CSC420

Showing Complex Data

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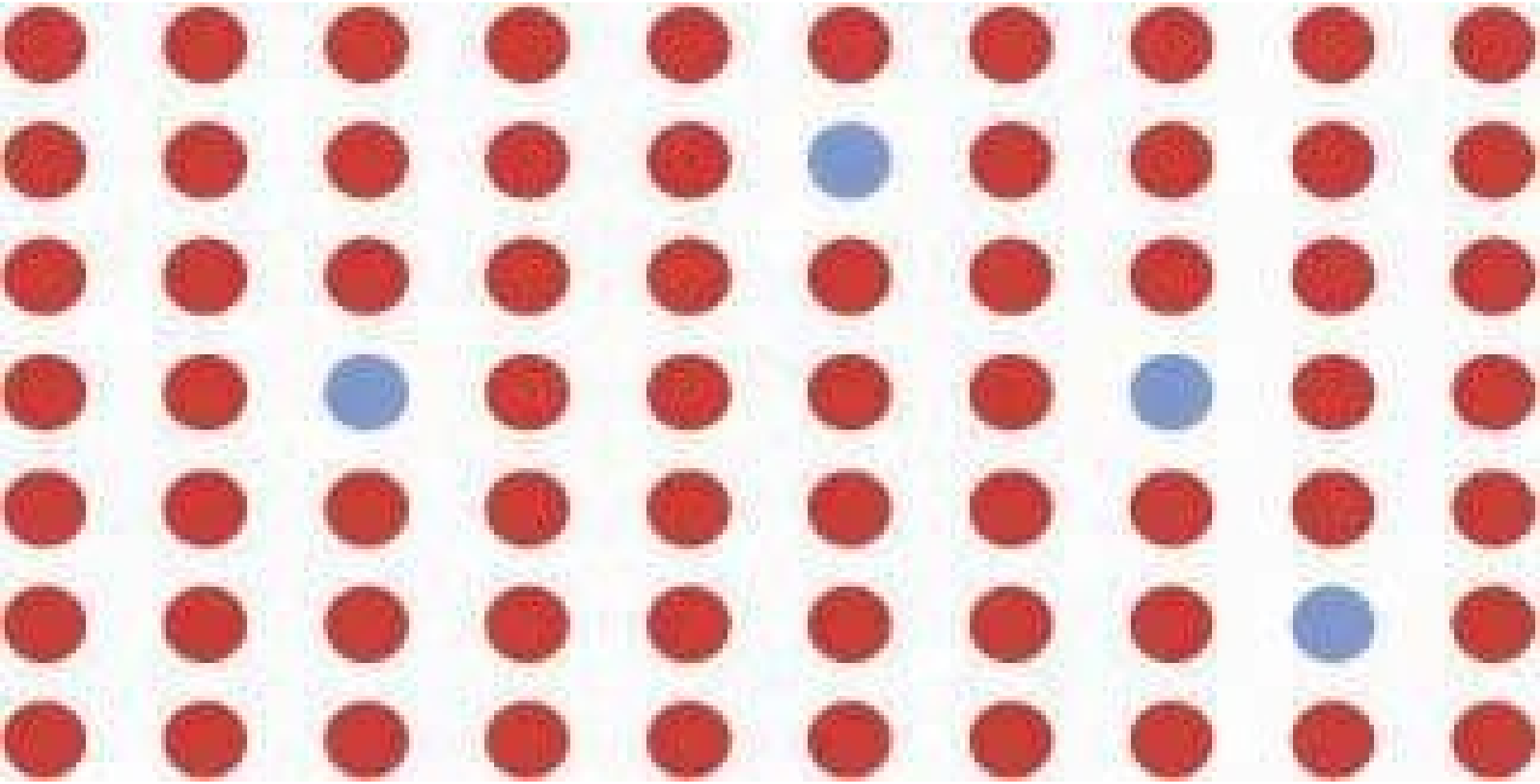
Basic User Questions

- How is this data organized?
- What's related to what?
- How can I explore this data?
- Can I rearrange this data to see it differently?
- Show me only what I need to know.
- What are the specific data values?

Data Organization

- Linear: List or single-variable plot
- Tabular: Spreadsheet, multi-column list, Sortable Table, Multi-Y Plot, or other multi-variable plots
- Hierarchical: Tree, Cascaded Lists, Tree Table, Treemap
- Network: Directed graph or flowchart
- Geographical/spatial: Map or schematic
- Other: Plots of various sorts, such as parallel coordinate plots, or Treemaps

What's Related to What?



And Again

0.103	0.176	0.387	0.300	0.379	0.276	0.179	0.321	0.192	0.250
0.333	0.384	0.564	0.587	0.857	1.064	0.698	0.621	0.232	0.316
0.421	0.309	0.654	0.729	0.228	0.529	0.832	0.935	0.452	0.426
0.266	0.750	1.056	0.936	0.911	0.820	0.723	1.201	0.935	0.819
0.225	0.326	0.643	0.337	0.721	0.837	0.682	0.987	0.984	0.849
0.187	0.586	0.529	0.340	0.829	0.835	0.873	0.945	1.103	0.710
0.153	0.485	0.560	0.428	0.628	0.335	0.956	0.879	0.699	0.424

How about now?

