cs6964 | February 9 2012

MULTIPLE VIEWS

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slide acknowledgements:

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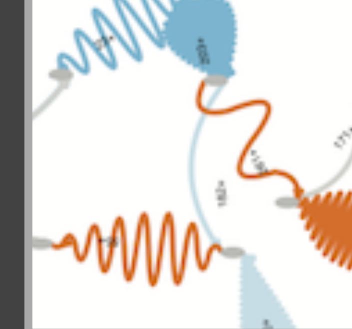
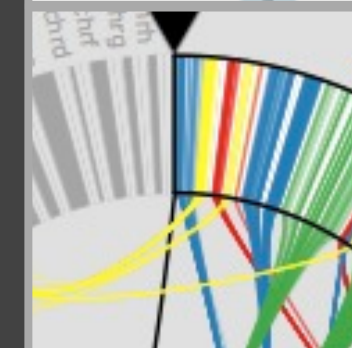
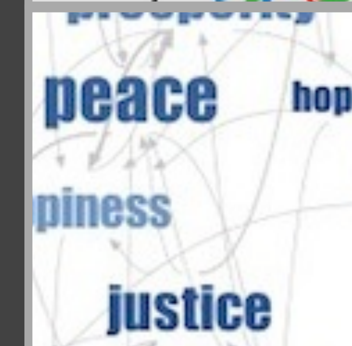
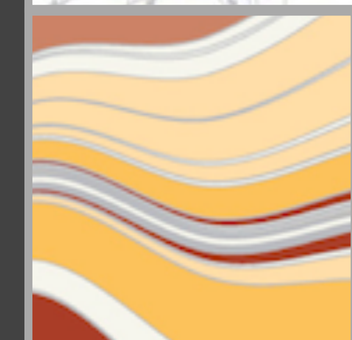
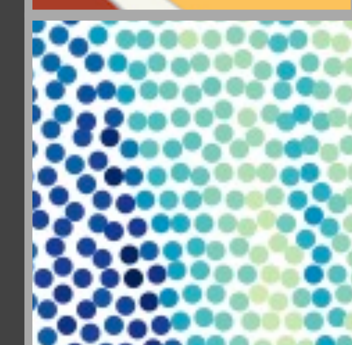
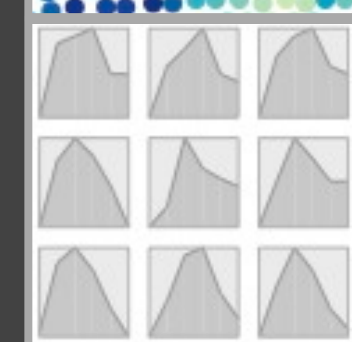






