Navigation and Overview

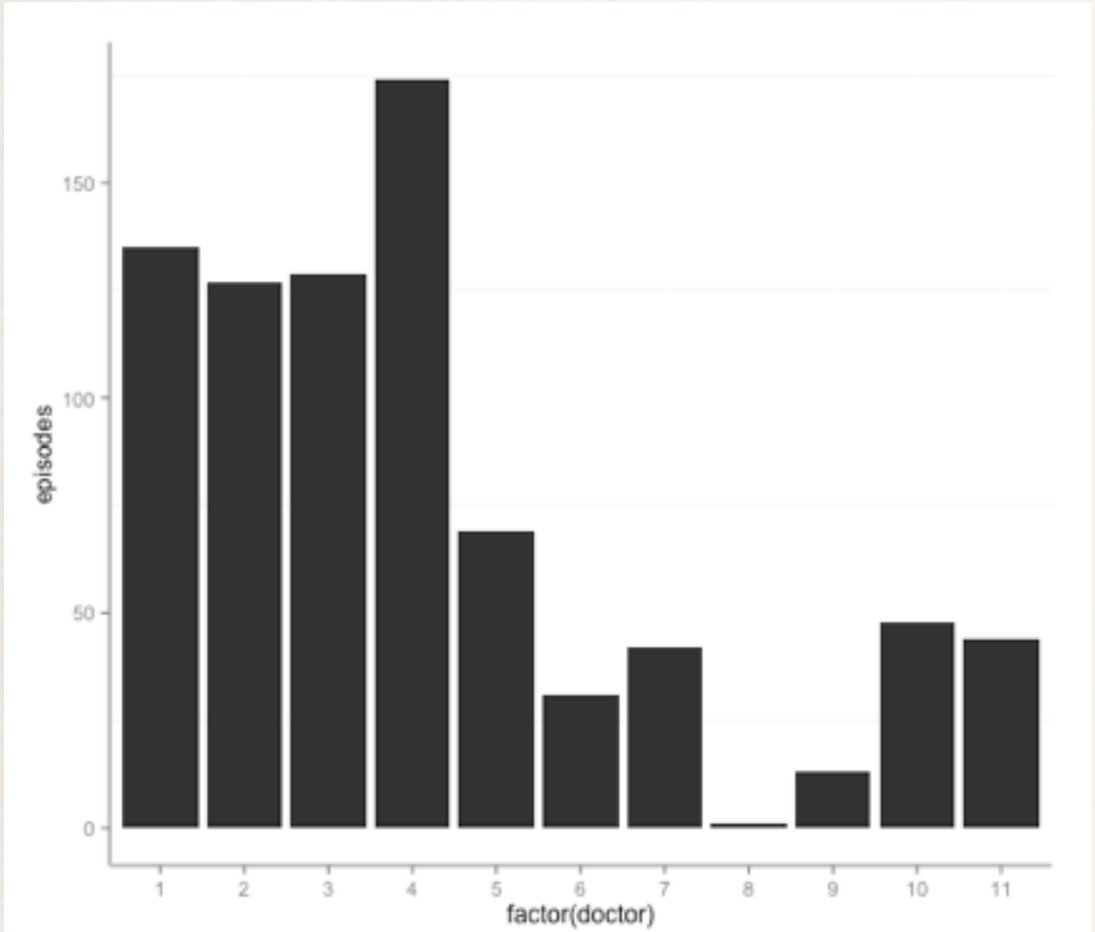
C. Andrews

2014-03-20

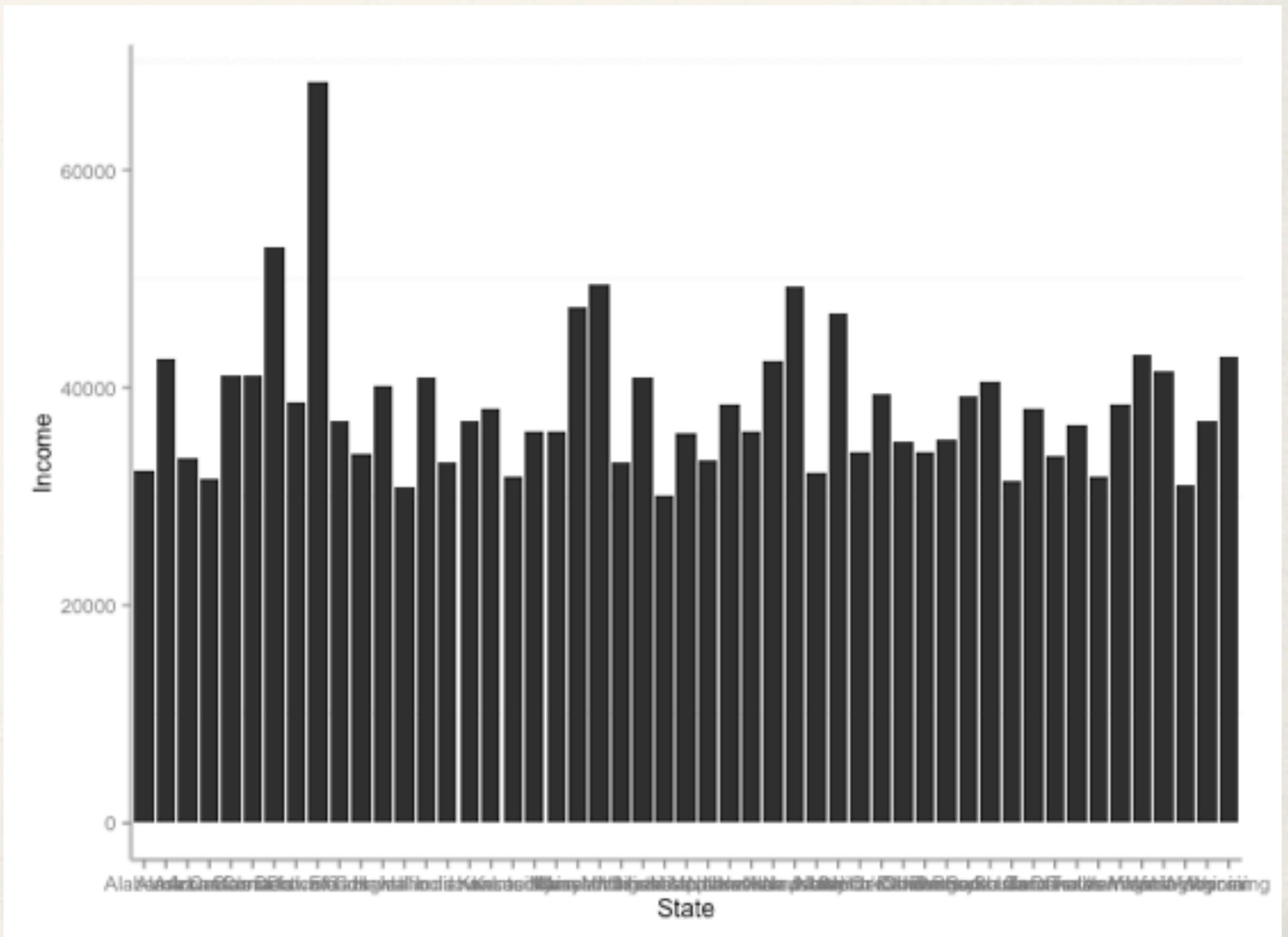
Schneiderman's Mantra

Overview first,
zoom and filter,
details on demand

Data scalability

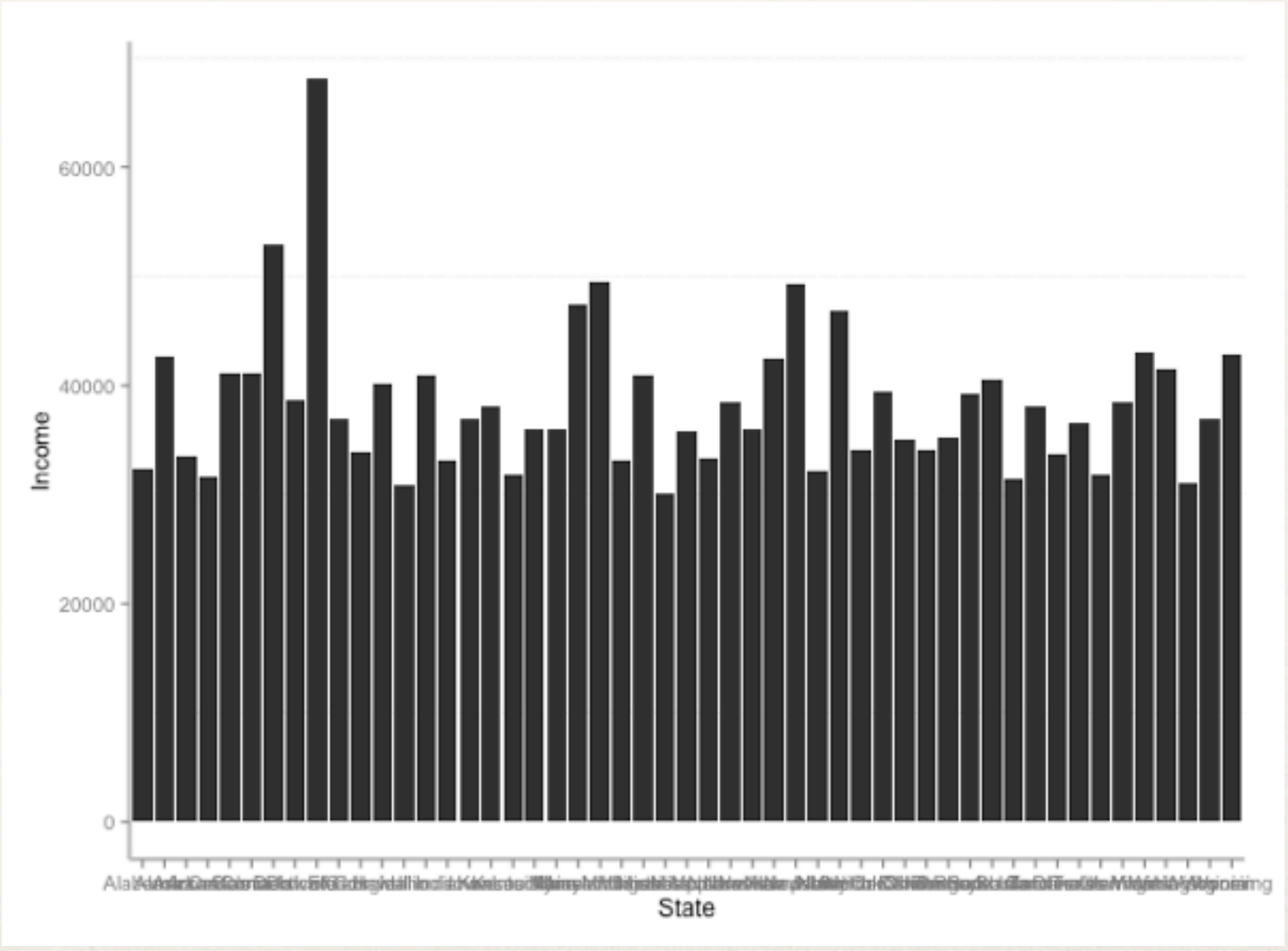


There is always more data



Solution 1: pixel space

Keep squishing those representations



Solution 1: pixel space

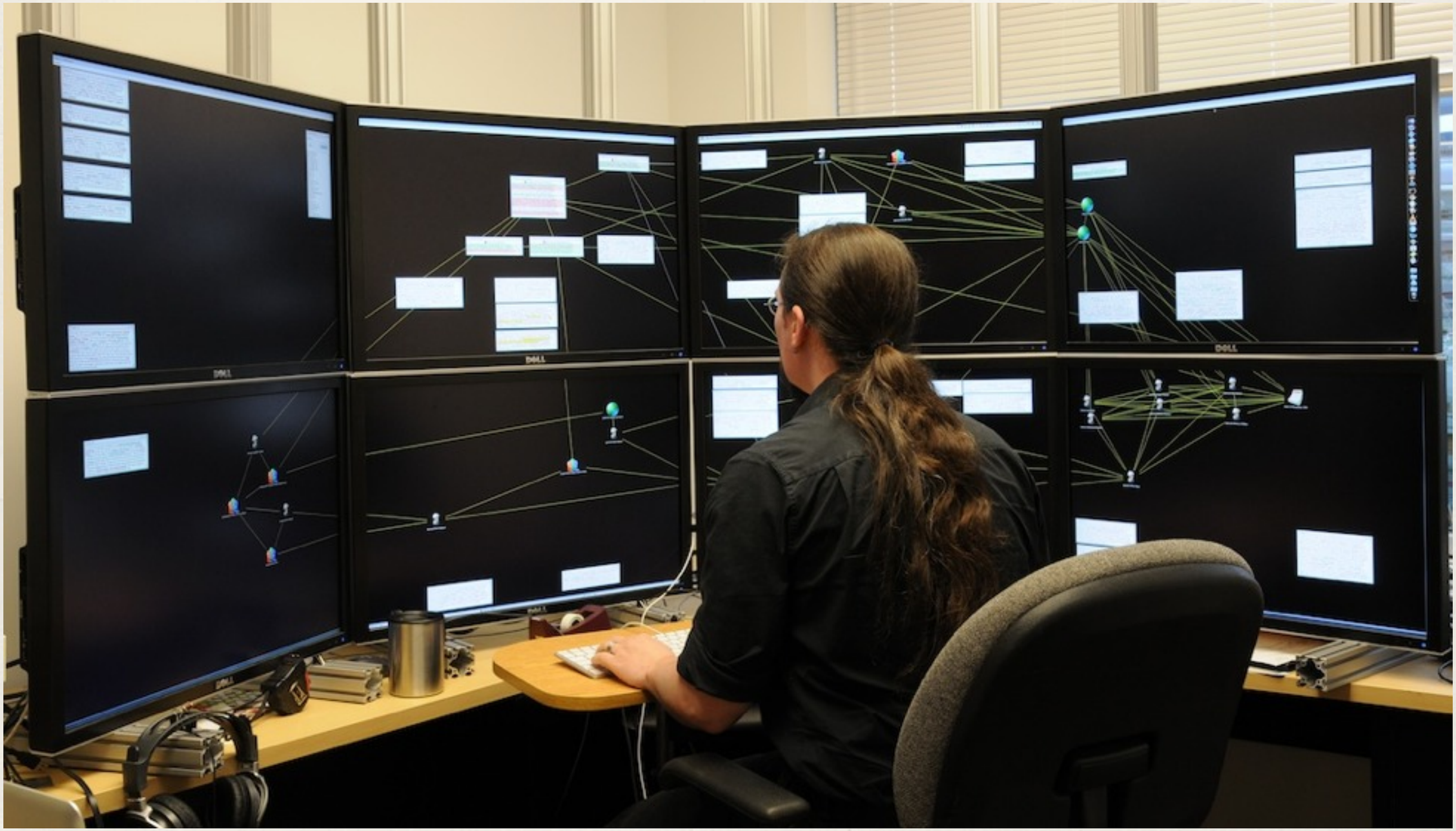
Solution 1: pixel space


File Statistics View Options Help
file1.c
file2.c
file3.c
file4.c
file7.c
file8.c
file9.c
file10.c
file11.c
file12.c
file14.c
file15.c
file16.c
file17.c
file18.c
file19.c
file20.c
file21.c
file22.c
file23.c
file24.c
file25.c
file26.c
file27.c
file28.c
file29.c
file30.c
file31.c
file32.c
file33.c
file34.c
file35.c
file36.c
file37.c
file38.c
file39.c
file40.c
file41.c
file42.c
file43.c
file44.c
file45.c
file46.c
file47.c
file48.c
file49.c
file50.c
file51.c
file52.c
/file1.c, line 408 of 834
if (IS_GET_DAT (pcbla1_ptr))
{
/* Get DSL Information */
/* the macro call IS_GET_DAT has ju
* the DPB for us, how lucky we are!!
*/
dslinfo.dsl = dpb_ptr->port;
/* Use RTretval for RTERRASSRT/RTD
RTretval = DBfrdtup(RLDSLEQUIP, &
switch(RTretval) {
case GLSUCCESS:
break;
stats 327/327/327
lines 15255/15255/15255
files 52/52/52

SeeSoft

Solution 1: pixel space

Get bigger screens!