0.103	0.176	0.387	0.300	0.379	0.276	0.179	0.321	0.192	0.250
0.333	0.384	0.564	0.587	0.857	1.064	0.698	0.621	0.232	0.316
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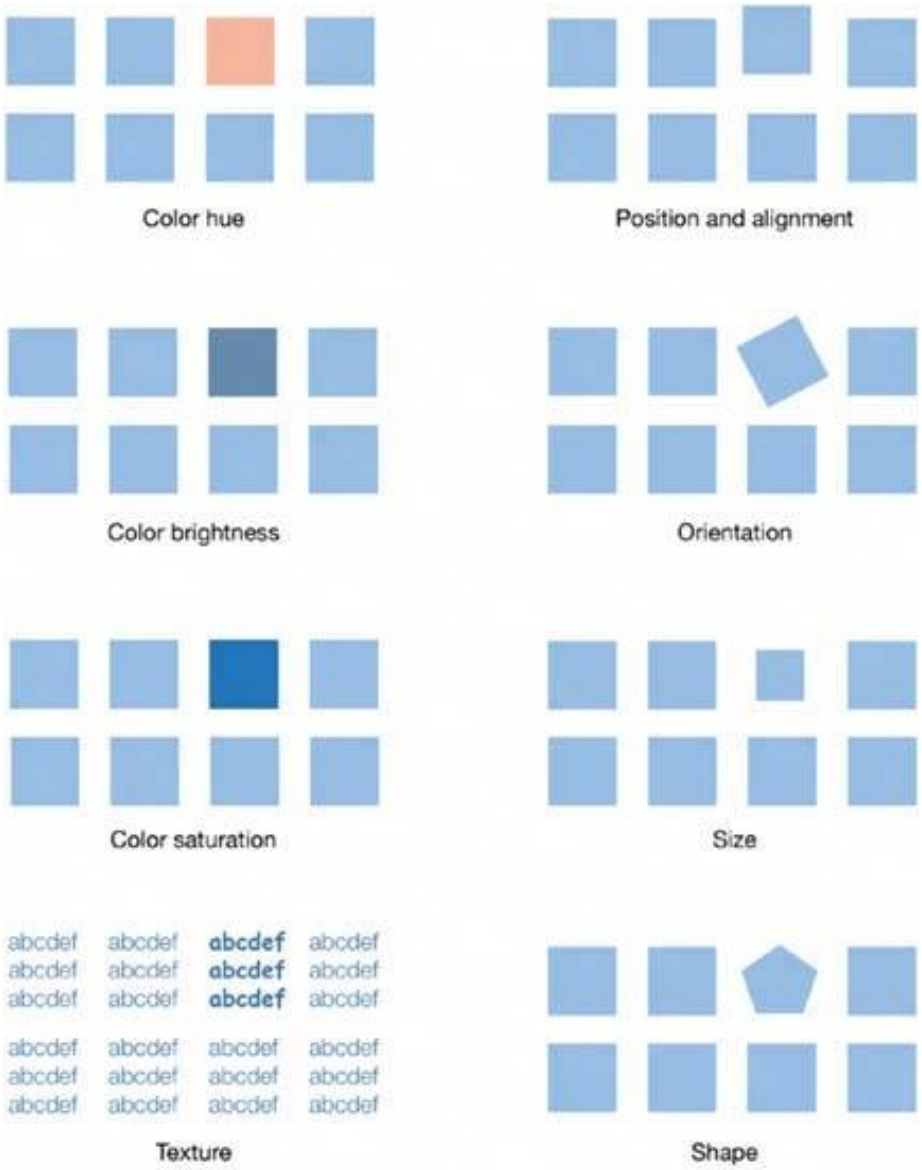
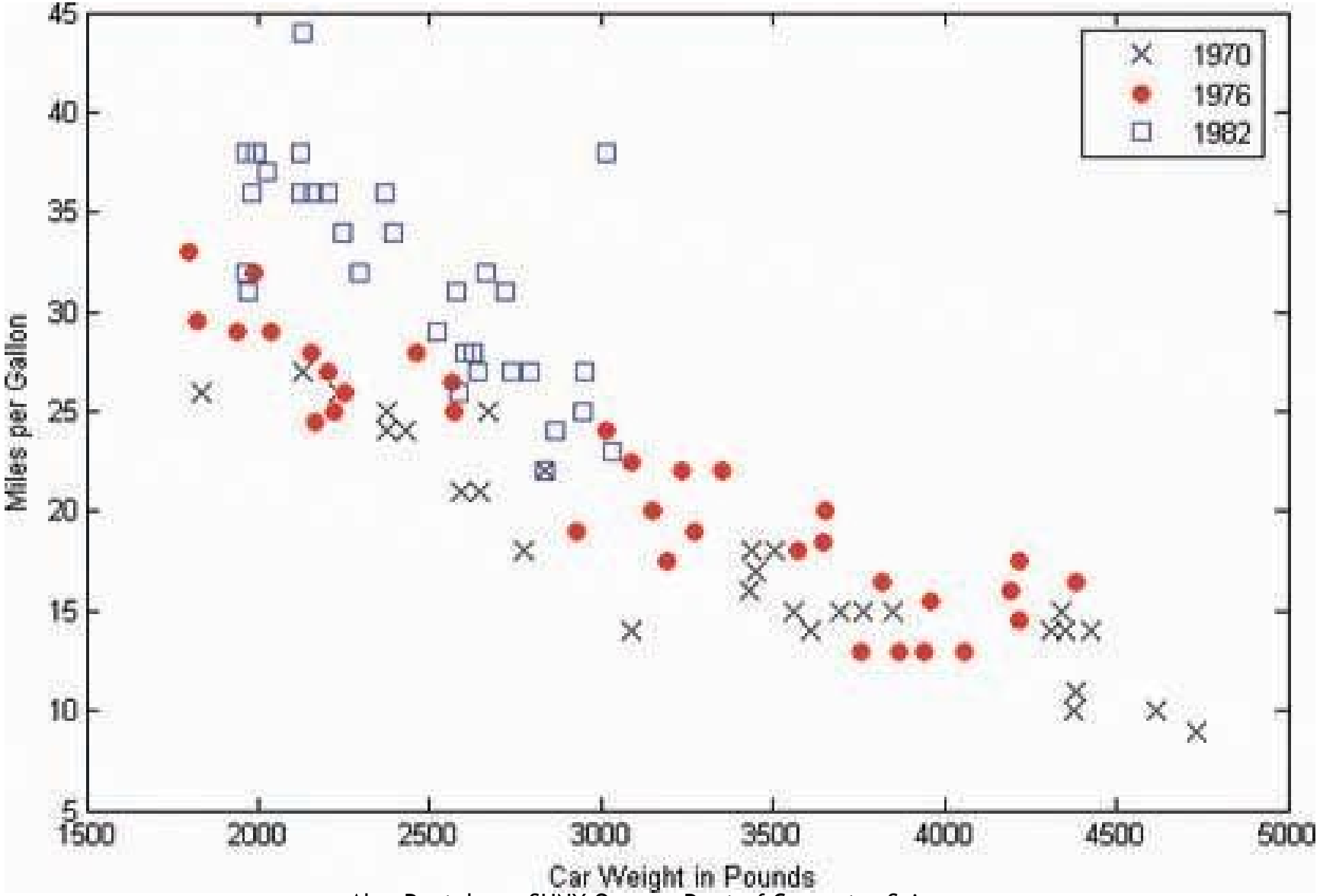
Preattentive Variables