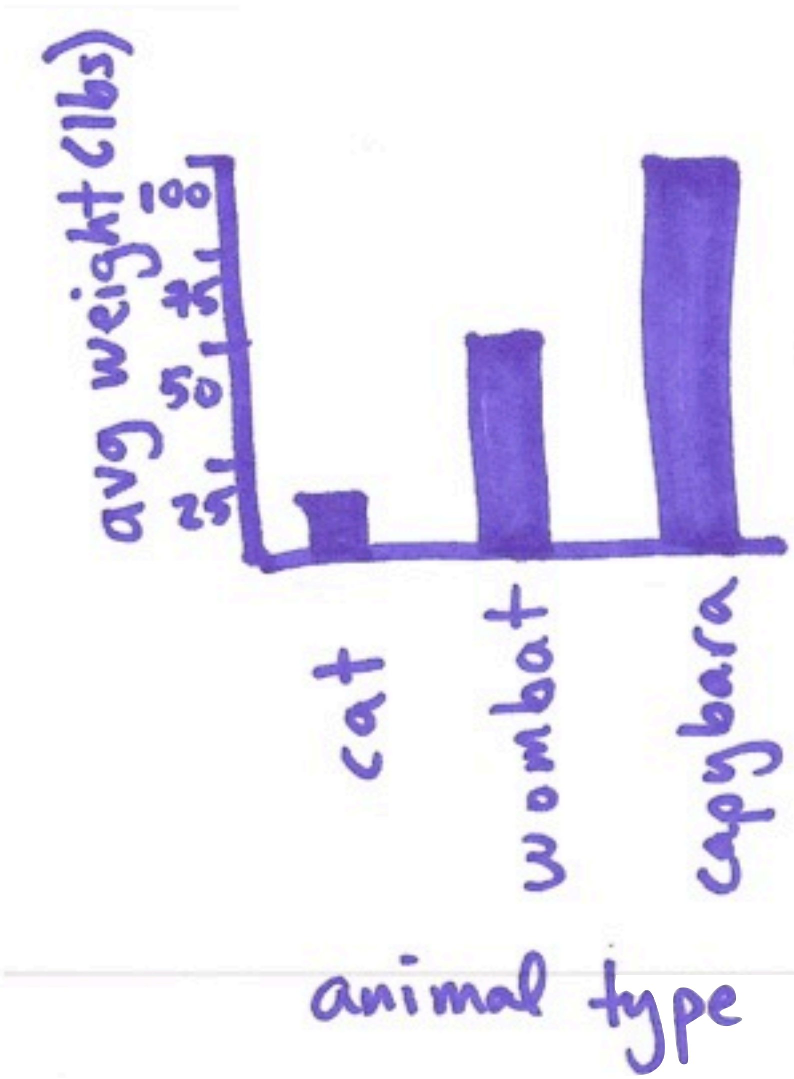




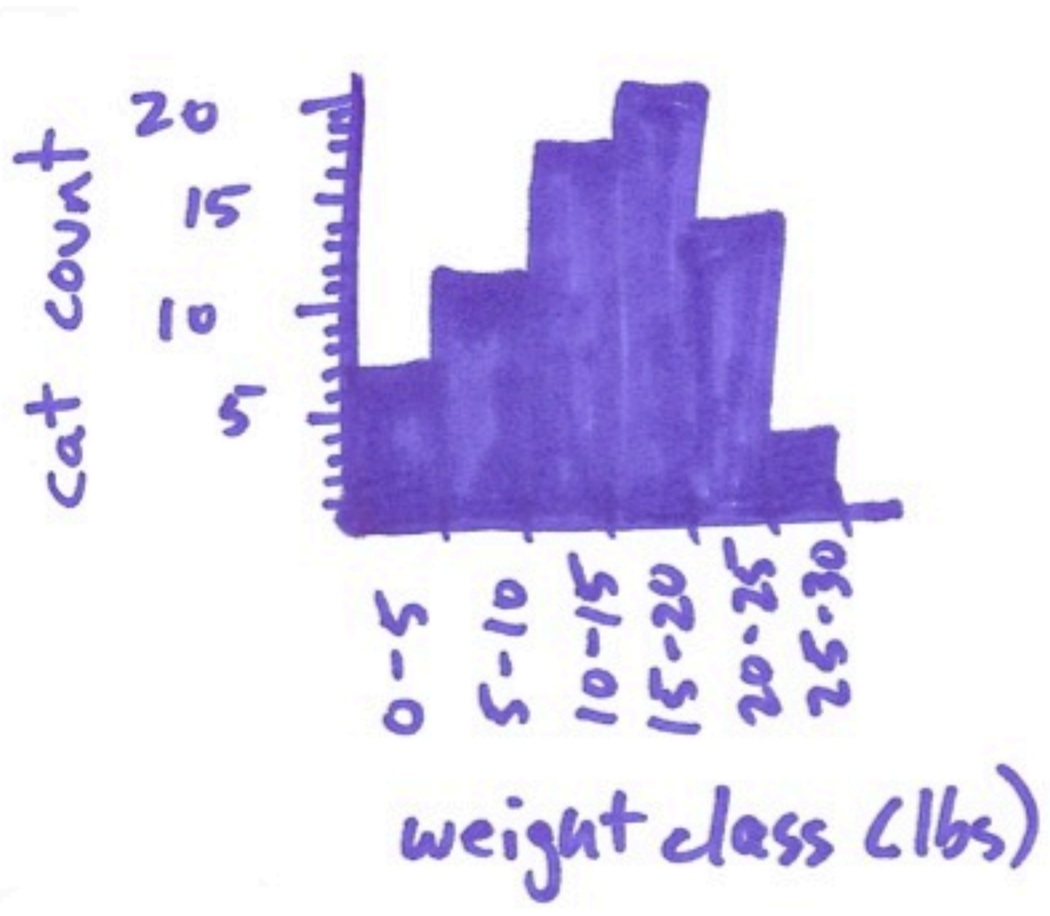


LAST TIME

SPATIAL POSITION

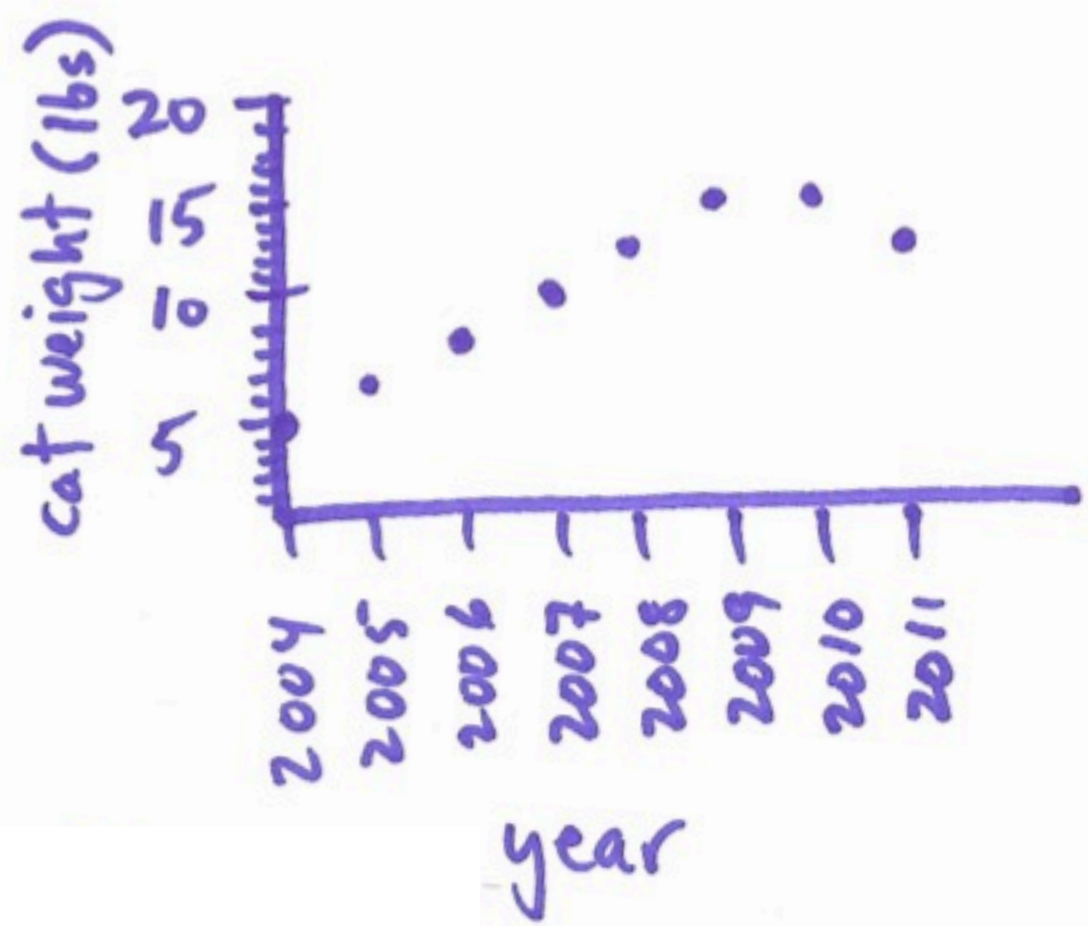


bar chart

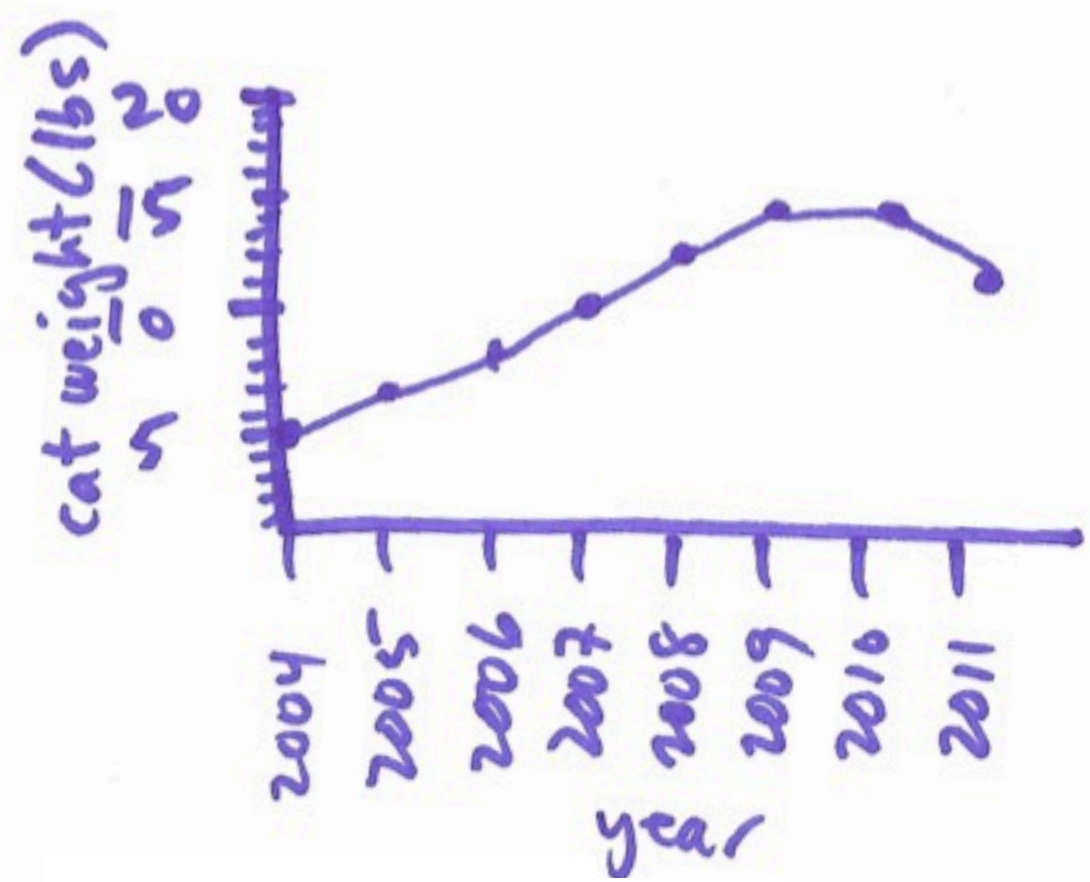


histogram

SPATIAL POSITION



dot plot

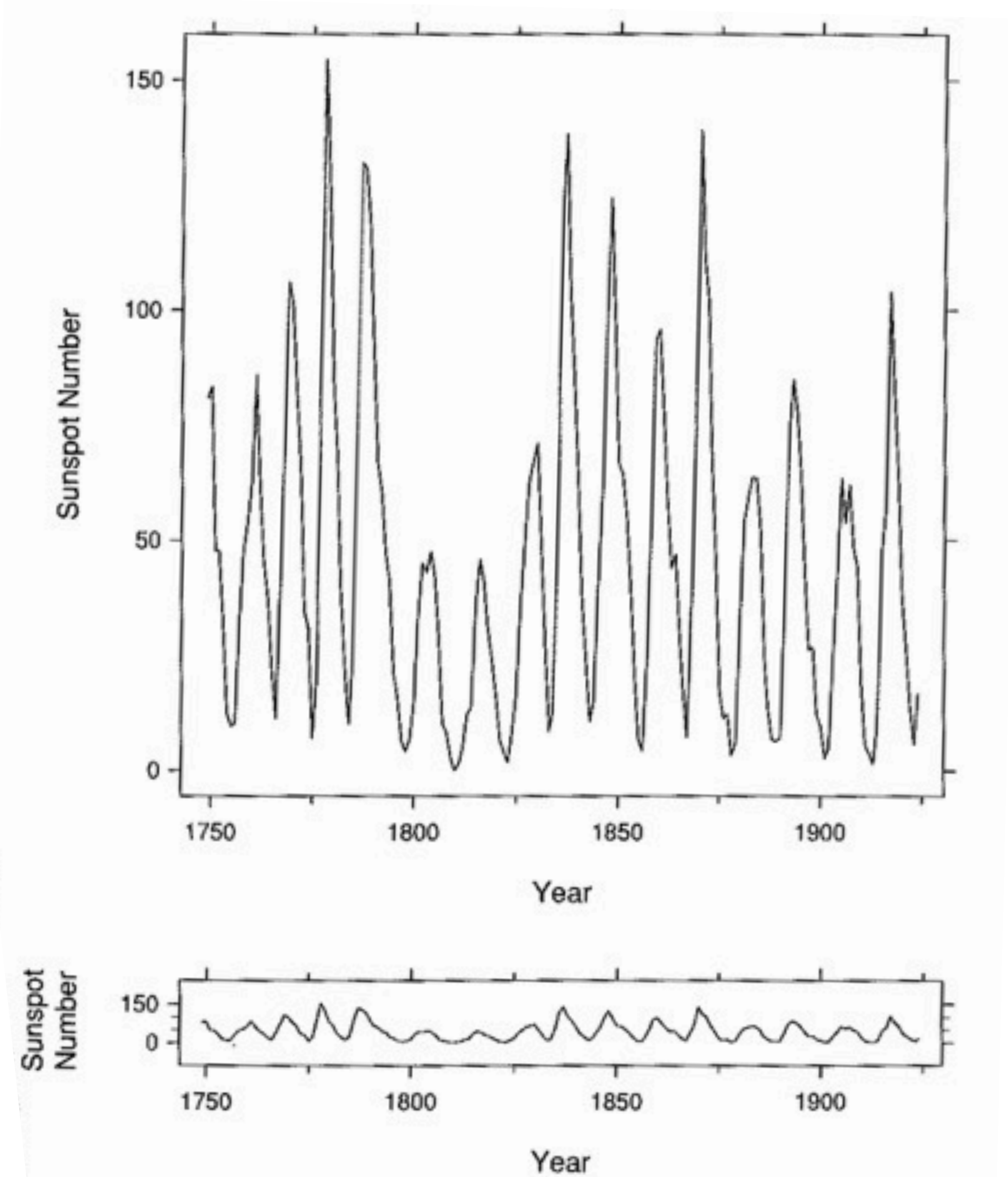


line chart

BANKING TO 45°

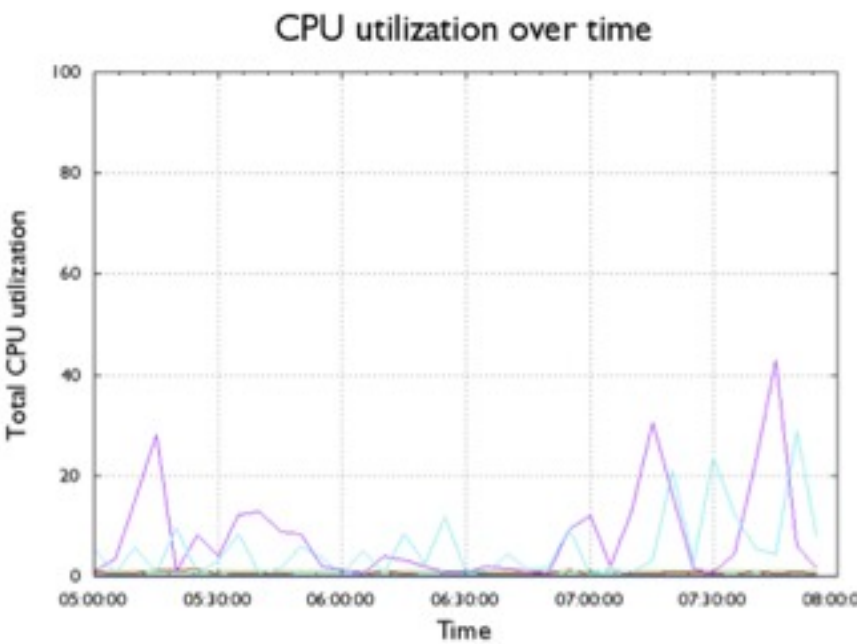
The aspect ratio of a graph is an important factor for judging rate of change.