Solution 2: data space / attribute space

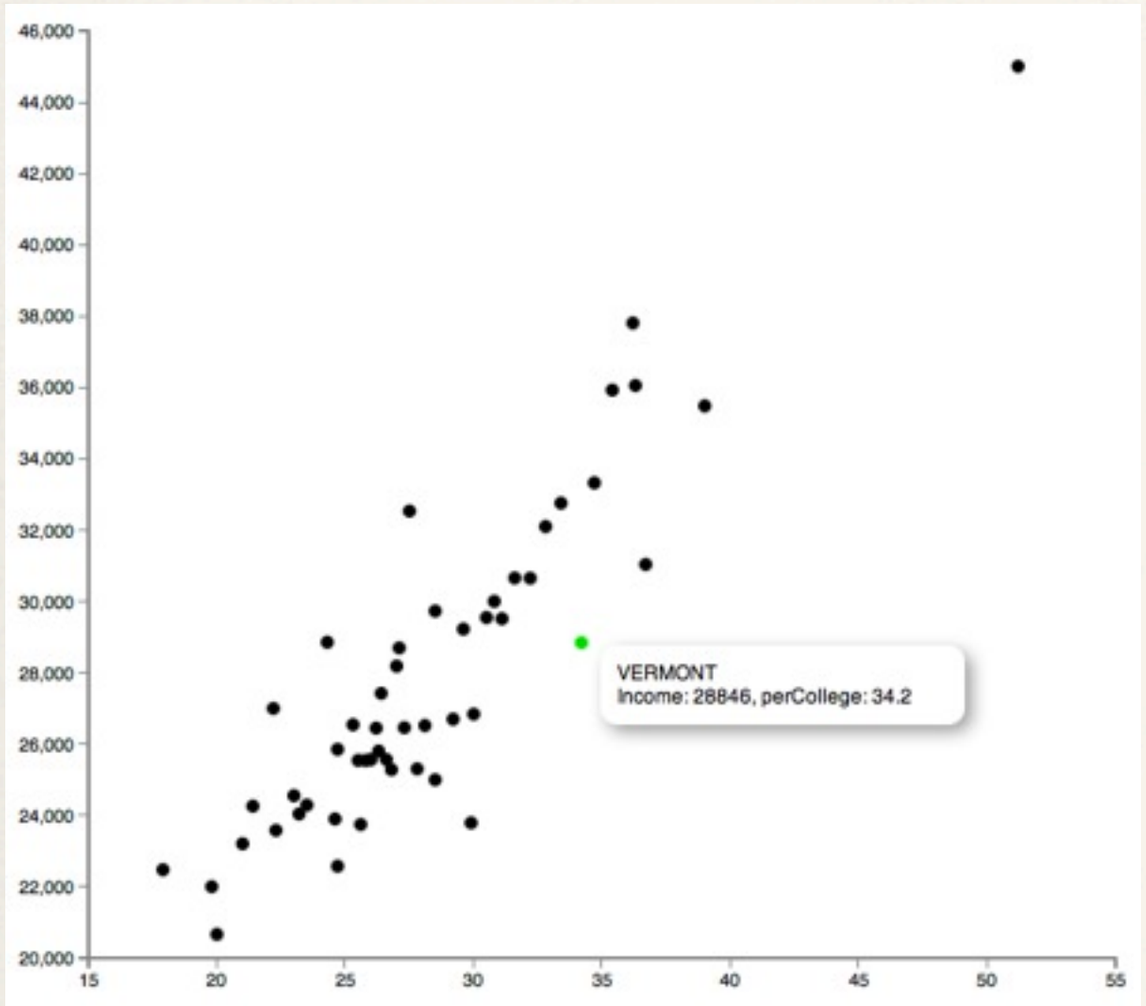
Reduce # of attributes

Reduce # of items

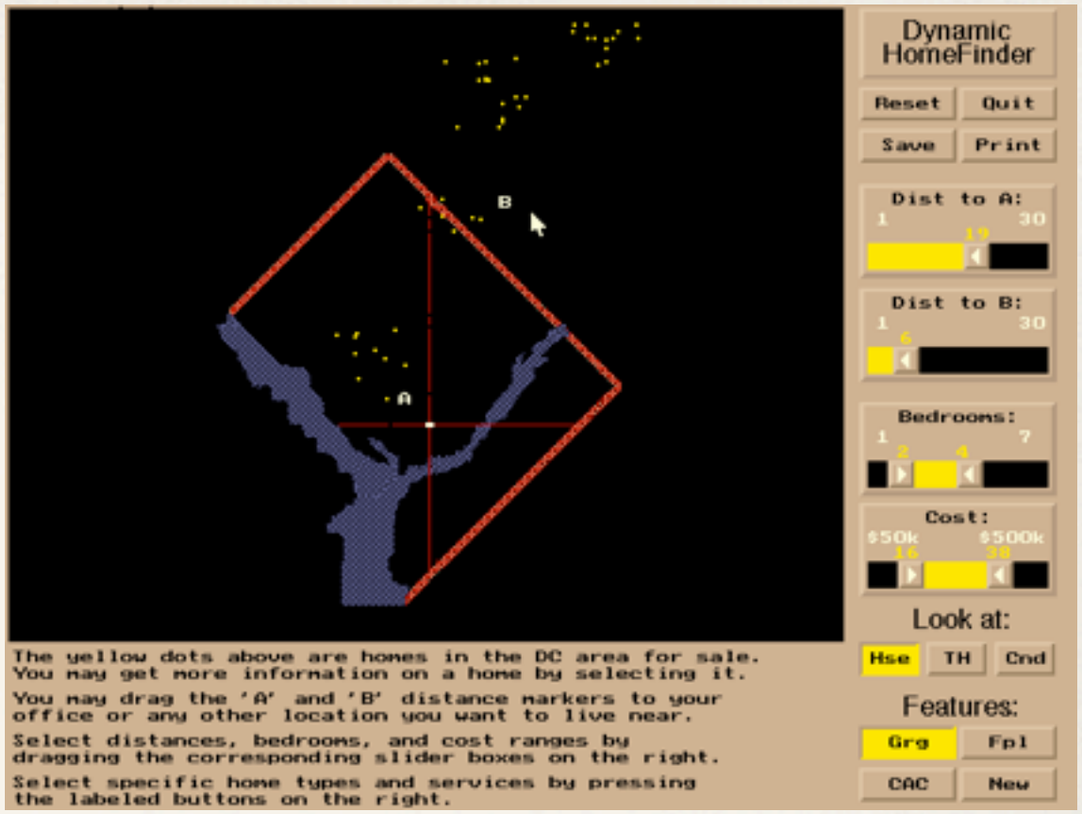
	A	B	C	D	E	F	G
1	doctor	name	companions	start	end	episodes	duration
2	1	William Hartnell	10	1963	1966	135	3288
3	2	Patrick Troughton	5	1966	1970	127	3183
4	3	Jon Pertwee	3	1970	1974	129	3206
5	4	Tom Baker	8	1974	1982	174	4248
6	5	Peter Davidson	6	1982	1984	69	1800
7	6	Colin Baker	2	1984	1987	31	1029
8	7	Sylvester McCoy	2	1987	1989	42	1025
9	8	Paul McGann	1	1996	1996	1	84
10	9	Christopher Eccleston	3	2005	2005	13	568
11	10	David Tennant	5	2005	2010	48	2368
12	11	Matt Smith	4	2010	2013	44	2083