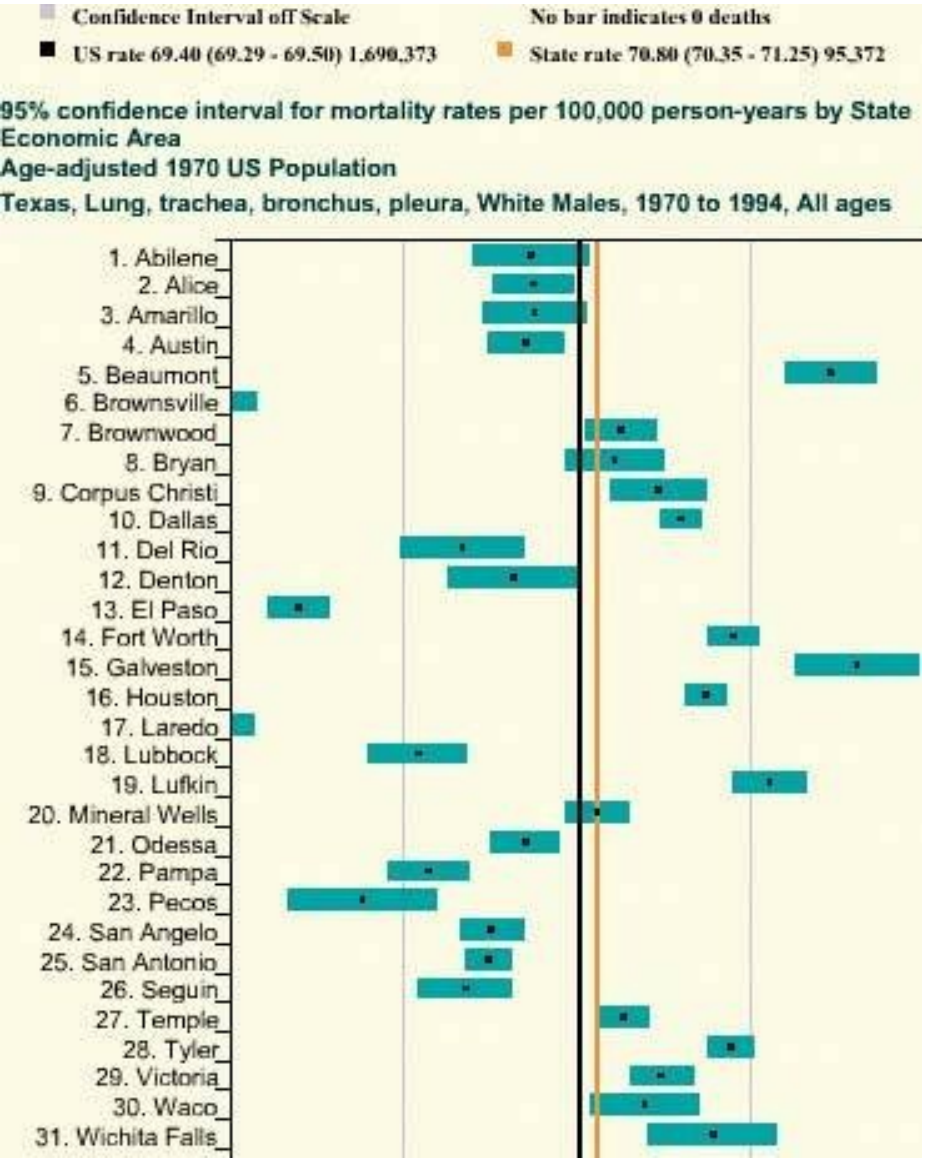
Example

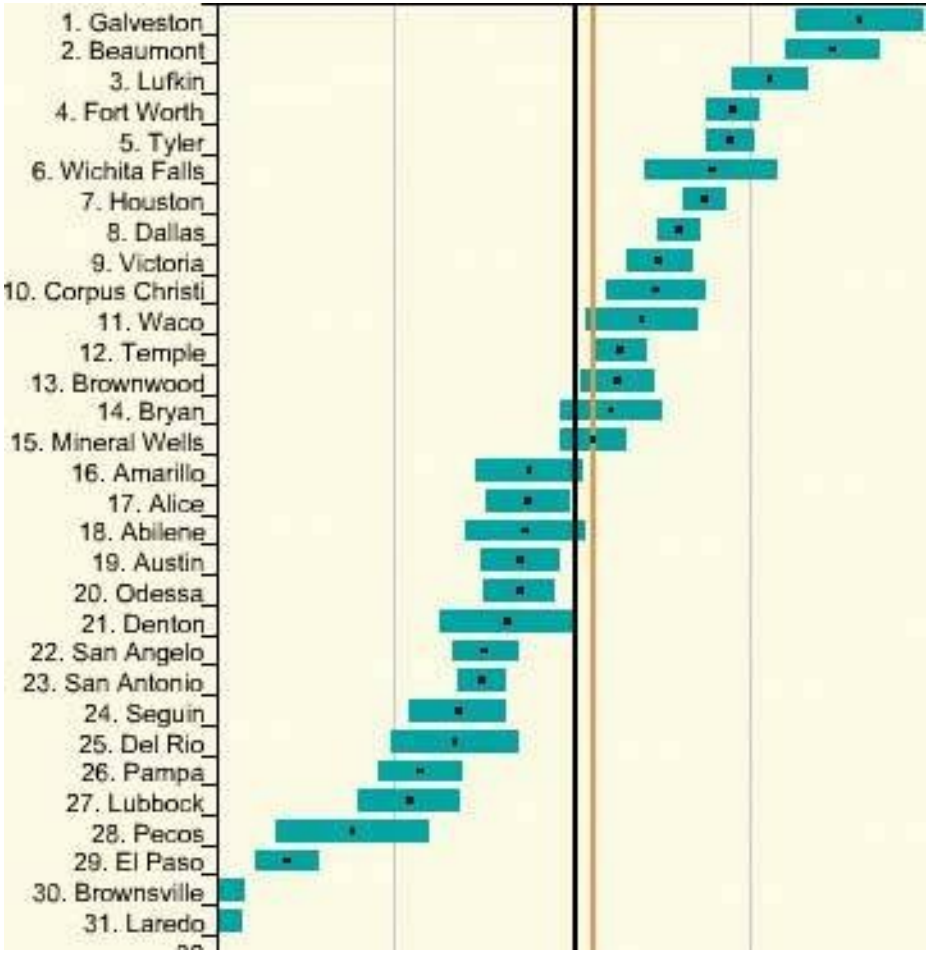

1970
1976
1982
Miles per Gallon
Car Weight in Pounds
45
40
35
30
25
20
15
10
5
1500
2000
2500
3000
3500
4000
4500
5000

Navigation and Browsing

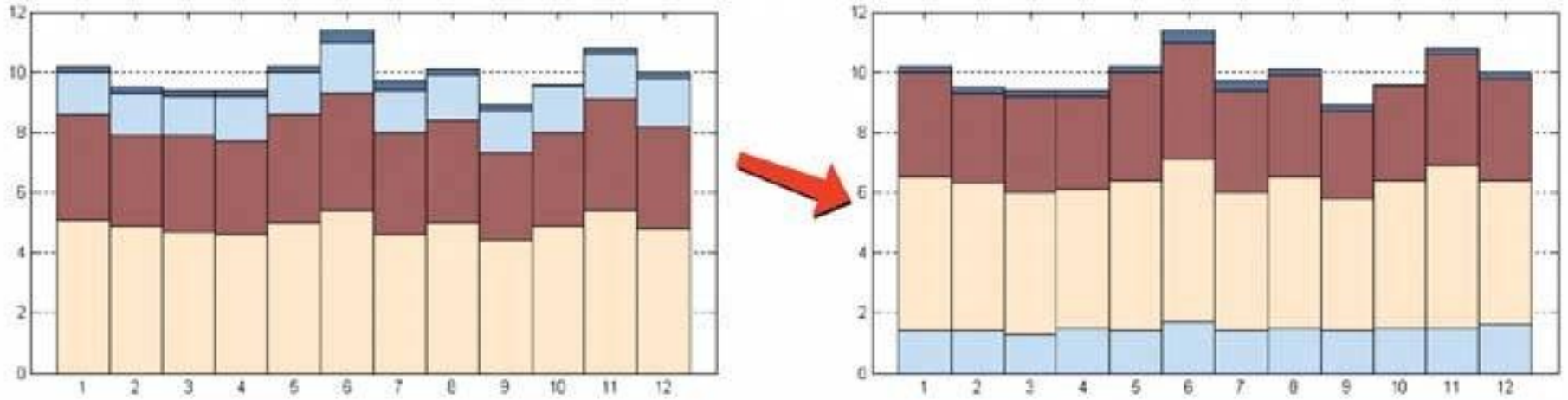
- Scroll and pan: interactively move the visible part of the graphic
- Zoom: change the scale
- Open and close points of interest
- Drill down into points of interest (open + zoom in)