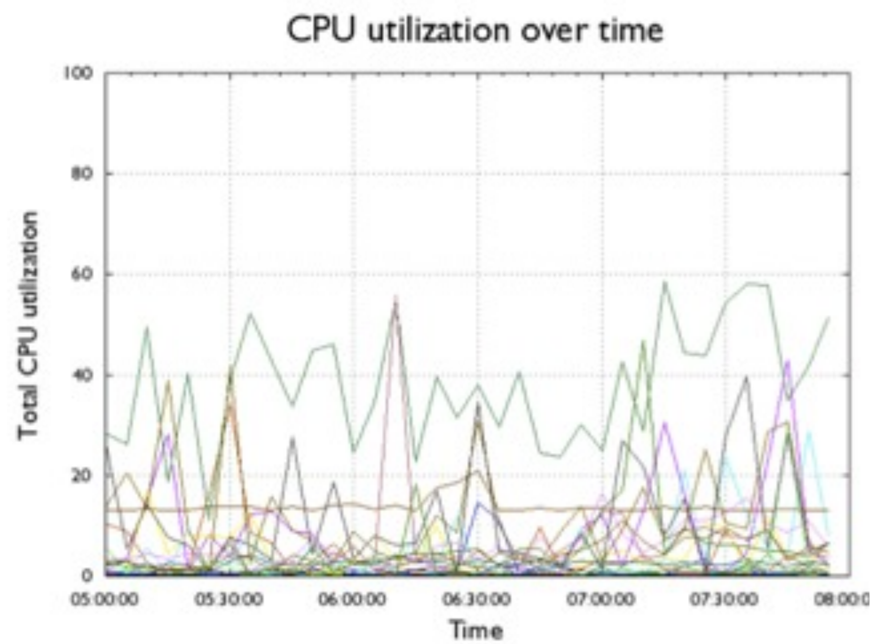
perceptual principle:
most accurate angle judgement is at 45

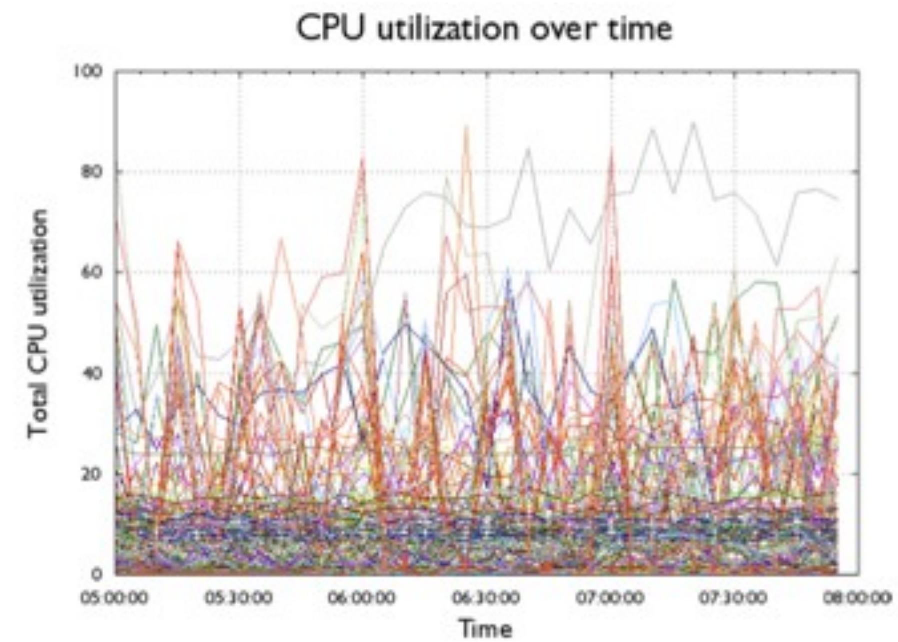


Cleveland 1994

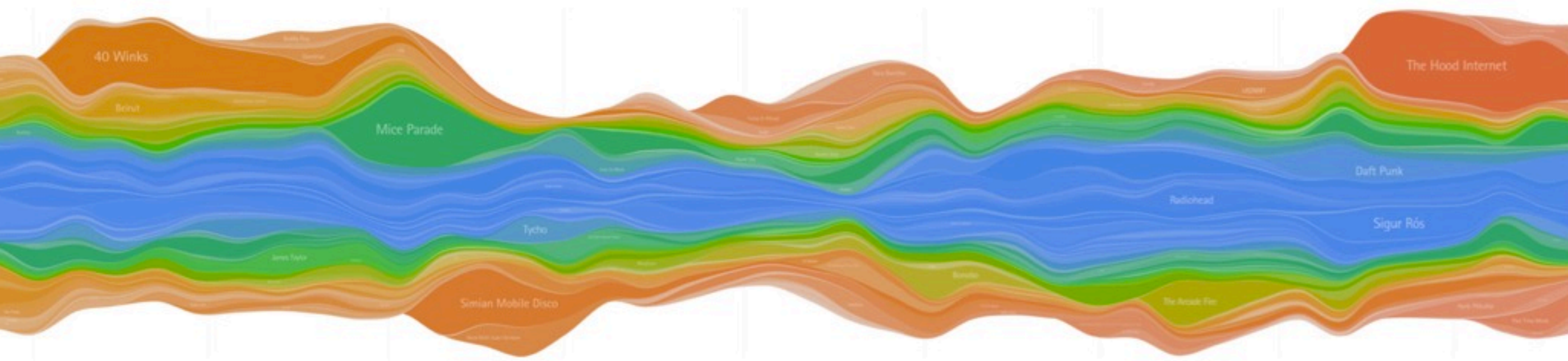
layering: global compositing





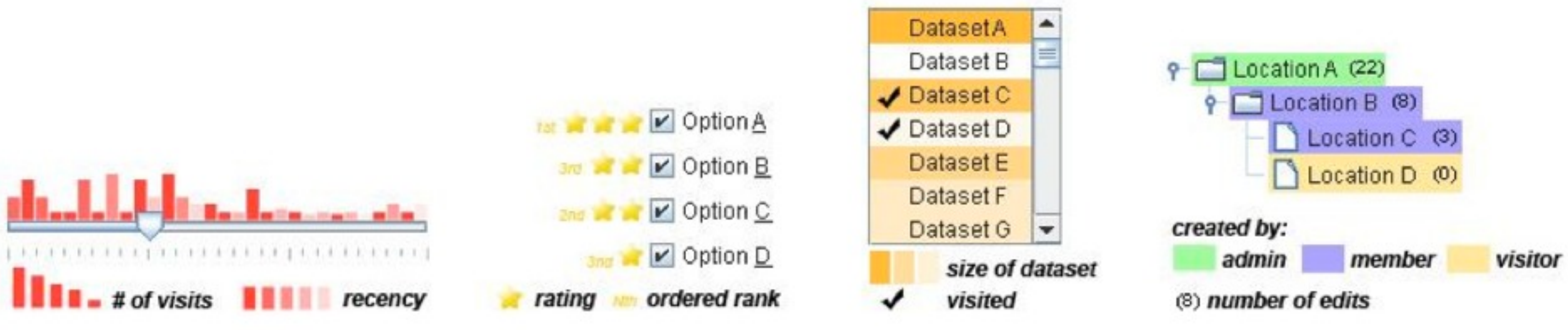


layering: item stacking



Byron 2008

scented widgets

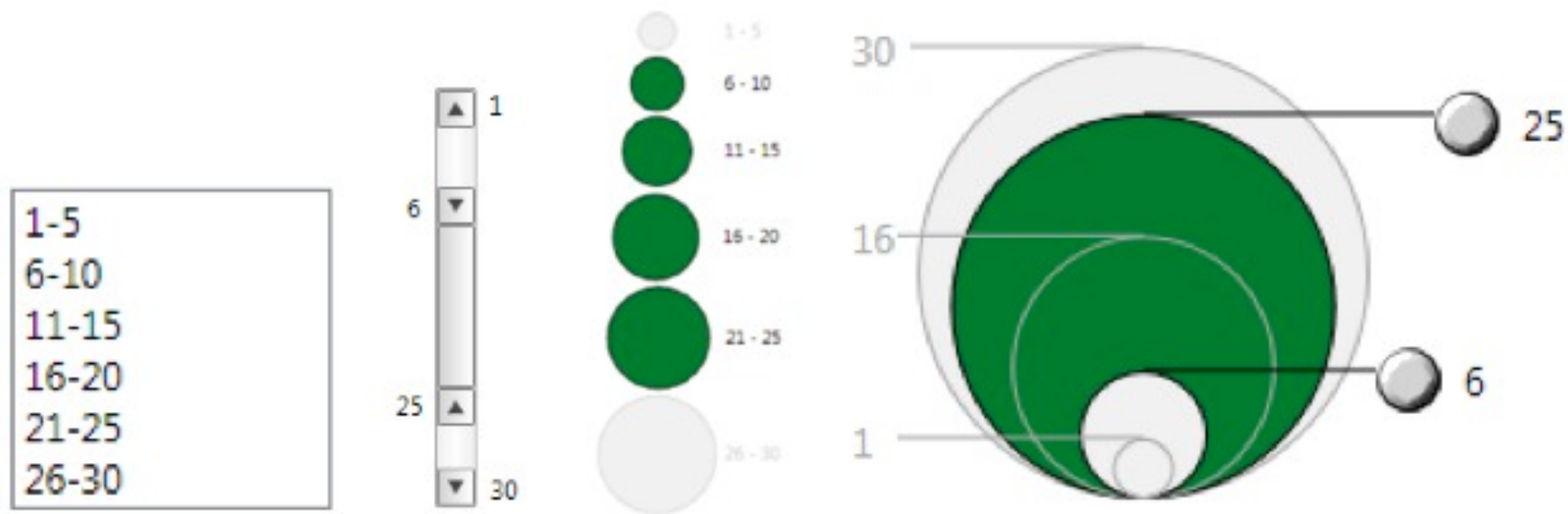


information scent: user's (imperfect) perception of data

GOAL: lower the cost of information forging through better cues

Willett 2007

interactive legends



controls combining the visual representation of static legends with interaction mechanisms of widgets

define and control visual display together

Riche 2010

administrivia

feb 14-23 : proposal meetings

march 7 : presentation topics due

march 9 : proposals due

march 27-april 3 : project updates

april 5-24 : paper presentations

may 1 : final project presentations

may 3 : process books due

- **linking choices**

- **view choices**

target

translate

design

implement

validate

comments on readings?