Reduce range of items

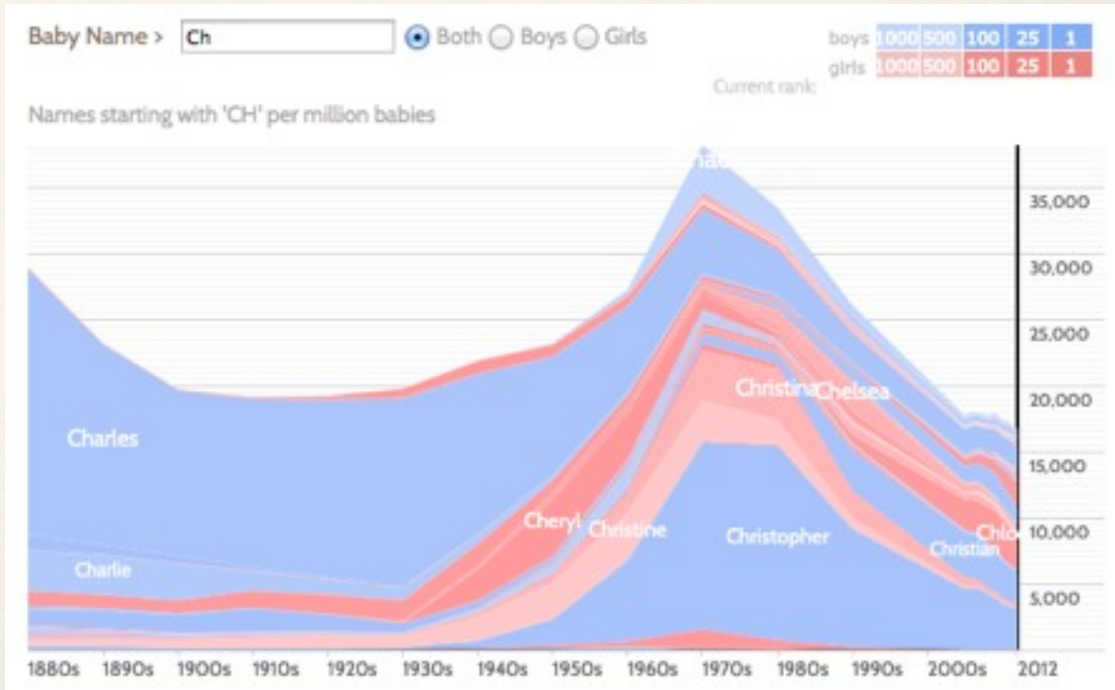
Elimination



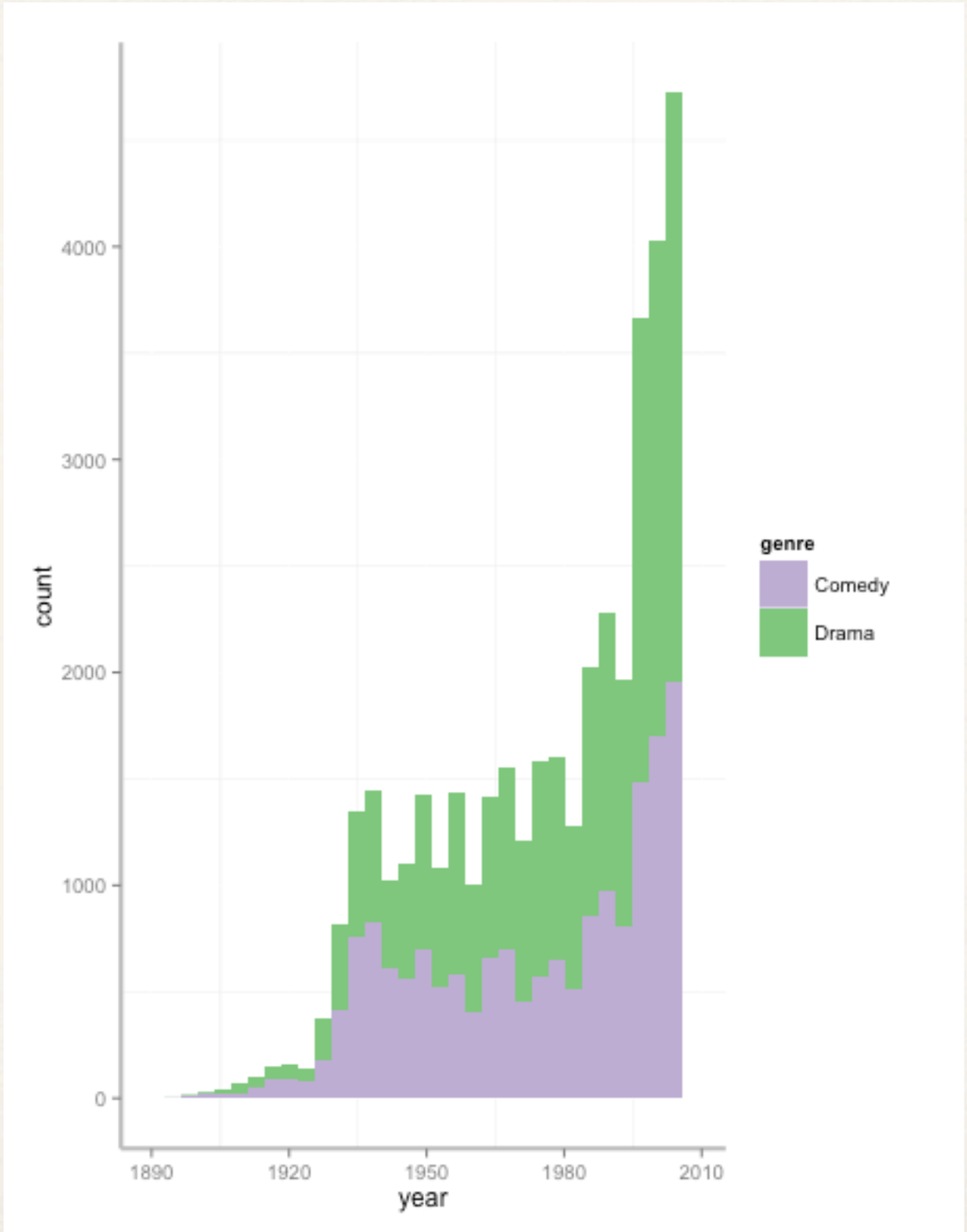
eliminate attributes



eliminate items



Aggregation



Aggregation

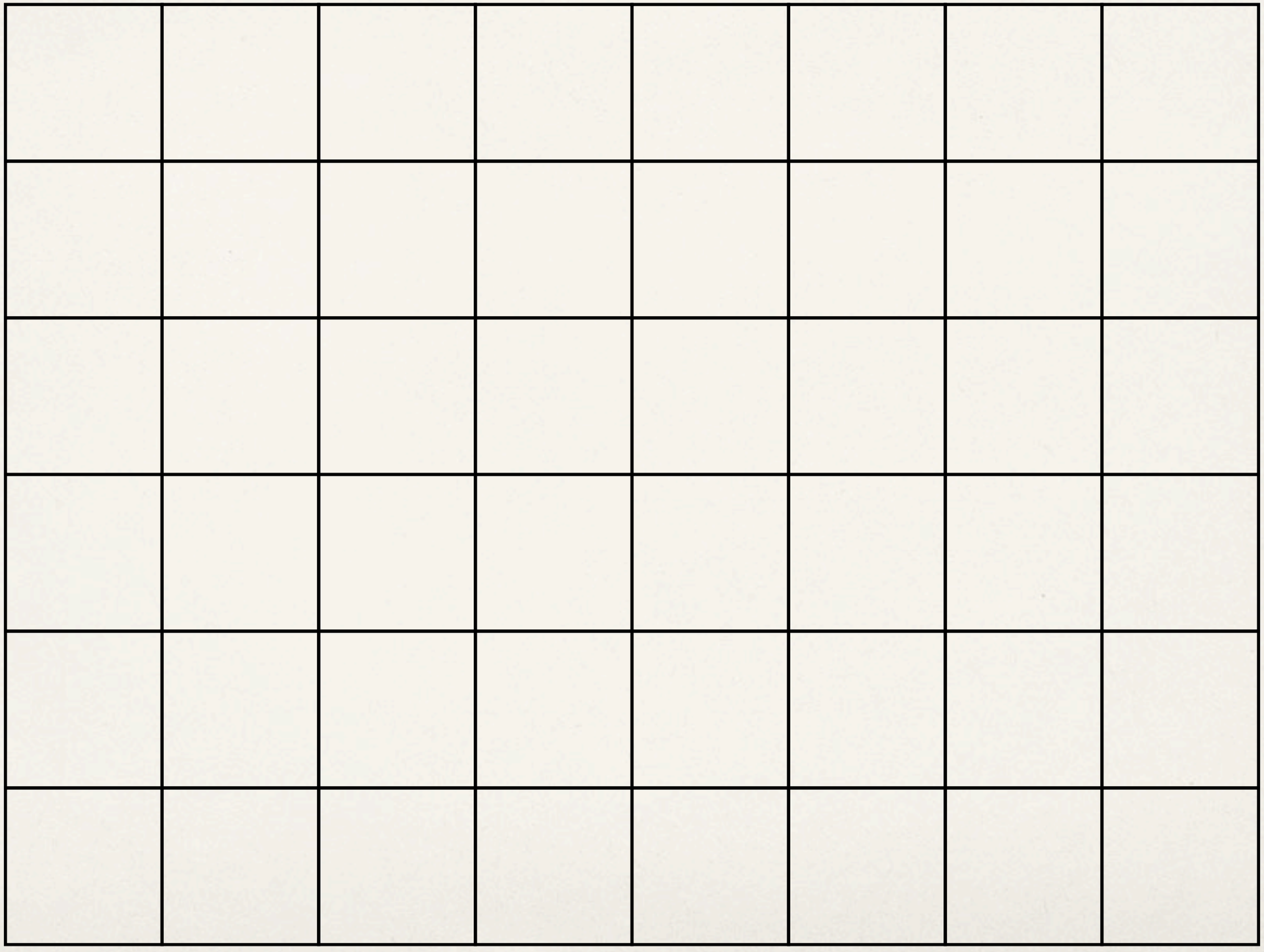
What to group by?

- categorical data or shared data values
- spatial position
- algorithmic (i.e., clustering based on attributes)
- user defined