Sorting and Rearrangement

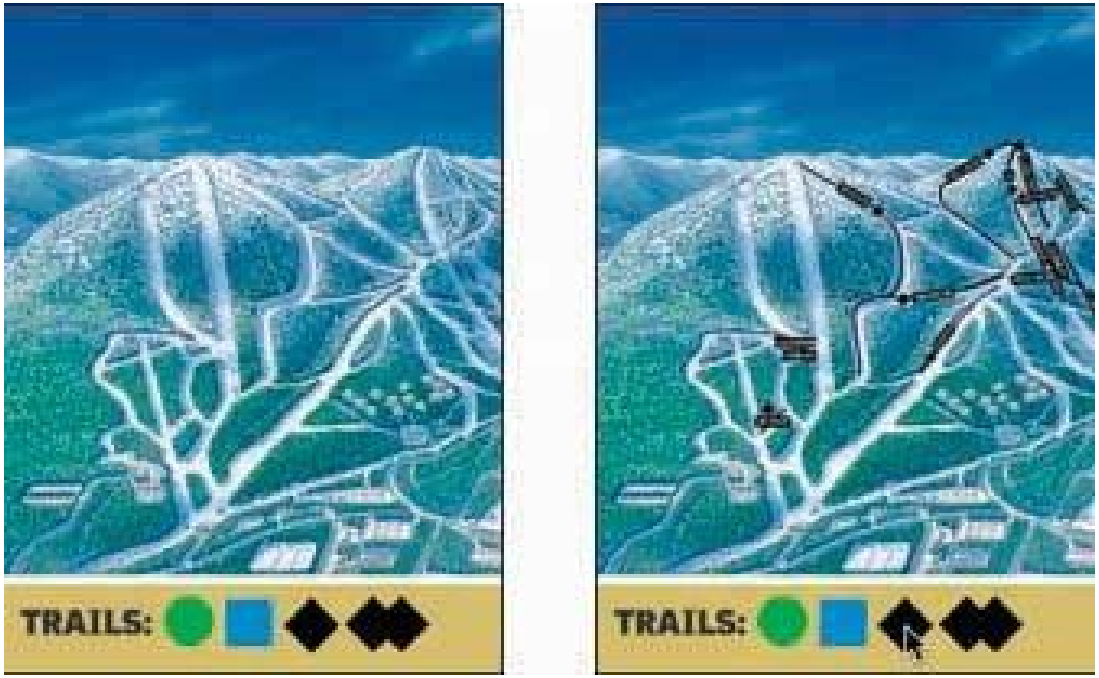




Sorting and Rearrangement



Searching and Filtering: Show me only what I need to know



- Interactive: respond as quickly as possible
- Iterative: let a user define the search/filter
- Contextual: show results with surrounding data (keyword embedded in a sentence)

Actual Data: Show the Values

- Labels: directly on the graphic (town names on a map)
- Legends: show the user what represents what
- Axes, rulers, scales, timelines: tell the user the relationship between values and position
  - Less precise, also less clutter
- Datatips: tooltips that show data values
- Data brushing: select a subset of the data, put it in another context (another graphic)
  - e.g., select outliers in a scatter plot -> color the values in a spreadsheet

Patterns

- Overview plus detail
- Datatips
- Dynamic Queries
- Data brushing
- Local zooming
- Row striping
- Sortable table
- Jump to item
- New-item row
- Cascading lists
- Tree table
- Multi-Y graph
- Small multiples
- Treemap

Overview Plus Detail

- Place an overview next to a zoomed-in detail view
- Micro and macro readings: users can scroll, compare, move at their own pace through the interface
- One of the best ways to deal with visual complexity
- “You are here” sign

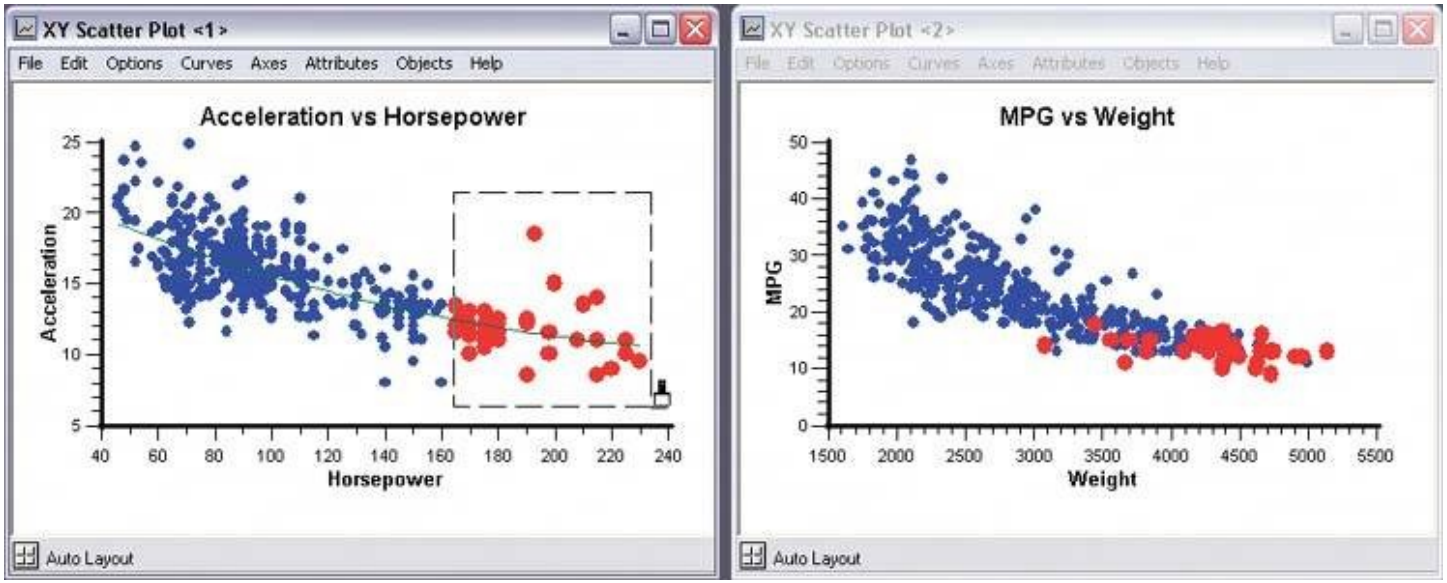
Datatips

- Solving complexity: present the overview, put details in tooltips
- Put the detail where the attention is (mouse)
- Inside the tooltip, you can afford to format densely
- Make the tooltip as small as possible, obscuring as little as possible