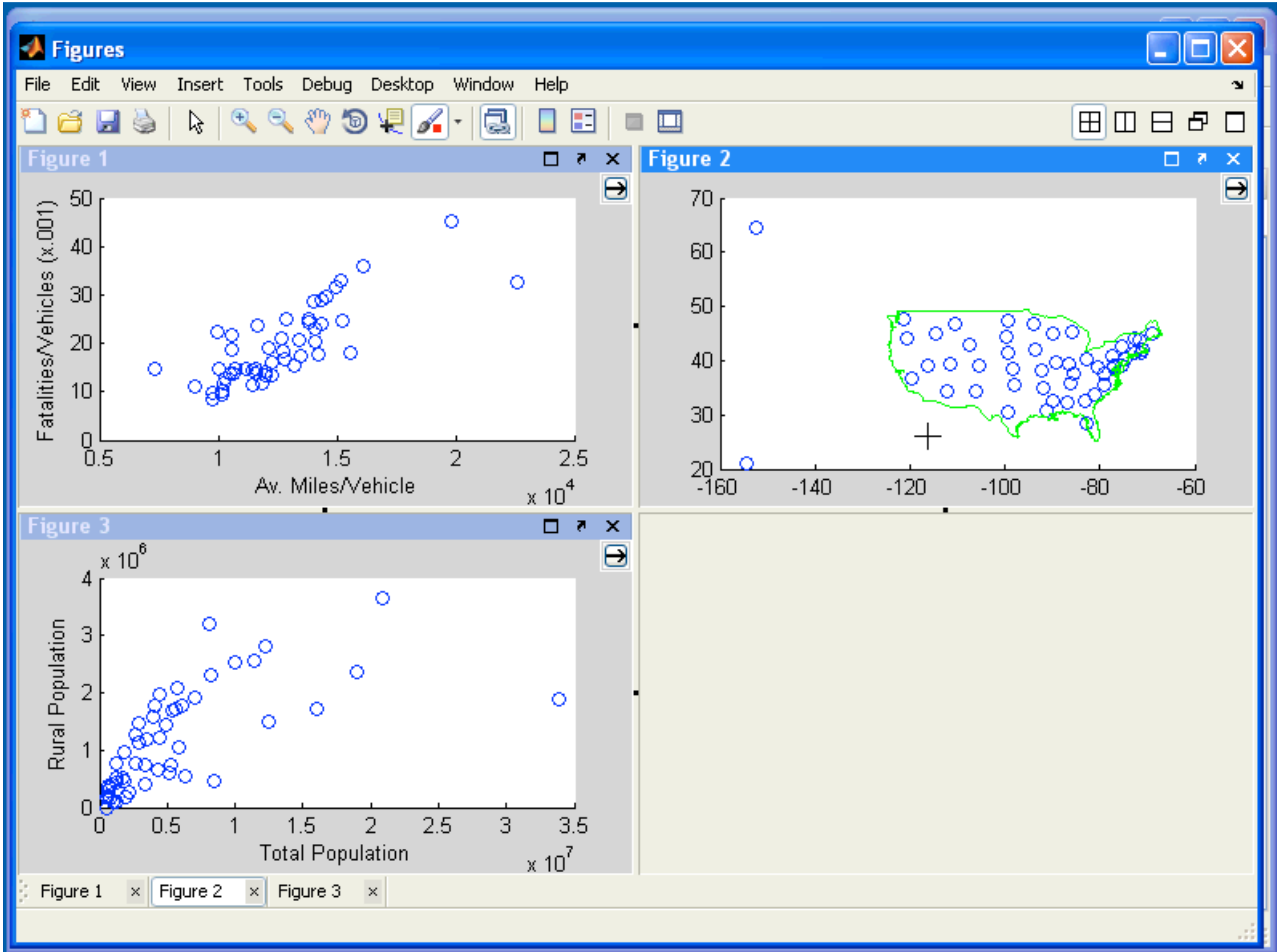
- **linking choices**
  - linked highlighting
  - linked navigation

- **view choices**

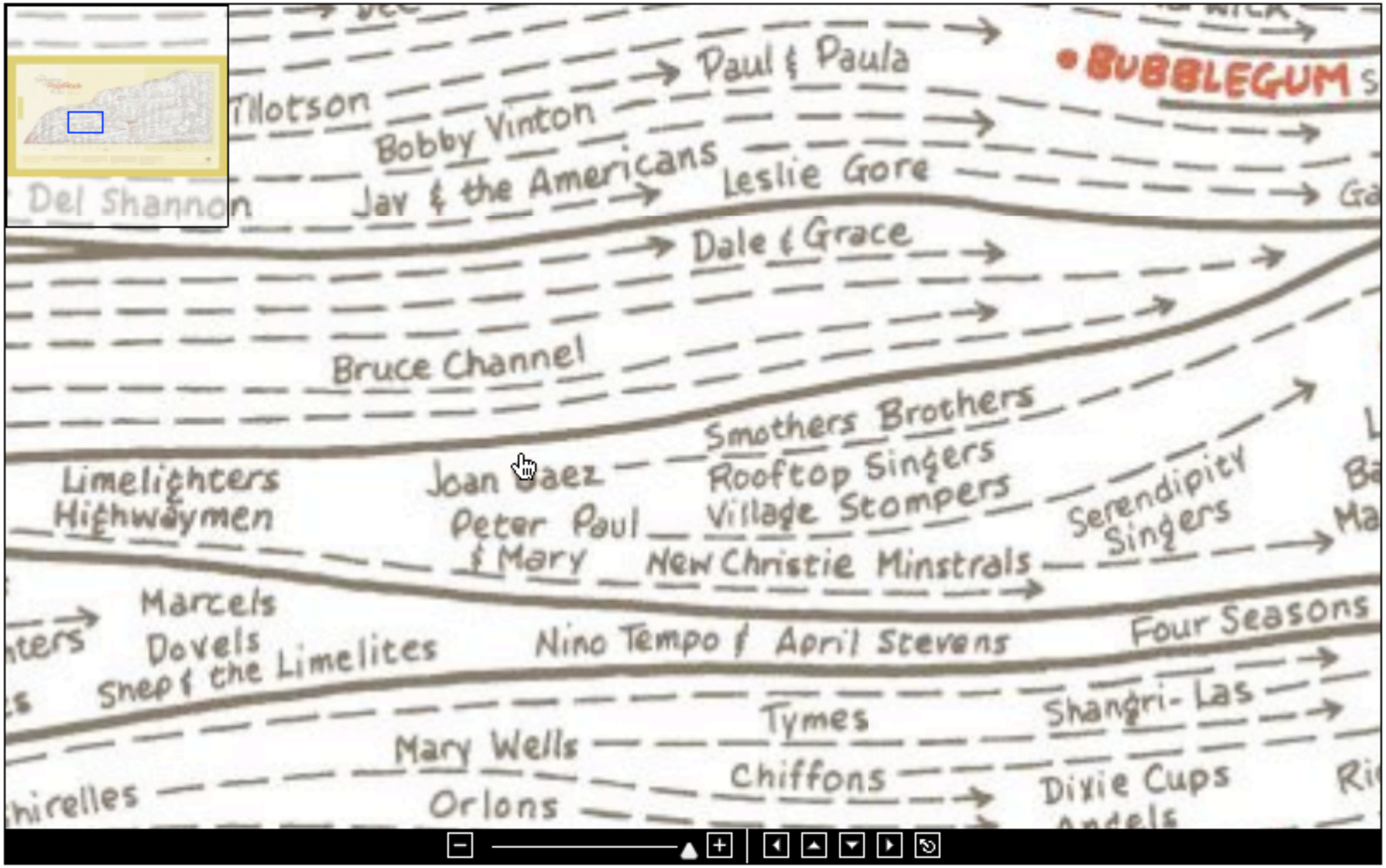
LINKED VIEWS

multiple views that are simultaneously visible and linked together such that actions in one view affect the others

LINKED HIGHLIGHTING



LINKED NAVIGATION

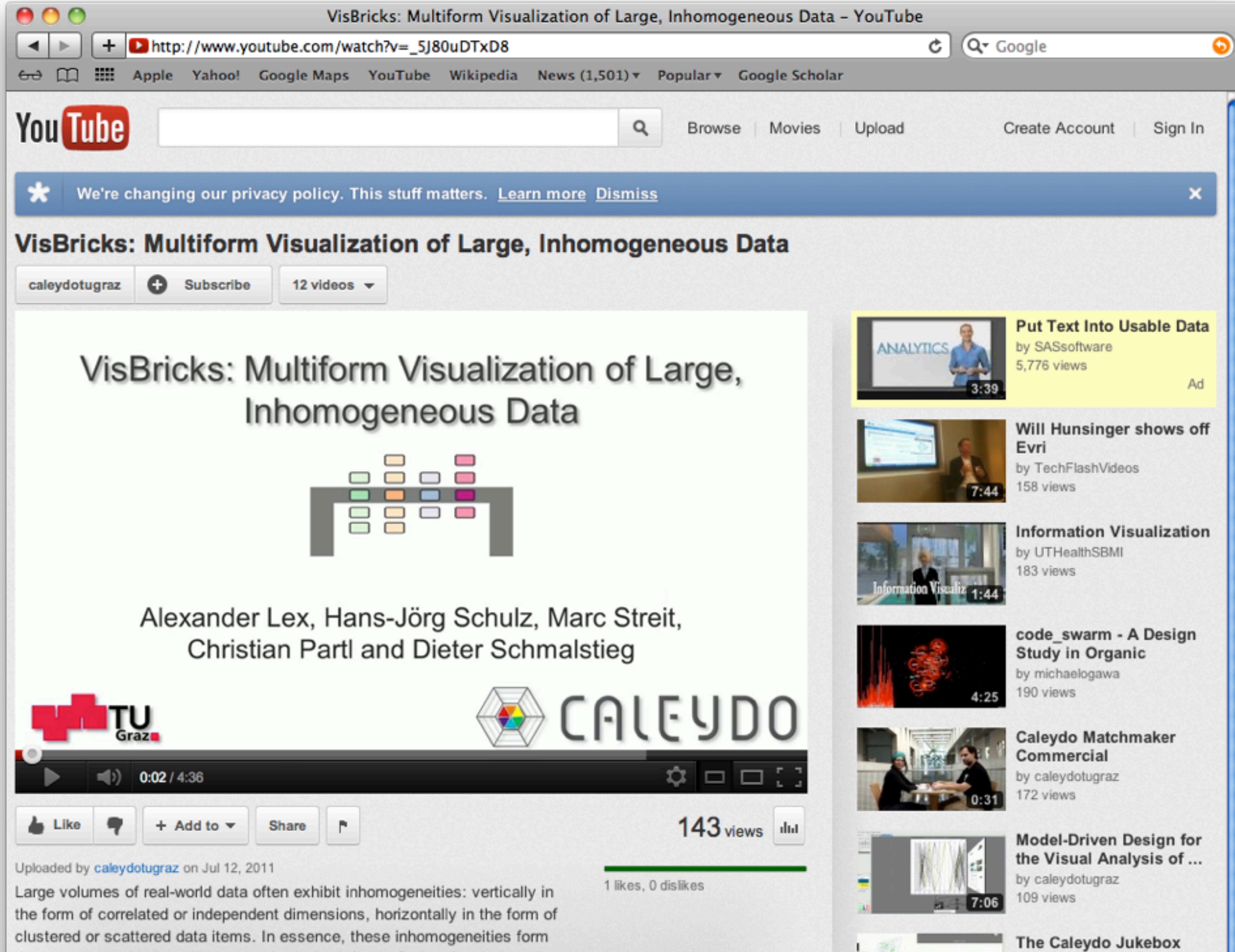


http://www.historyshots.com/rockmusic/

- **linking choices**

- **view choices**
  - encoding: same or multiform
  - dataset: same or small multiple
  - data: all or subset (overview/detail)
  - conditioning