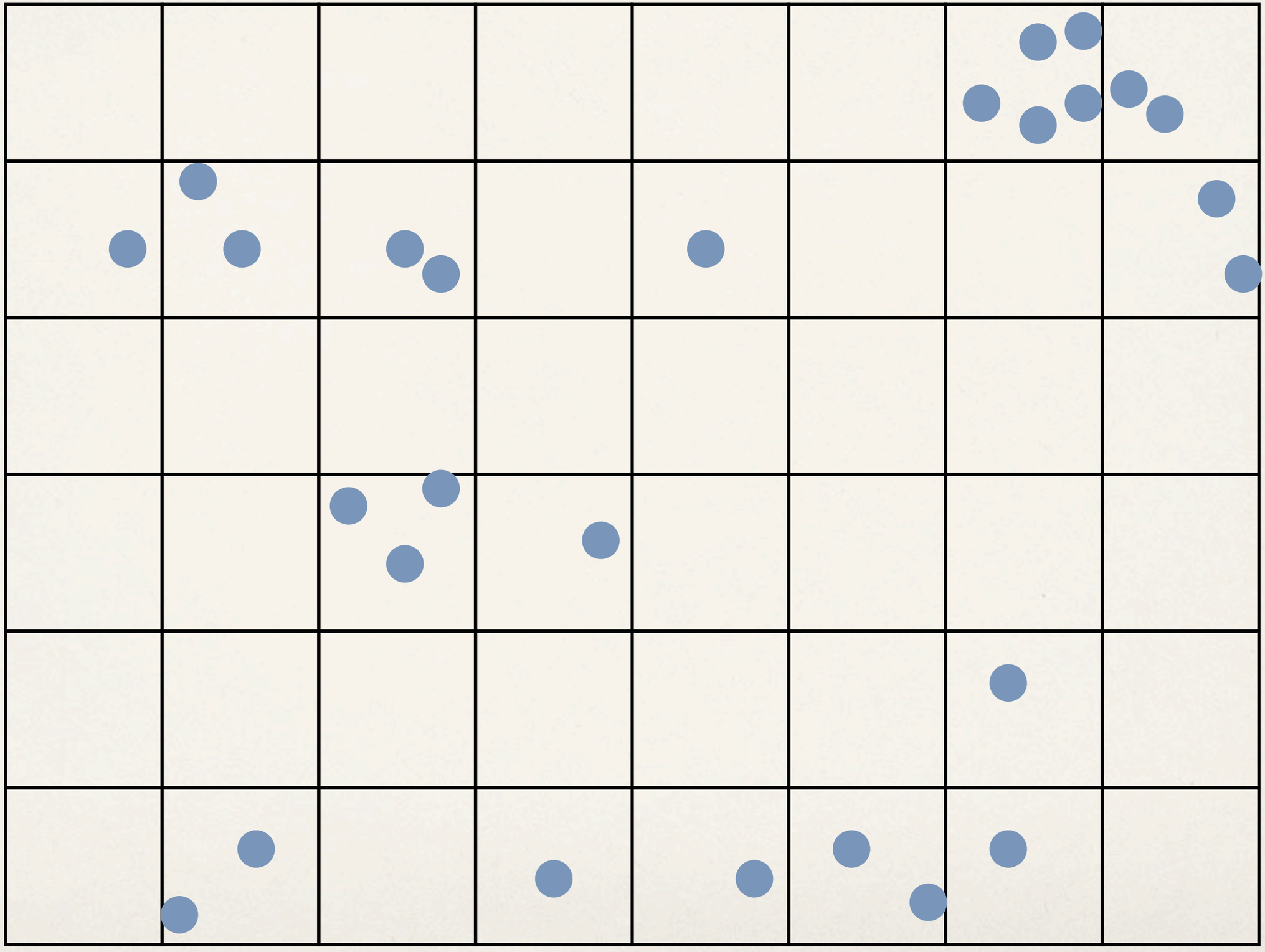
How to group?

- math function on attributes (e.g., min, max, mean, mode, sum, count, etc...)
- semantics or shared abstraction