Dynamic Queries

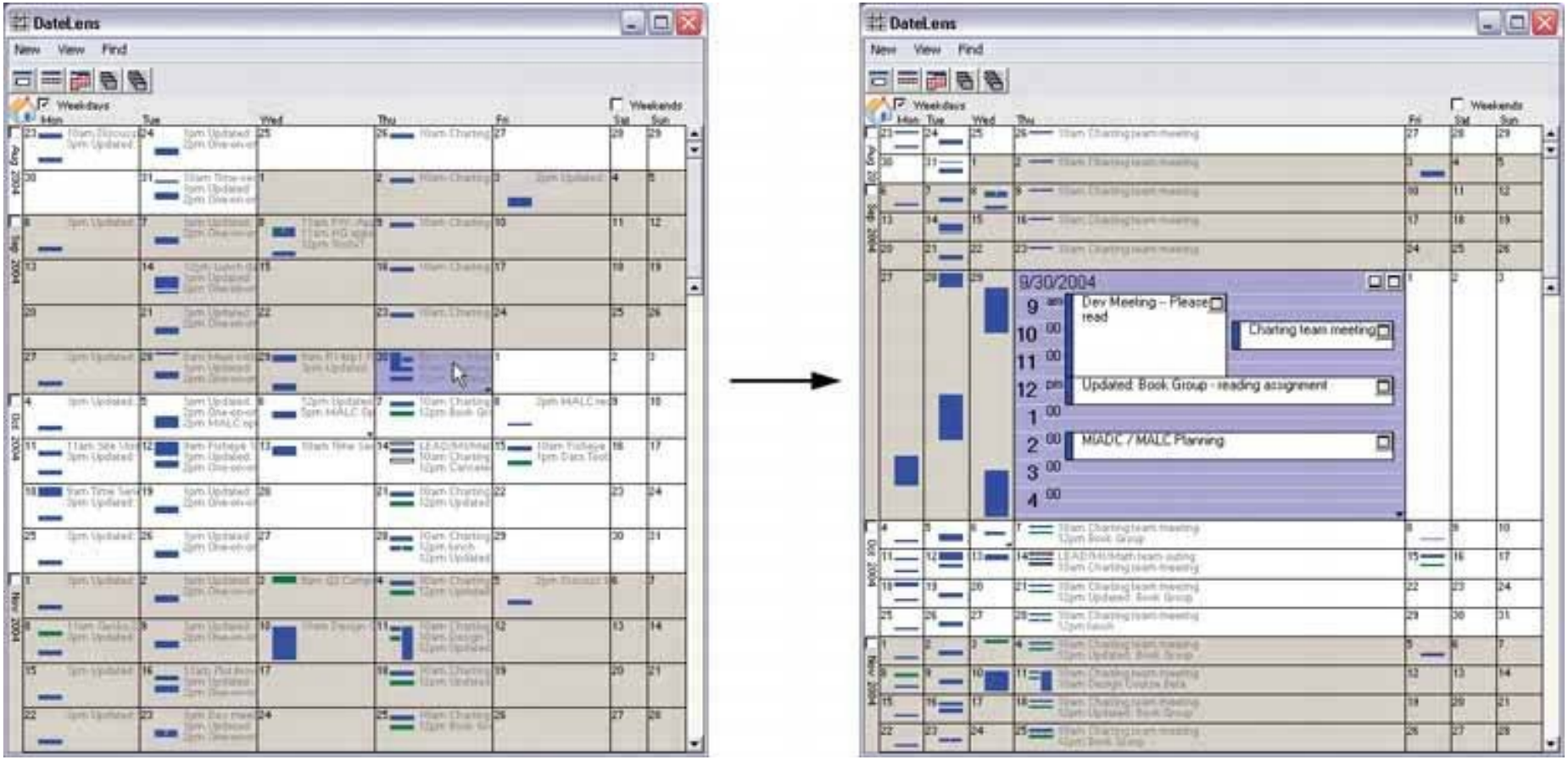
- Provide ways to filter the data set immediately and interactively
- Use for large datasets, with predictable interesting parameters
- Controls: single/double sliders, radio buttons...
- Can also directly manipulate display data
  - Drawback: depends on spatial rendering of data

Data Brushing



- Let the user select data items in one view; show the same data selected simultaneously in another view
- Use for multivariate data
- Helps users gain insight
- Coordinated/linked views (larger pattern)

Local Zooming



Row Striping

Here are the top women finishers in the 2004 Boston Marathon.

1	Catherine Ndereba	31	Kenya	2:24:27
2	Elfenesh Alemu	28	Ethiopia	2:24:43
3	Olivera Jevtic	26	Serbia and Montenegro	2:27:34
4	Jelena Prokopcuka	27	Latvia	2:30:16
5	Nuta Olaru	33	Romania	2:30:44
6	Lyubov Denisova	32	Russian Federation	2:31:17
7	Malgorzata Sobanska	34	Poland	2:32:23
8	Victoria Klimina	28	Russian Federation	2:33:20
9	Ramilia Burangulova	42	Russian Federation	2:34:08
10	Ai Yamamoto	25	Japan	2:34:32
11	Rika Tabashi	22	Japan	2:41:41
12	Jessica Rodriguez Galvan	27	Mexico	2:50:57
13	Andrea Niggemeier	34	Germany	2:50:59
14	Greta Varchi	31	Italy	2:54:15
15	Yumiko Une	32	Japan	2:54:59
16	Julie S. Spencer	27	Baraboo, WI	2:56:39
17	Angela M. Batsford	23	Canada	2:57:06
18	Mary Ann Protz	47	St. Petersburg, FL	2:57:58
19	Kim A. Donaldson	42	St. Petersburg, FL	2:58:15
20	Lee Di Pietro	46	Ruxton, MD	2:58:59
21	Tracy Fischer	35	Jamul, CA	2:59:36
22	Stephanie Hodge	38	Canada	3:00:00
23	Simonetta Piergentili	39	Woburn, MA	3:01:00