MULTIFORM
difference visual encodings are used between the views



VisBricks: Multiform Visualization of Large, Inhomogeneous Data – YouTube
http://www.youtube.com/watch?v=_5J80uDTxD8
Google
Apple Yahoo! Google Maps YouTube Wikipedia News (1,501) Popular Google Scholar
YouTube
Browse Movies Upload Create Account Sign In
We're changing our privacy policy. This stuff matters. Learn more Dismiss
VisBricks: Multiform Visualization of Large, Inhomogeneous Data
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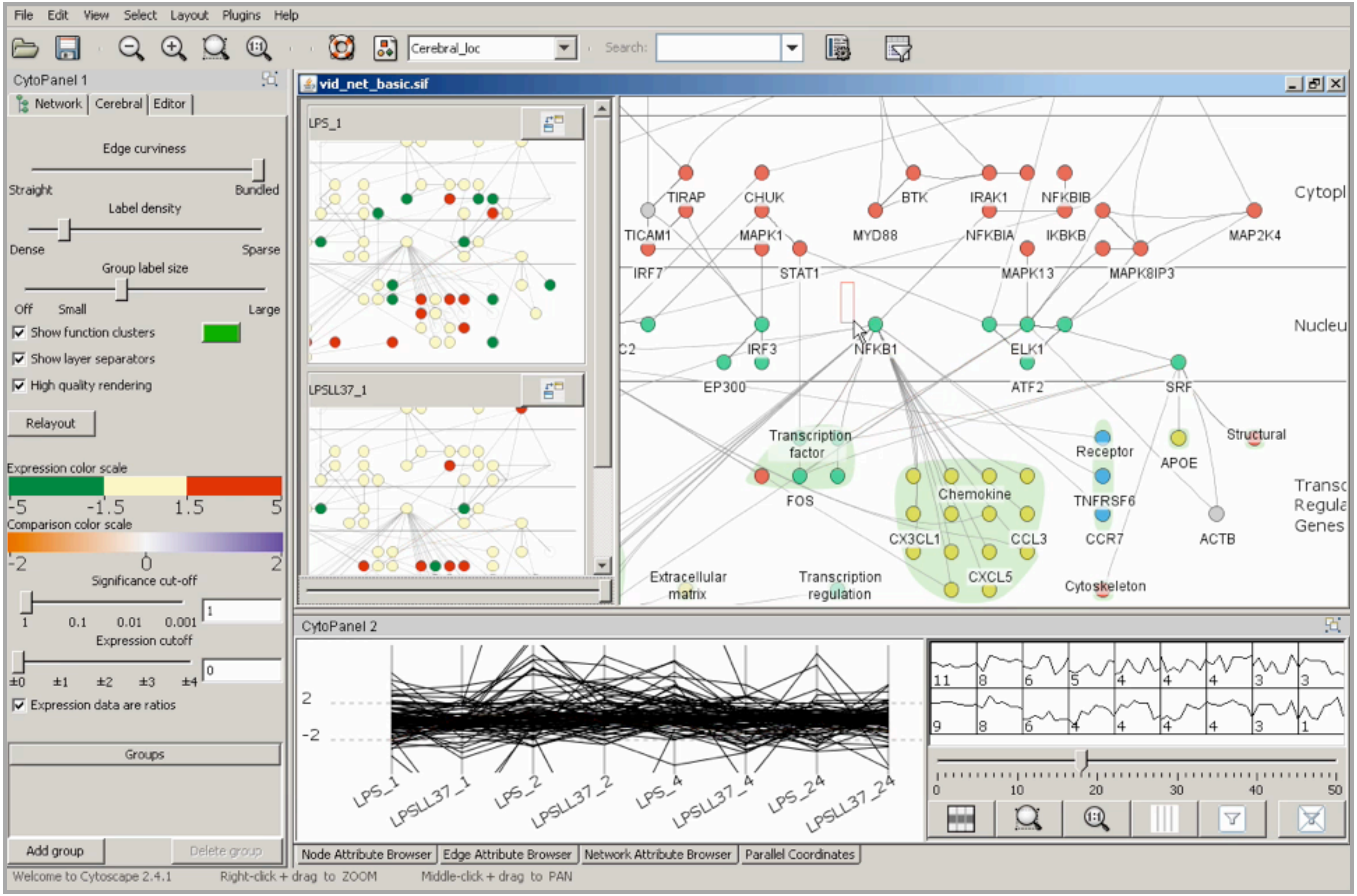
VisBricks: Multiform Visualization of Large, Inhomogeneous Data
Alexander Lex, Hans-Jörg Schulz, Marc Streit, Christian Partl and Dieter Schmalstieg
TU Graz
CALEYDO
0:02 / 4:36
Like Add to Share
143 views
Uploaded by caleydotugraz on Jul 12, 2011
1 likes, 0 dislikes
Large volumes of real-world data often exhibit inhomogeneities: vertically in the form of correlated or independent dimensions, horizontally in the form of clustered or scattered data items. In essence, these inhomogeneities form
Put Text Into Usable Data
by SASsoftware
5,776 views
Ad
3:39
Will Hunsinger shows off Evri
by TechFlashVideos
158 views
7:44
Information Visualization
by UTHealthSBMI
183 views
1:44
code_swarm - A Design Study in Organic
by michaelogawa
190 views
4:25
Caleydo Matchmaker Commercial
by caleydotugraz
172 views
0:31
Model-Driven Design for the Visual Analysis of ...
by caleydotugraz
109 views
7:06
The Caleydo Jukebox

SMALL MULTIPLE

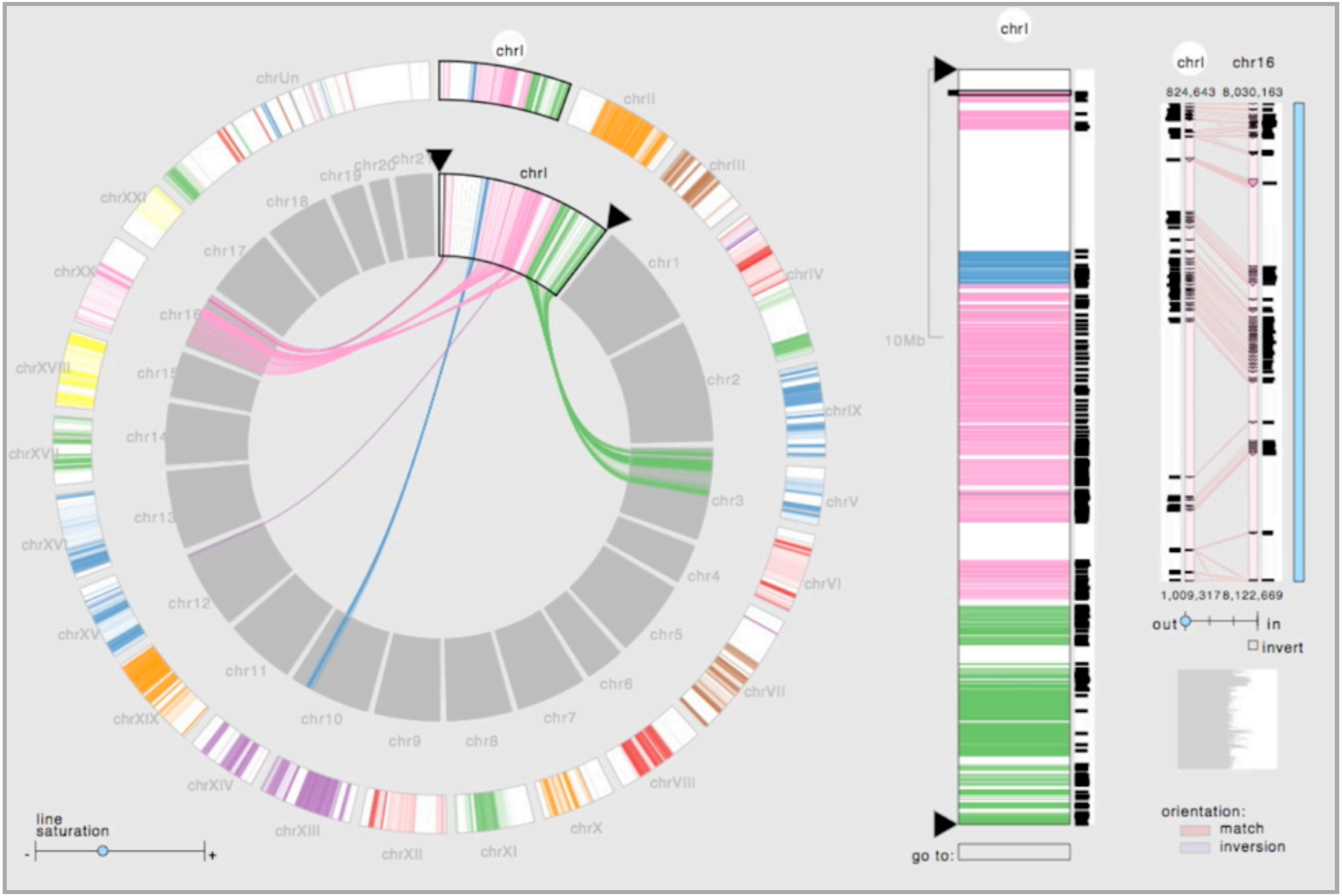
each view uses the same visual encodings
but shows a different data set



File Edit View Select Layout Plugins Help
Cerebral_loc
Search:
CytoPanel 1
Network Cerebral Editor
Edge curviness
Straight
Bundled
Label density
Dense
Sparse
Group label size
Off Small Large
Show function clusters
Show layer separators
High quality rendering
Relayout
Expression color scale
-5 -1.5 1.5 5
Comparison color scale
-2 0 2
Significance cut-off
1 0.1 0.01 0.001
Expression cutoff
±0 ±1 ±2 ±3 ±4
Expression data are ratios
Groups
Add group
Delete group
vid_net_basic.sif
LPS_1
LPSLL37_1
TIRAP
CHUK
BTK
IRAK1
NFKBIB
TICAM1
MAPK1
MYD88
NFKBIA
IKBKB
MAP2K4
IRF7
STAT1
MAPK13
MAPK8IP3
Cytopl
Nucleu
IRF3
NFKB1
ELK1
EP300
ATF2
SRF
Transcription factor
FOS
Chemokine
Receptor
TNFRSF6
APOE
Structural
CX3CL1
CCL3
CCR7
ACTB
Transc Regula Genes
Extracellular matrix
Transcription regulation
CXCL5
Cytoskeleton
CytoPanel 2
2
-2
LPS_1 LPSLL37_1 LPS_2 LPSLL37_2 LPS_4 LPSLL37_4 LPS_24 LPSLL37_24
0 10 20 30 40 50
Node Attribute Browser
Edge Attribute Browser
Network Attribute Browser
Parallel Coordinates
Welcome to Cytoscape 2.4.1
Right-click + drag to ZOOM
Middle-click + drag to PAN

OVERVIEW & DETAIL

one view shows information about entire dataset, while additional view(s) shows more detailed information about a subset of the data