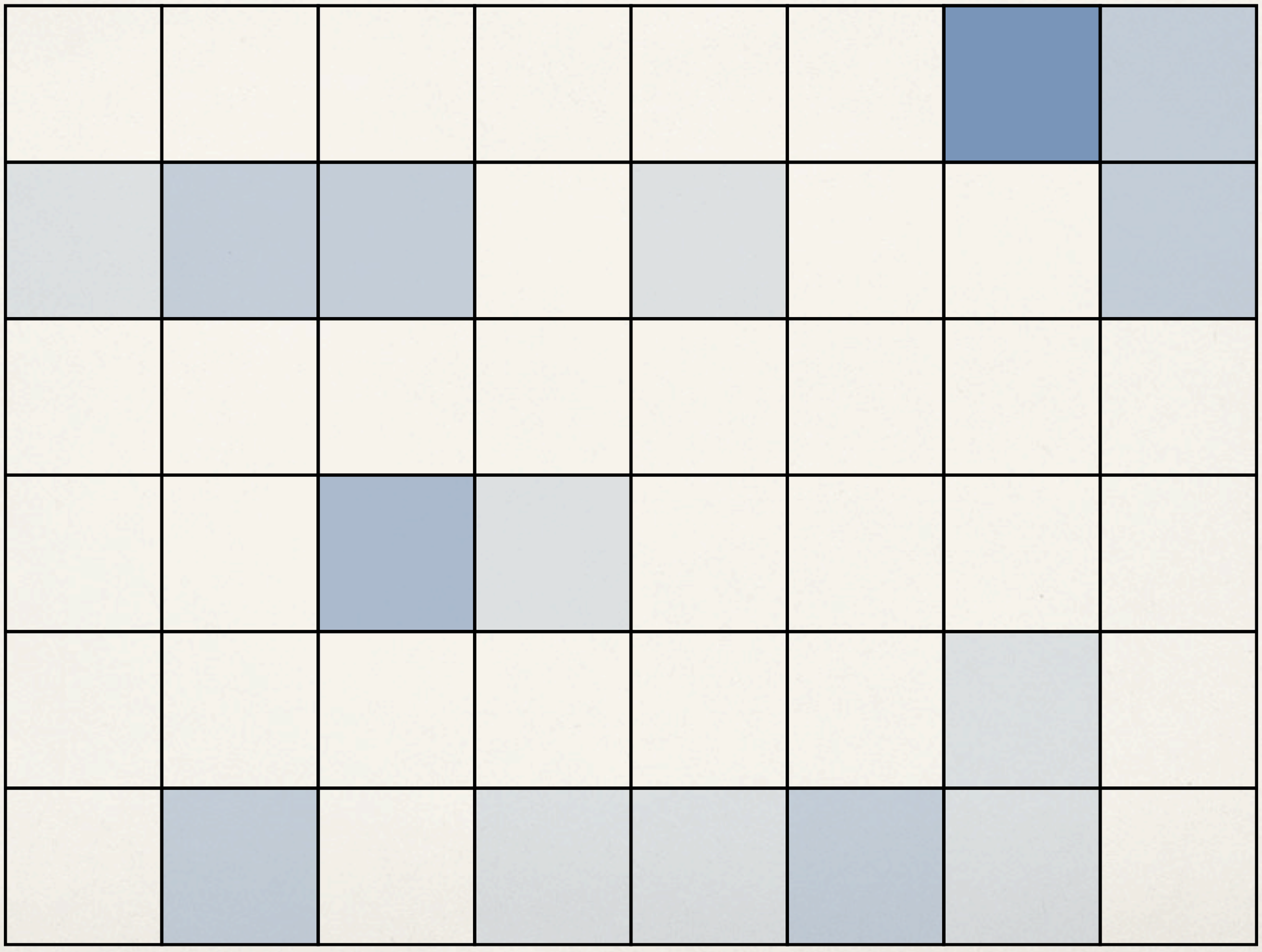
Pixel-level binning



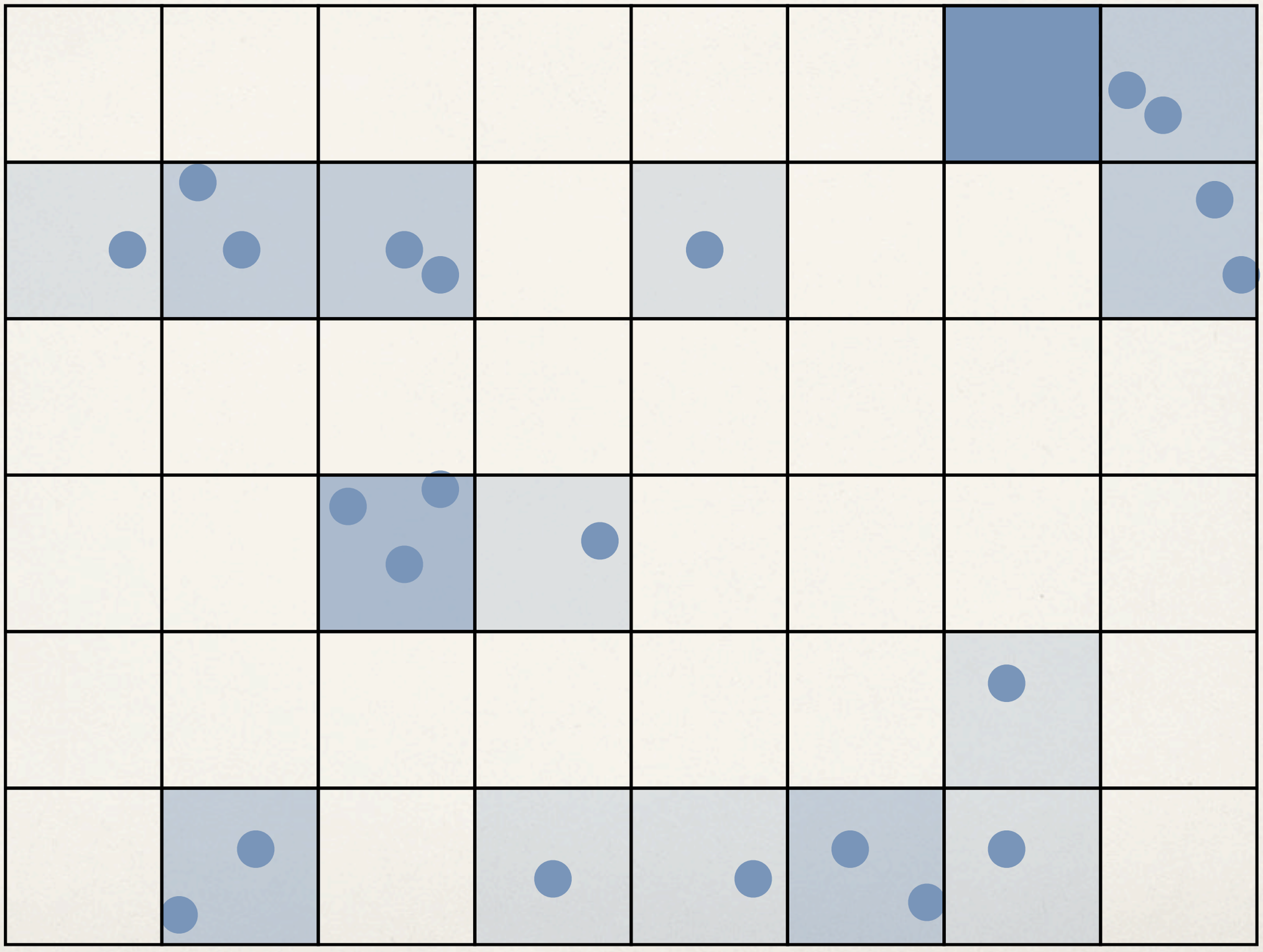