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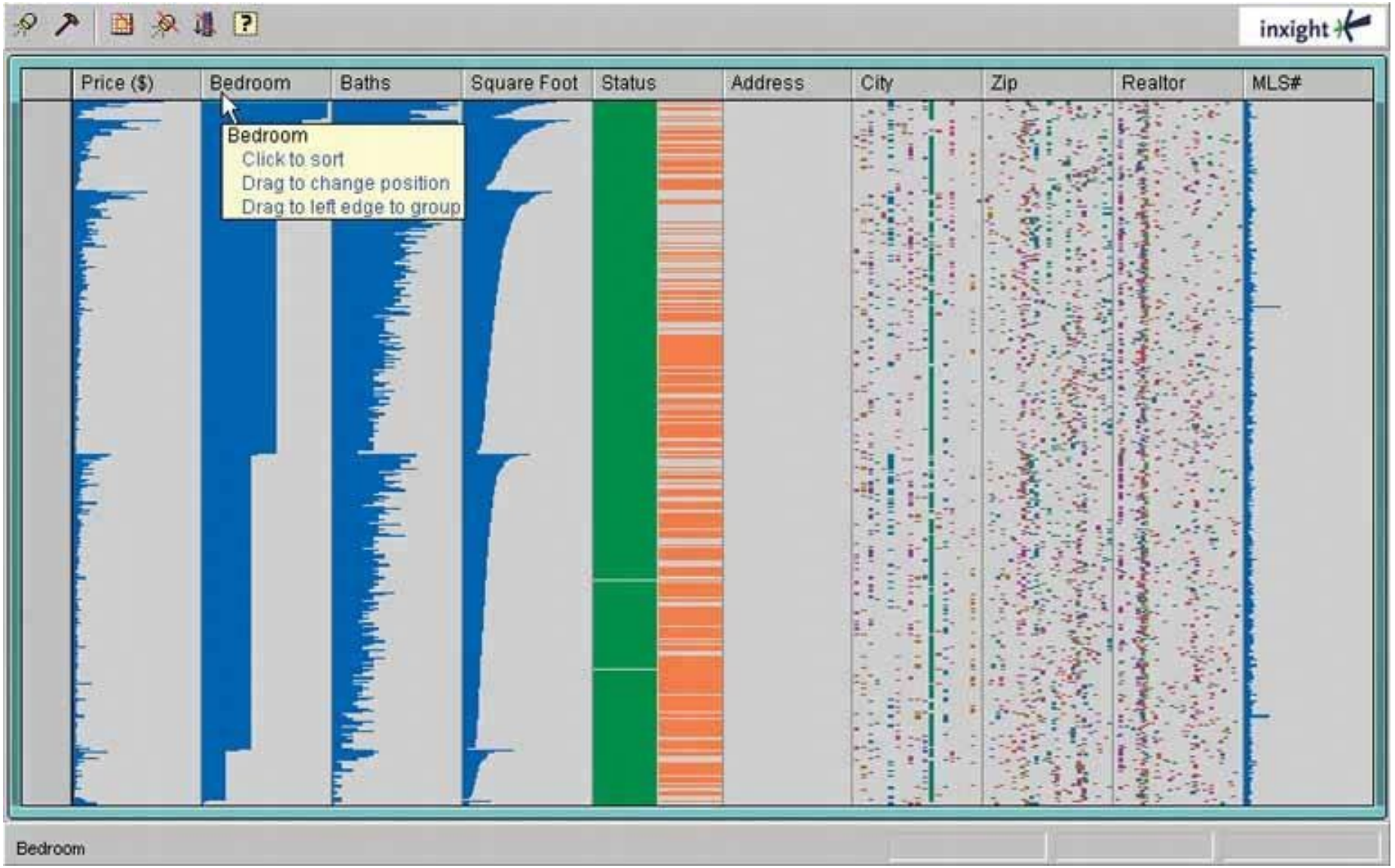
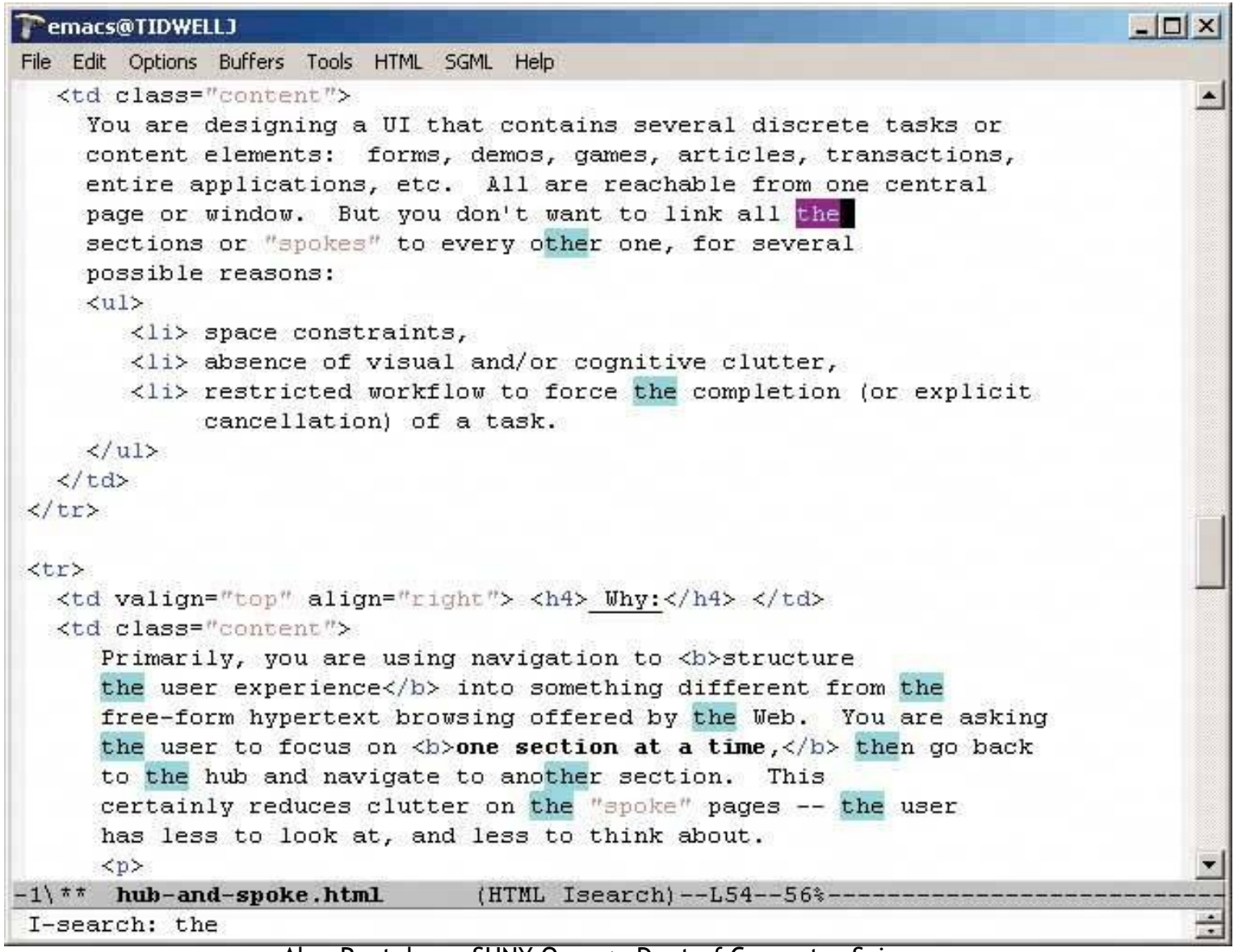
Sortable Table