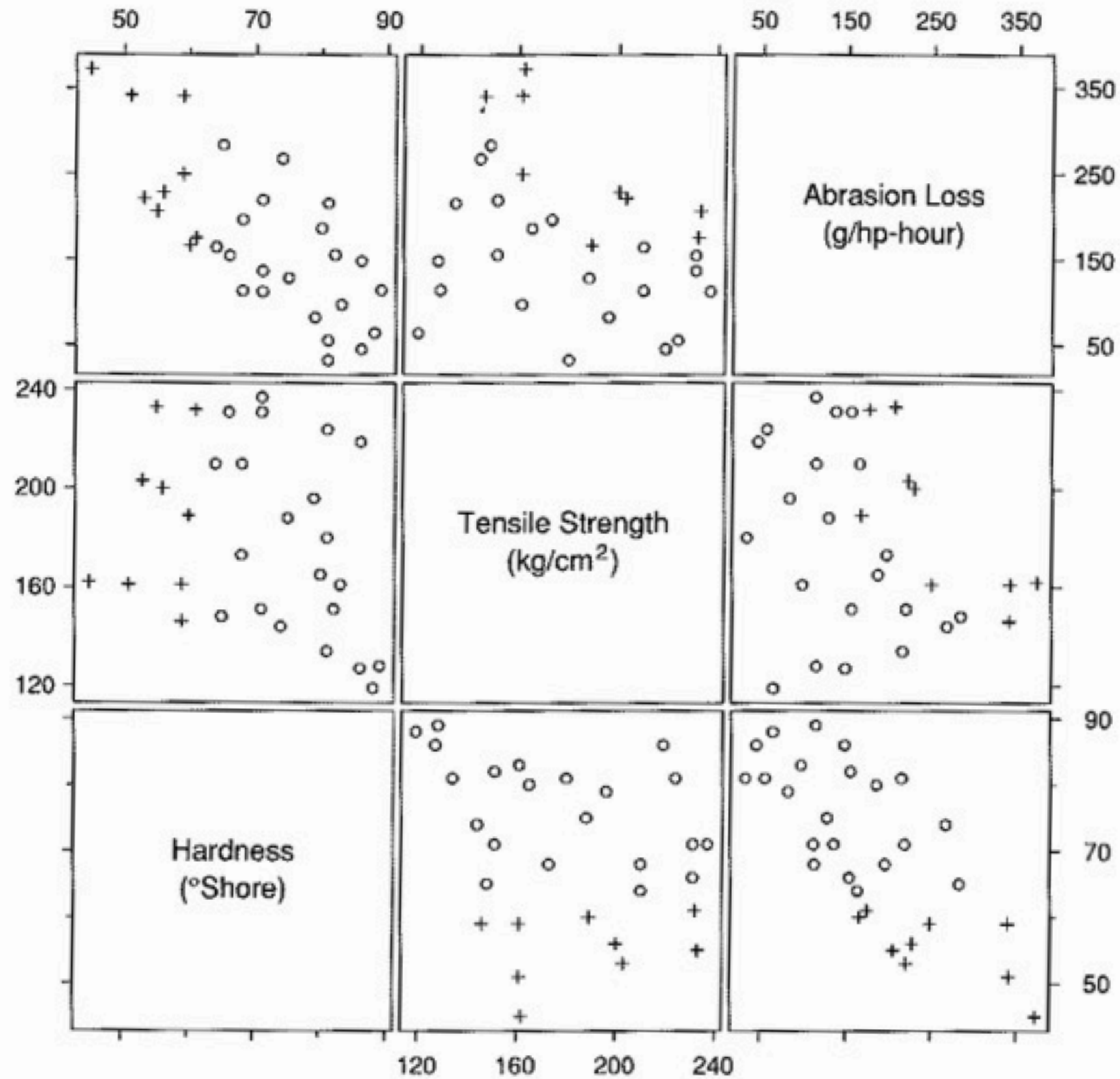
chrI
chrUn
chrII
chrIII
chrIV
chrIX
chrV
chrVI
chrVII
chrVIII
chrX
chrXI
chrXII
chrXIII
chrXIV
chrXIX
chrXV
chrXVI
chrXVII
chrXVIII
chrXX
chrXXI
chr1
chr2
chr3
chr4
chr5
chr6
chr7
chr8
chr9
chr10
chr11
chr12
chr13
chr14
chr15
chr16
chr17
chr18
chr19
chr20
chr21
line saturation
10Mb
go to:
chr16
824,643
8,030,163
1,009,317
8,122,669
out
in
invert
orientation:
match
inversion

CONDITIONING
divide the dataset into subsets; show each subset in a different small multiples view

CONDITIONING VARIABLES
dataset attributes used to chunk data into subsets

ENCODING VARIABLES
other dataset attributes used to visually encode the subsets

SCATTERPLOT MATRIX (SPLOM)



3.65 CONDITIONING. A scatterplot matrix displays trivariate data: measurements of abrasion loss, hardness, and tensile strength for 30 rubber specimens. The "+" plotting symbols encode the data for those specimens with hardness less than 62 °Shore.

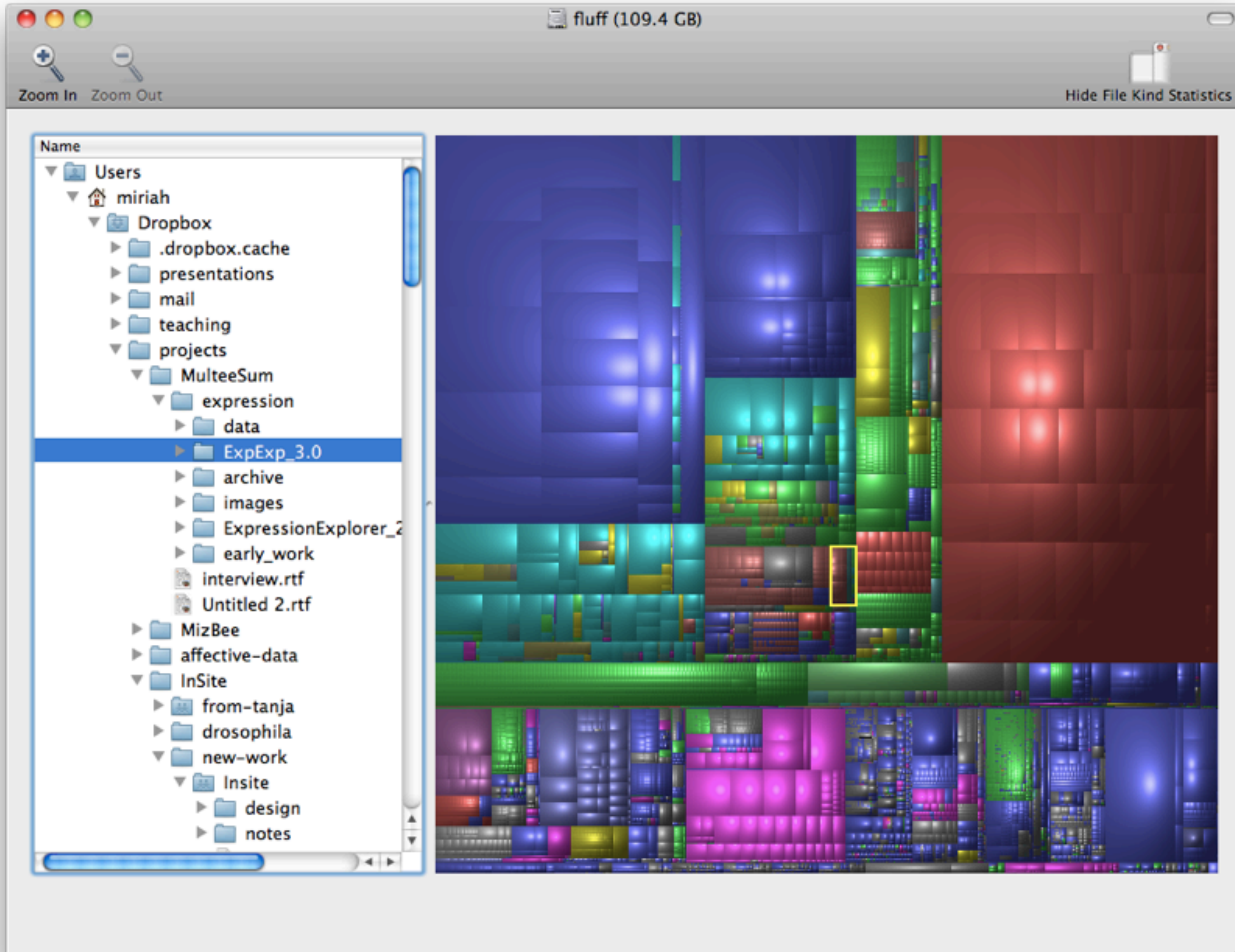
Cleveland 1994

HiVE

Hierarchical Visual Expression

- **conditioning:** transform multidimensional data into a hierarchy
- reconfigure conditioning hierarchies to explore data space
- use **treemaps** as spacefilling rectangular layouts

TREEMAP


fluff (109.4 GB)
Zoom In
Zoom Out
Hide File Kind Statistics
Name
Users
miriah
Dropbox
.dropbox.cache
presentations
mail
teaching
projects
MulteeSum
expression
data
ExpExp_3.0
archive
images
ExpressionExplorer_2
early_work
interview.rtf
Untitled 2.rtf
MizBee
affective-data
InSite
from-tanja
drosophila
new-work
Insite
design
notes

HiVE
Hierarchical Visual Expression

- **conditioning:** transform multidimensional data into a hierarchy
- reconfigure conditioning hierarchies to explore data space
- use **treemaps** as spacefilling rectangular layouts
  - each rectangle is a conditioned subset
  - nested graphical summaries
    - size, shape, color used to show subset properties
    - containment ordering by condition variables