Pixel-level binning



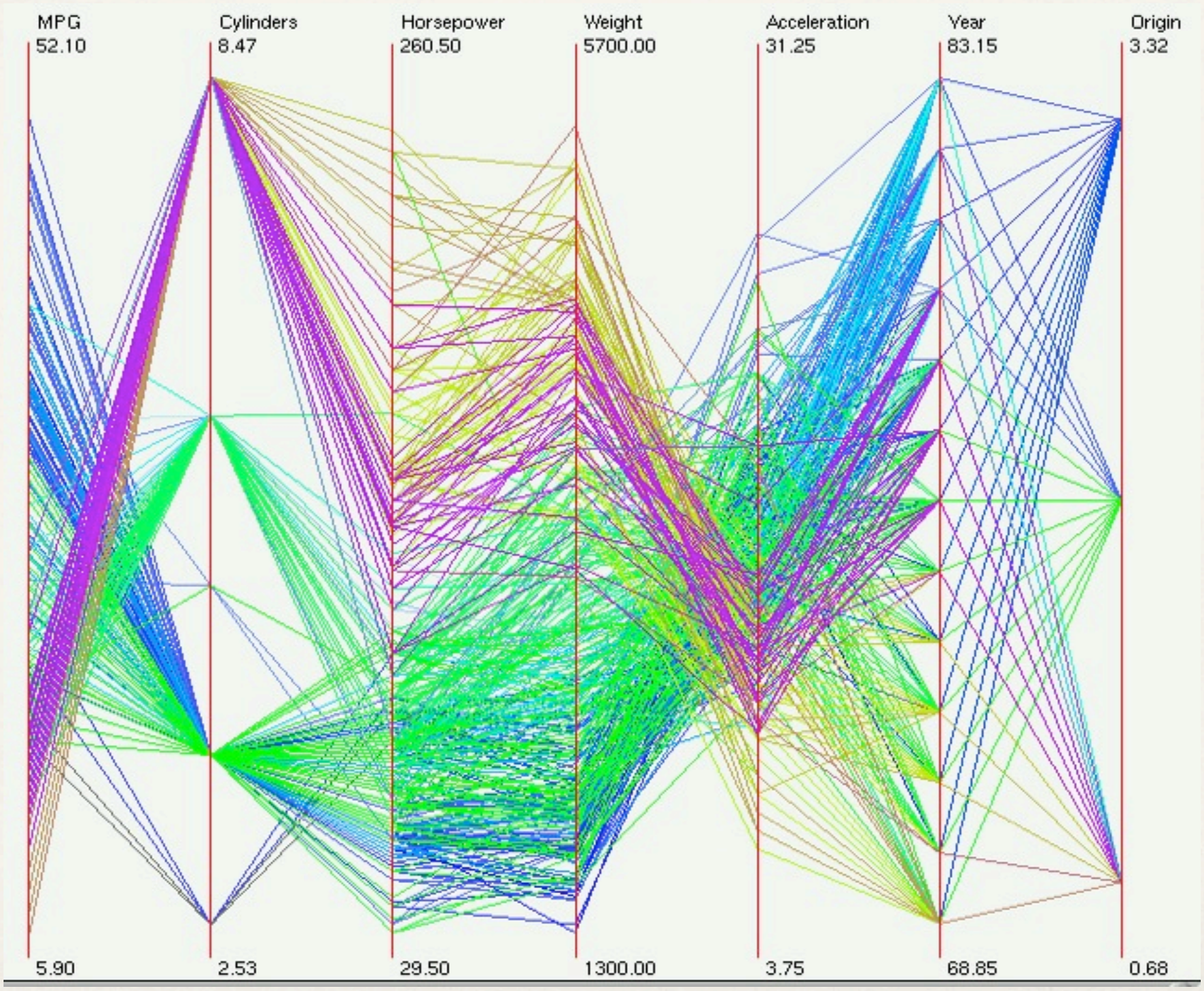
Pixel-level binning