Jump to Item / Continuous Filter

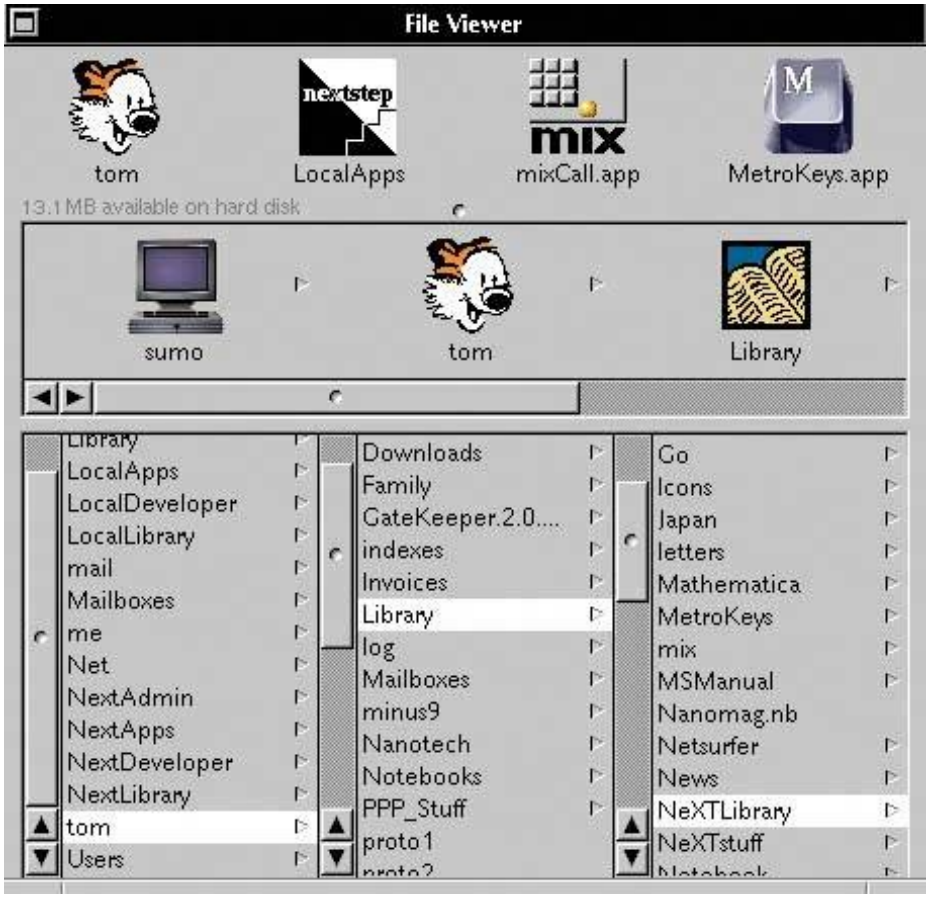


New-Item Row

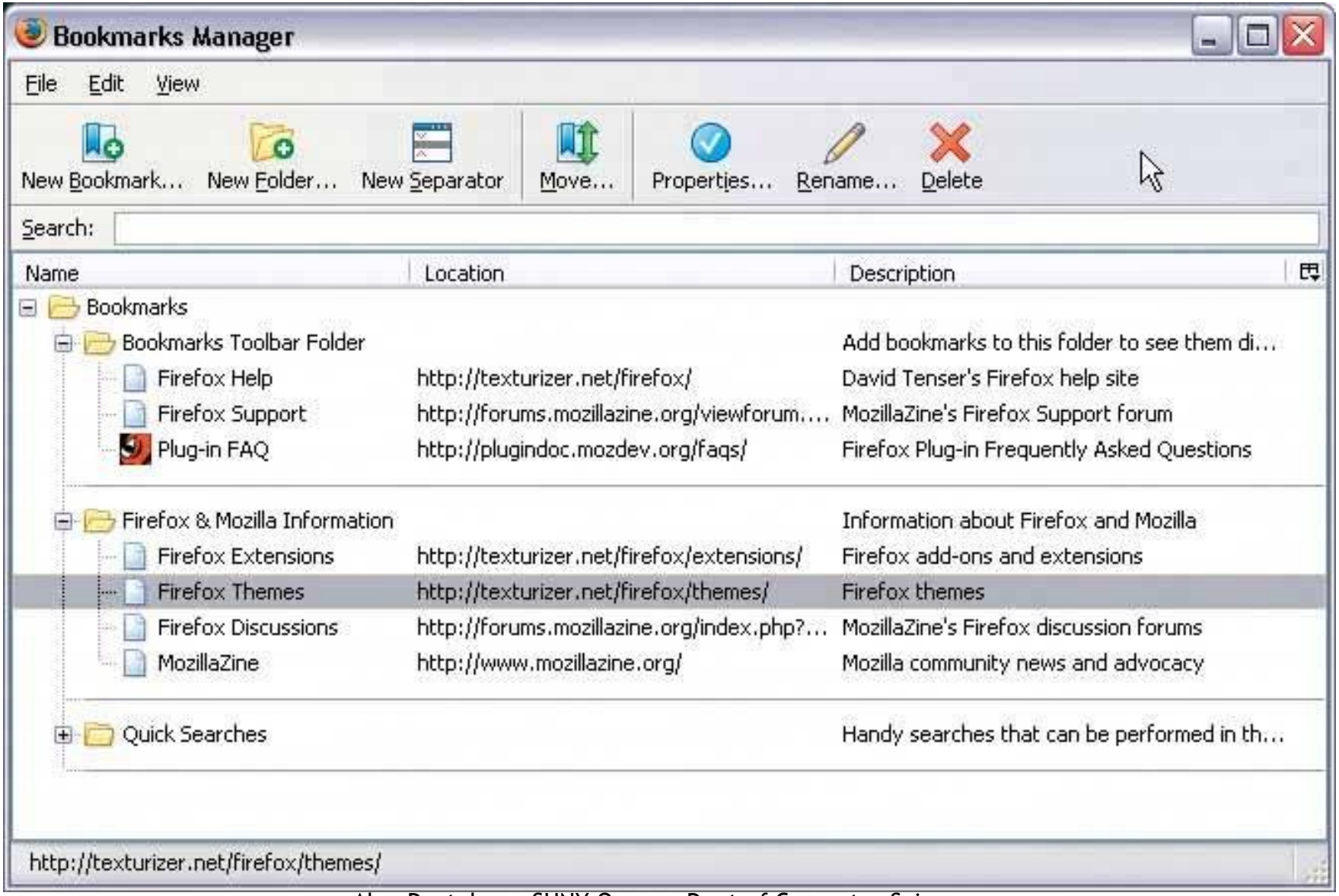
- Use the last row in the table to create a new item in place
- Use for interfaces with vertical lists
- Conceptually coherent
- Avoids opening another UI for item creation
- Uses less screen, reduces navigation, is less work

Cascading Lists

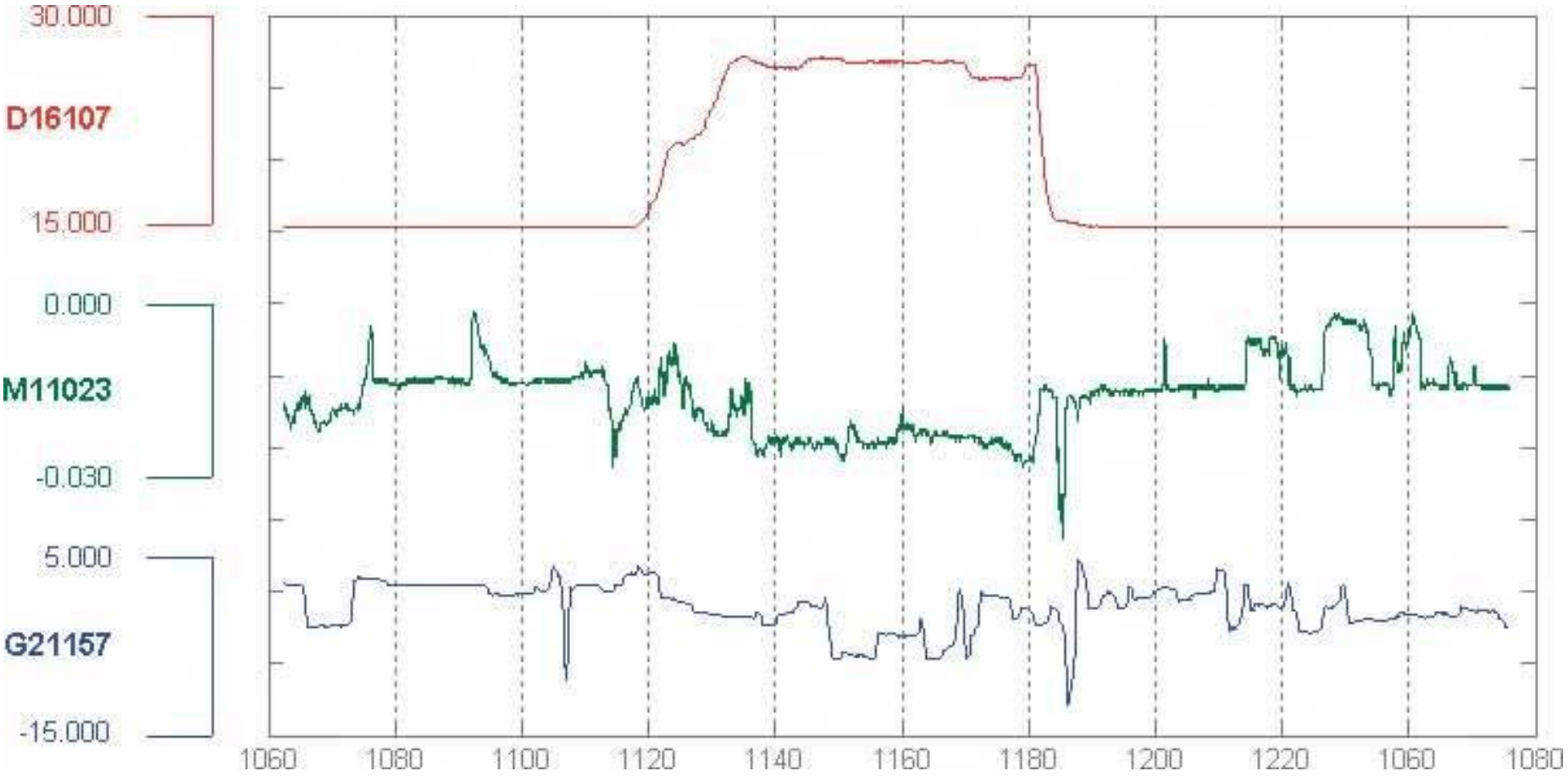
- Hierarchy: show lists for each level
- Selecting an item shows children at next level
- Use for broad shallow trees (otherwise, use tree outline)
- Shows more of the hierarchy at once
- Organizes it visually