Slingsby 2009

HiVE example: London property

conditioning variables
house type
neighborhood
sale time

encoding variables
average price (color)
number of sales (size)

results
between neighborhoods, different housing distributions

within neighborhoods, similar prices

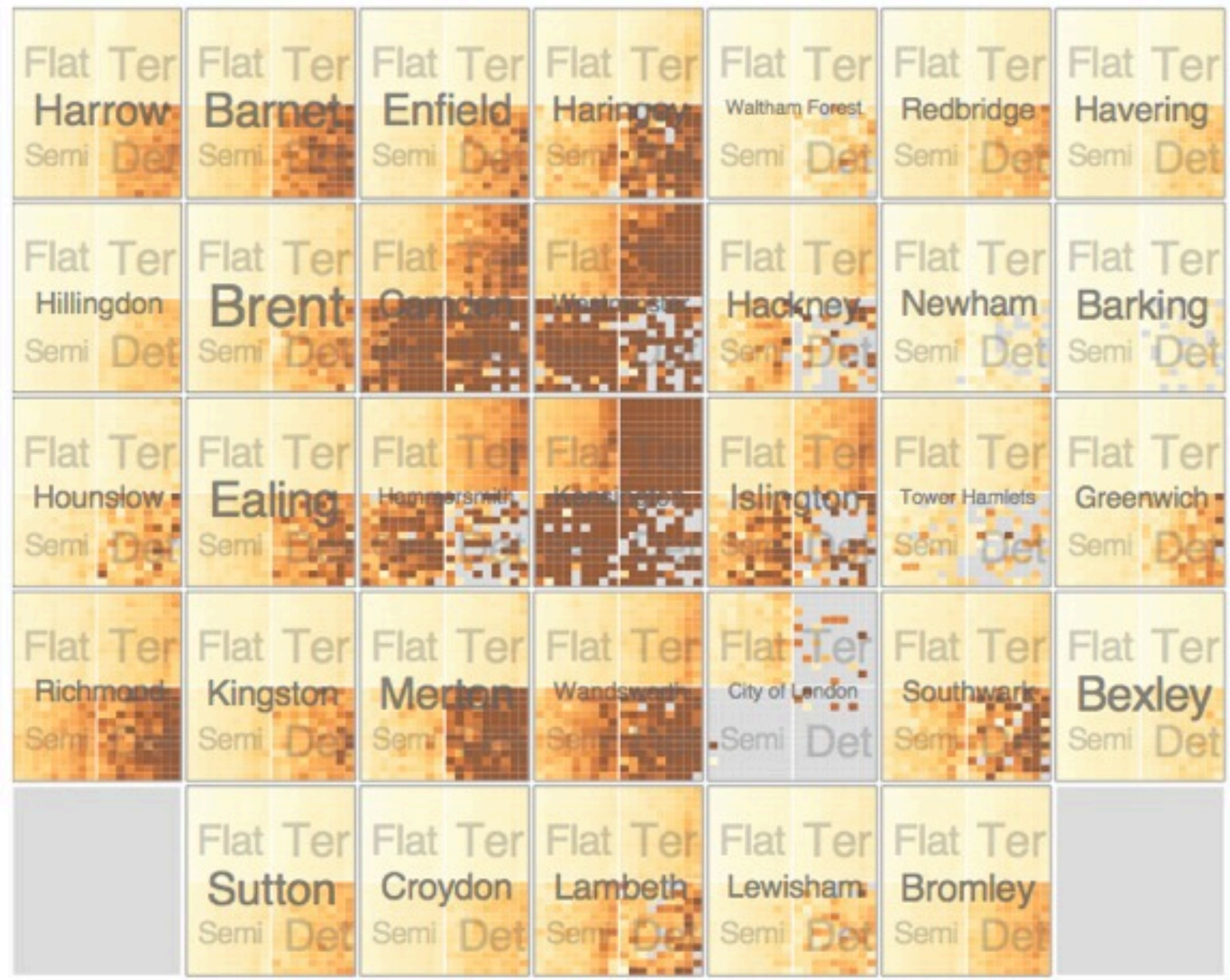
Slingsby 2009

HiVE example: London property

conditioning variables
neighborhood location
neighborhood
house type
sale time (year)
sale time (month)

encoding variables
average price (color)
n/a (size)

results
expensive neighborhoods near center of city



Slingsby 2009

Configuring Hierarchical Layouts to Address Research Questions

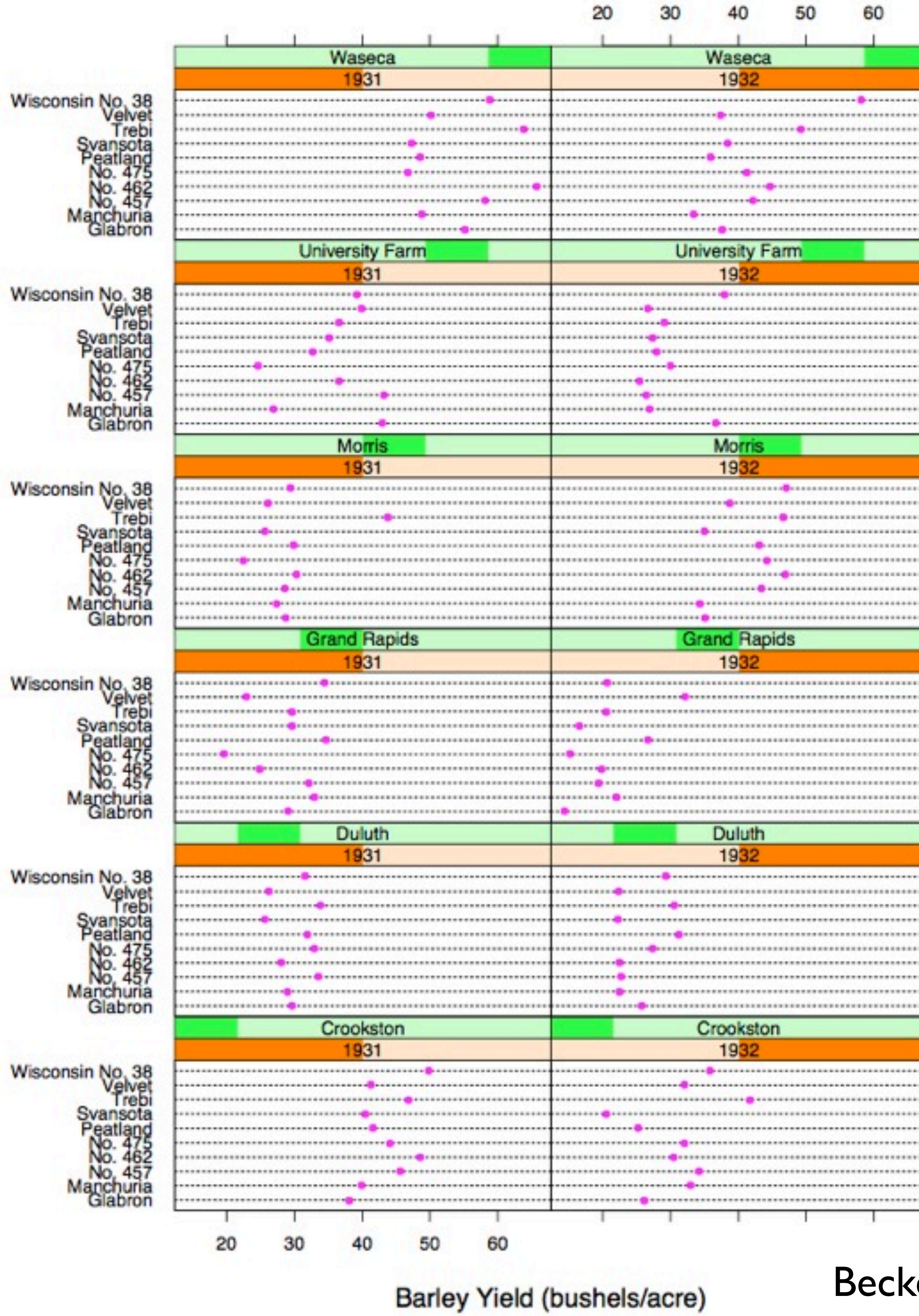
Aidan Slingsby, Jason Dykes and Jo Wood
giCentre, Department of Information Science, City University London
http://www.gicentre.org/hierarchical_layouts/

TRELLIS

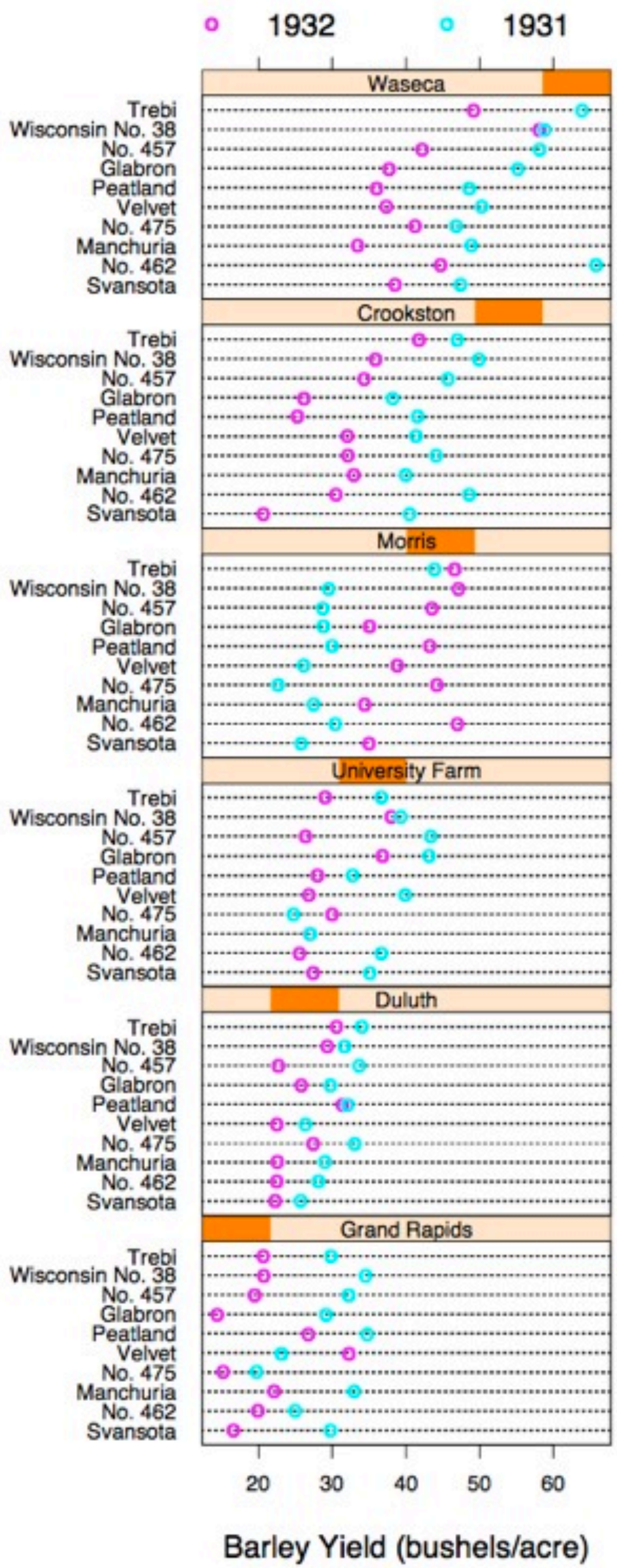
- **panel variables**
  - visual encoding attributes
- **conditioning variables**
  - assign to columns, rows, and pages
- **main-effects ordering**
  - order conditioning variable levels/states based on derived data
  - support perception of trends and structure in data

