location has the highest power surge for the given time period?
A fault occurred at the beginning of this recording, and resulted in a temporary power surge. Which location is affected the earliest?

VisDB Results: Separate Dimensions

VisDB Results: Grouped Dimensions

Study: Findings
- tasks
  - Max: simple, local, no comparison
  - Most: complex, dispersed, no comparison
  - Shape: complex, local, comparison
  - Compare: simple, local, comparison
- results
  - low-res / high-density used:
    - simple/local targets
  - (other findings about focus+context vs overview/detail)
- see also horizon graphs study

Pixel-Oriented Methods: VisDB
- how to draw pixels?
  - sort, color by relevance
  - local ordering

Tradeoff: Empirical Study
- Mix Task
- Shape Task
- Compare Task

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Glyphs
- compound marks
- macro (small picture) vs micro (texture)

Questions/Discussion
- channel questions
  - separability
  - effectiveness principle: importance matching

Accuracy/InfoDensity Tradeoff: Position/Color
- how to draw pixels?
  - sort, color by relevance
  - local ordering

Tradeoff: Empirical Study
- Mix Task
- Shape Task
- Compare Task


Partial Least Squares
- method variants
  - global composting: everything superimposed
  - item-level stacking
  - major consideration
- static layers: disjoint ranges in channels safest
- dynamic/interactive layers: more freedom


Fig 1. Lam, Munzner, and Kincaid. Overview Use in Multiple Visual Information Resolution Interfaces. Proc. InfoVis 2007


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Experiment: Feedback

- which lecture style works best?
- summarize chapters thoroughly
  - last several lectures
  - if book doing its job, maybe other choices viable!
- summarize lightly
  - more time for other/further ideas/approaches
  - more time for discussion
  - trying this today
- your preferences?

Reading For Next Time

Chapter 6: Multiple View Methods