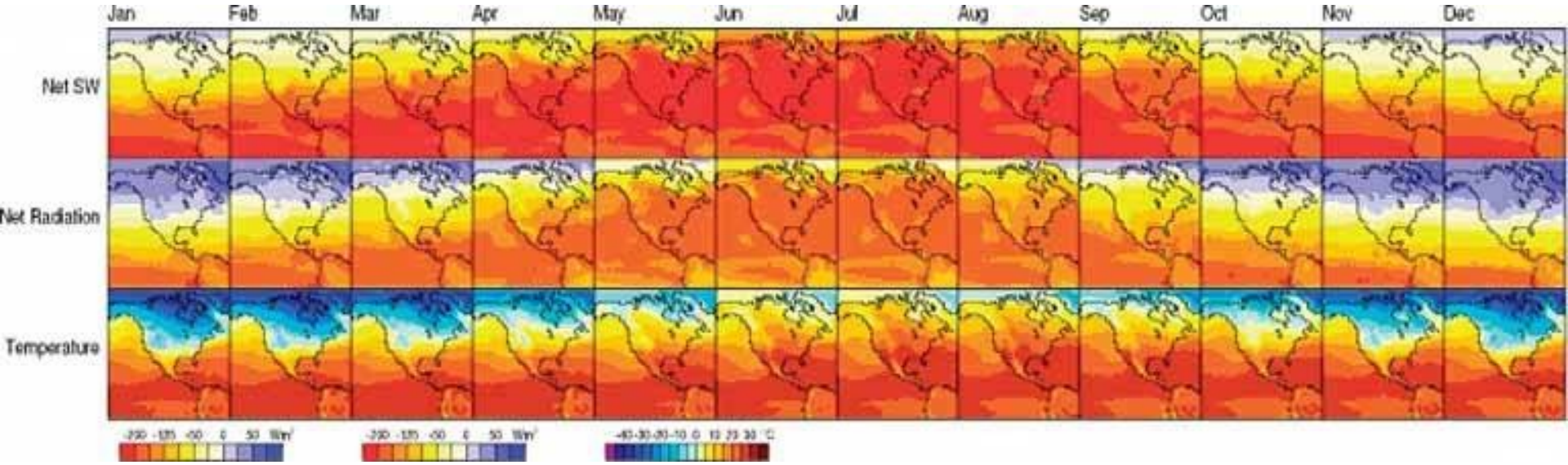
Tree Table


Bookmarks Manager
File Edit View
New Bookmark... New Folder... New Separator Move... Properties... Rename... Delete
Search:
Name Location Description
Bookmarks
Bookmarks Toolbar Folder Add bookmarks to this folder to see them di...
Firefox Help http://texturizer.net/firefox/ David Tenser's Firefox help site
Firefox Support http://forums.mozillazine.org/viewforum.... MozillaZine's Firefox Support forum
Plug-in FAQ http://plugindoc.mozdev.org/faqs/ Firefox Plug-in Frequently Asked Questions
Firefox & Mozilla Information Information about Firefox and Mozilla
Firefox Extensions http://texturizer.net/firefox/extensions/ Firefox add-ons and extensions
Firefox Themes http://texturizer.net/firefox/themes/ Firefox themes
Firefox Discussions http://forums.mozillazine.org/index.php?... MozillaZine's Firefox discussion forums
MozillaZine http://www.mozillazine.org/ Mozilla community news and advocacy
Quick Searches Handy searches that can be performed in th...
http://texturizer.net/firefox/themes/

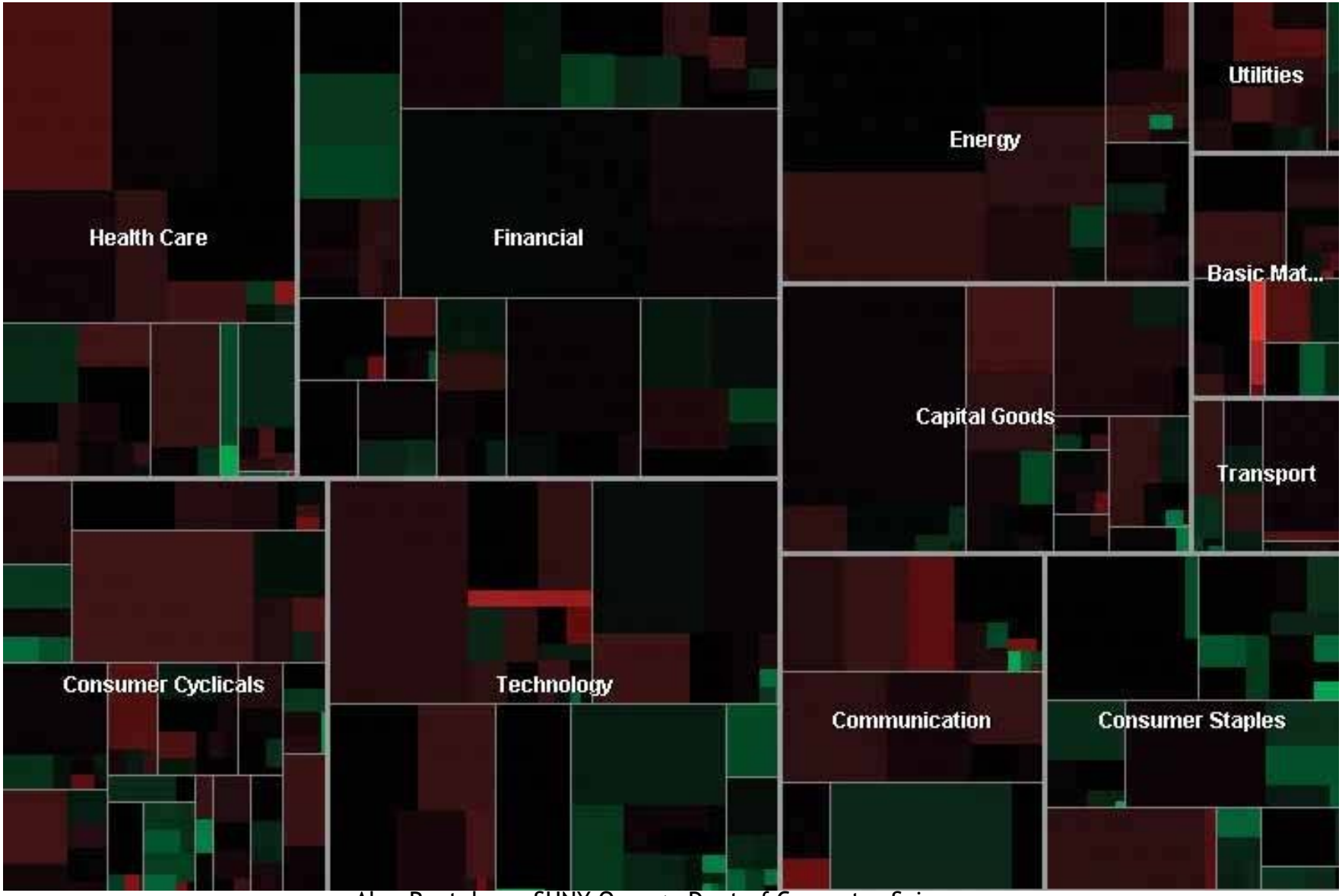
Multi-Y Graph



Small Multiples



Treemap


Health Care
Financial
Energy
Utilities
Basic Mat...
Capital Goods
Transport
Consumer Cyclicals
Technology
Communication
Consumer Staples