Becker 1996

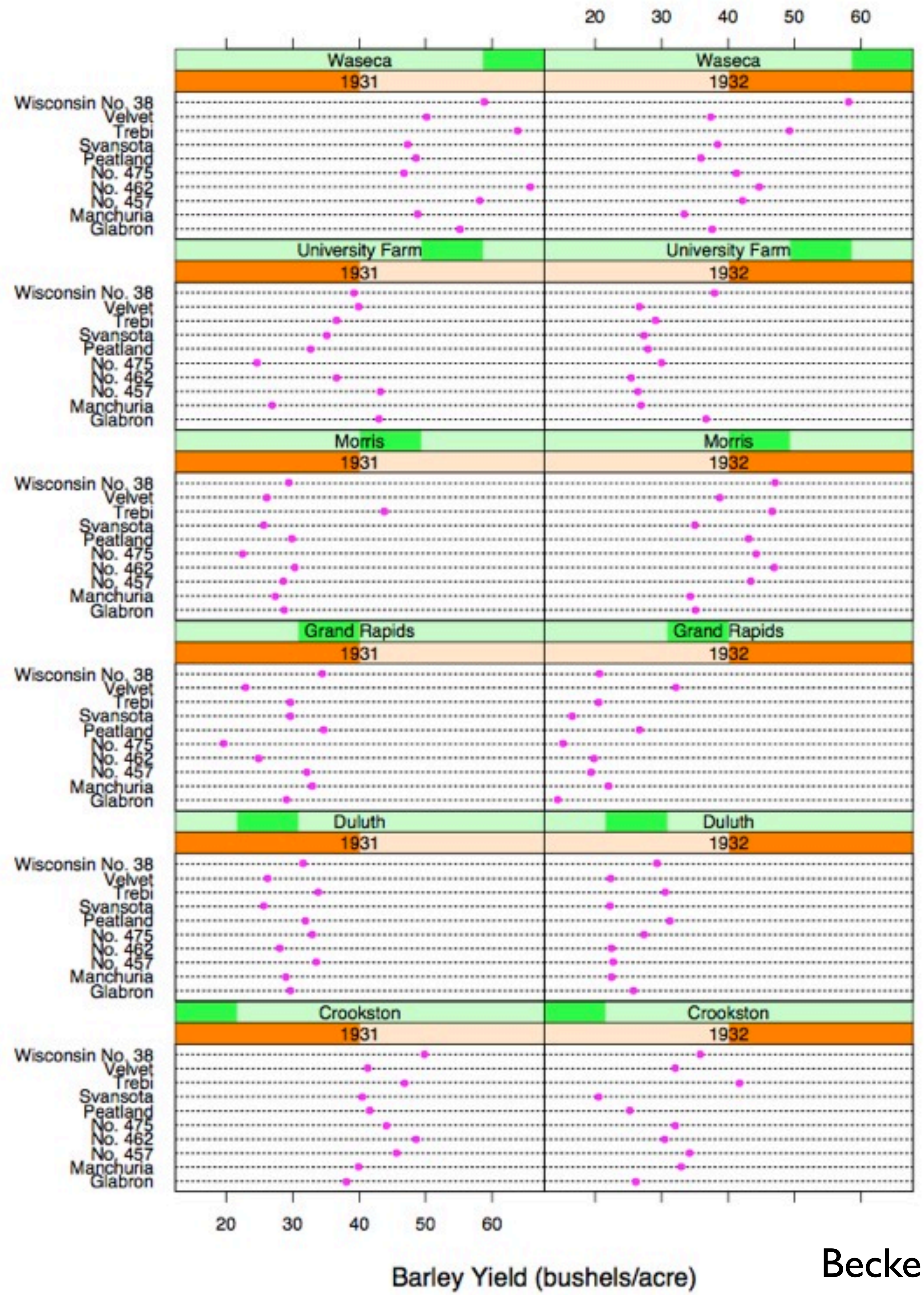
sort by group medians



Becker 1996



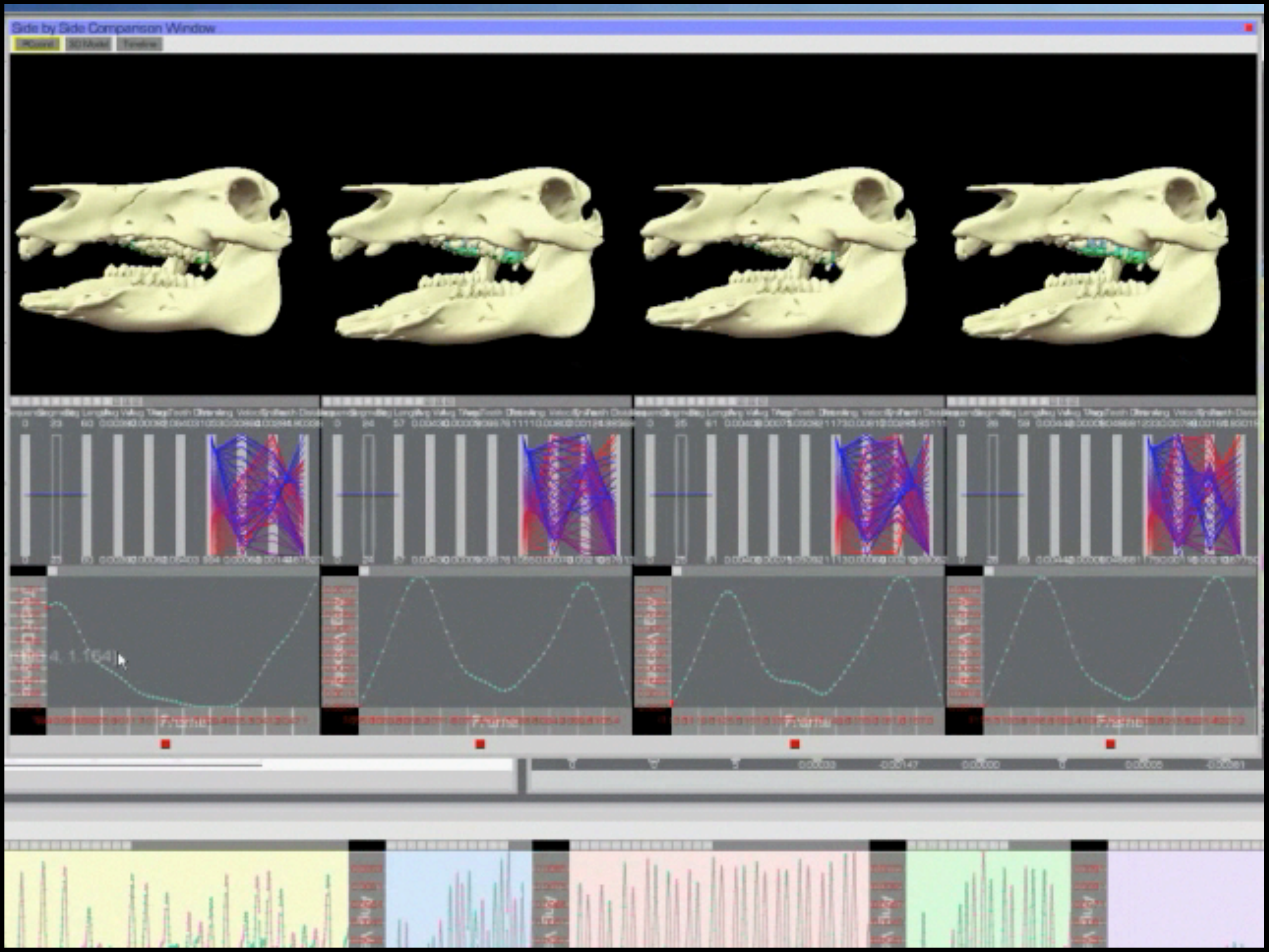
1932
1931
Waseca
Crookston
Morris
University Farm
Duluth
Grand Rapids
Trebi
Wisconsin No. 38
No. 457
Glabron
Peatland
Velvet
No. 475
Manchuria
No. 462
Svansota
Barley Yield (bushels/acre)



Waseca
University Farm
Morris
Grand Rapids
Duluth
Crookston
1931
1932
Wisconsin No. 38
Velvet
Trebi
Svansota
Peatland
No. 475
No. 462
No. 457
Manchuria
Glabron
Barley Yield (bushels/acre)

Becker 1996

critique


Side by Side Comparison Window
Frame
Frame
Frame
Frame

L10: Filtering and Aggregation

REQUIRED READING

7

Item Reduction Methods

The past two chapters that discuss view composition have only minimally addressed the question of whether any particular view shows all available data, or only part of it. Many datasets are so large that trying to show everything simultaneously would lead to incomprehensible clutter. There are two major families of methods for reducing the amount of information shown. This chapter begins the discussion with **item reduction** methods, where the goal is to reduct the number of items that need to be shown. The next chapter continues with methods for reducing the number of data attributes shown.

There are two major methods of item reduction, filtering and aggregation. With filtering, only a subset of the items are shown. Navigation can be thought of as a special case of filtering, where the subset is chosen based on a spatial viewpoint. While unconstrained navigation is easy to implement, constrained navigation can be much easier to use. Zooming in to see fewer items in more detail can be done geometrically, matching the semantics of real-world motion. With semantic zooming, the way to draw items adapts on the fly based on the number of available pixels, so appearance can change dramatically rather than simply shrinking or enlarging.

A Review of Overview+Detail, Zooming, and Focus+Context Interfaces

ANDY COCKBURN[*], AMY KARLSON[†], BENJAMIN B. BEDERSON[†]

There are many interface schemes that allow users to work at, and move between, focused and contextual views of a data set. We review and categorise these schemes according to the interface mechanisms used to separate and blend views. The four approaches are overview+detail, which uses a spatial separation between focused and contextual views; zooming, which uses a temporal separation; focus+context, which minimizes the seam between views by displaying the focus within the context; and cue-based techniques which selectively highlight or suppress items within the information space. Critical features of these categories, and empirical evidence of their success, are discussed. The aim is to provide a succinct summary of the state-of-the-art, to illuminate successful and unsuccessful interface strategies, and to identify potentially fruitful areas for further work.

Categories and Subject Descriptors: D.2.2 Design Tools and Techniques–*User Interfaces;* H.5.2 User Interfaces–*Graphical User Interfaces (GUI)*
General Terms: Human Factors
Additional Key Words and Phrases: Information display, information visualization, focus+context, overview+detail, zoomable user interfaces, fisheye views, review paper.

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1. INTRODUCTION

In most computer applications, users need to interact with more information and with more interface components than can be conveniently displayed at one time on a single screen. This need is dictated by pragmatic, technological, and human factors. The pragmatic issues concern form-factors such as the size, weight, and fashion of displays that are used for varied tasks in diverse locations, as well as the cost of construction. Technological limitations constrain the ability of displays to match the breadth and acuity