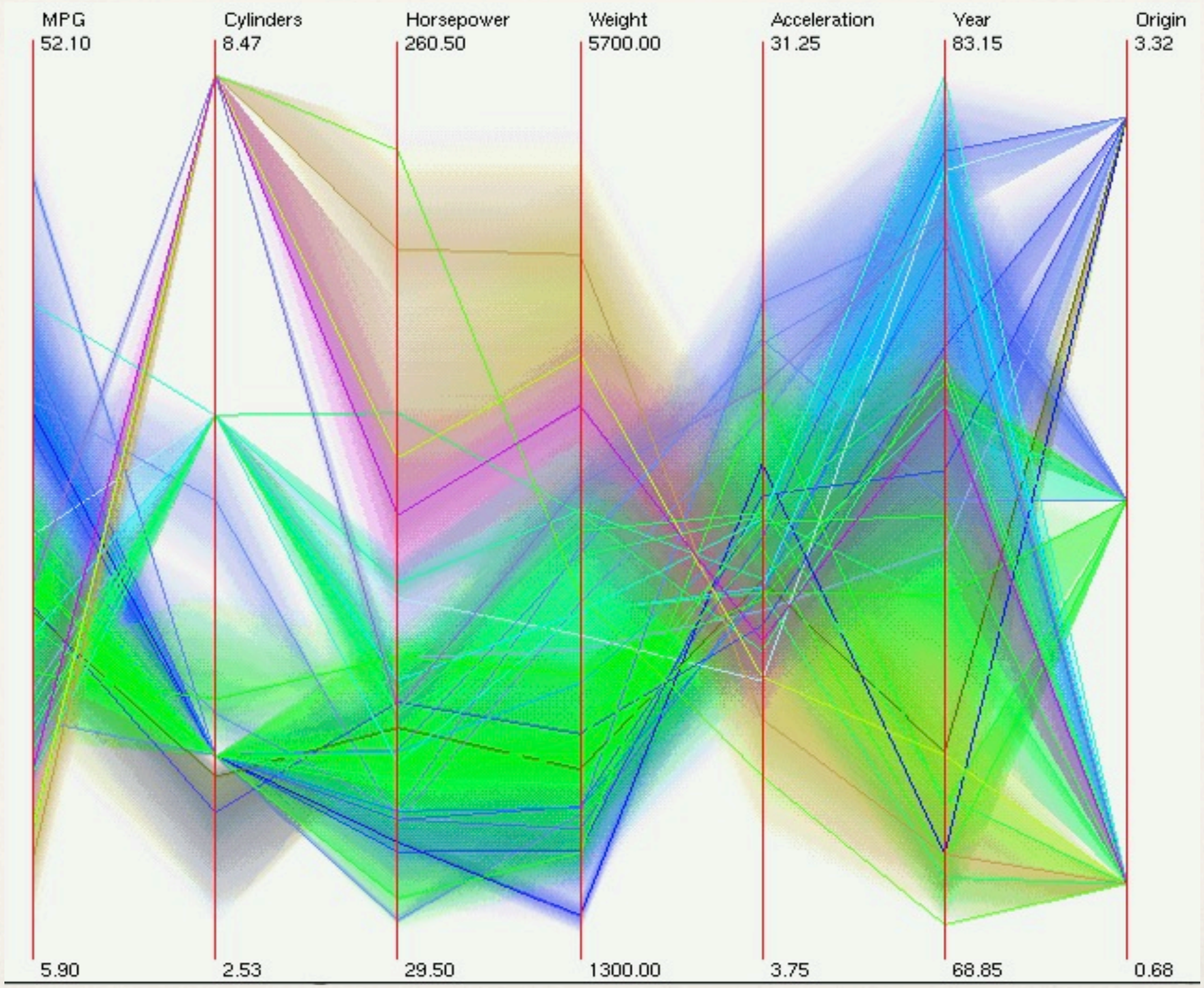
Pixel-level binning



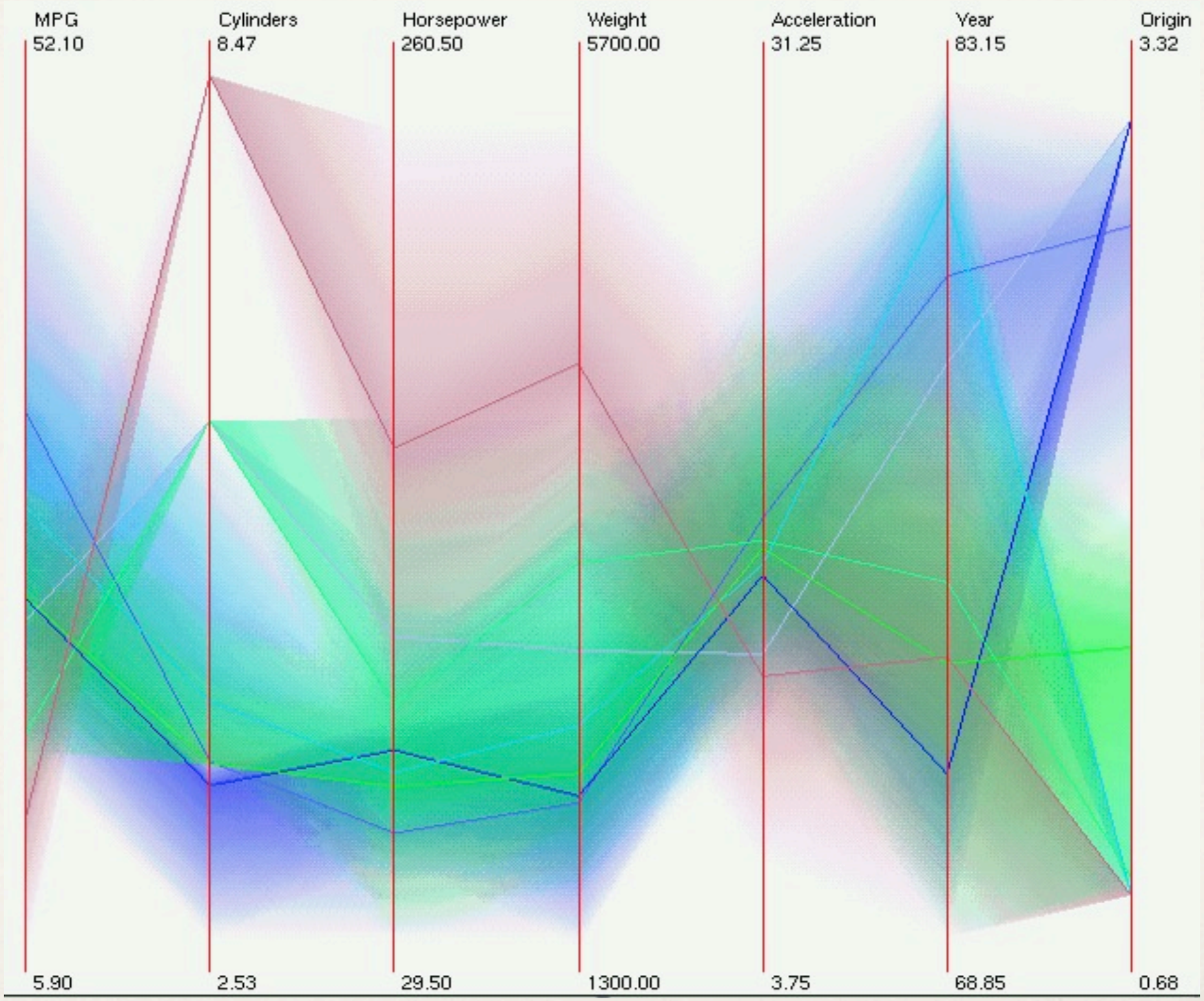
Aggregation



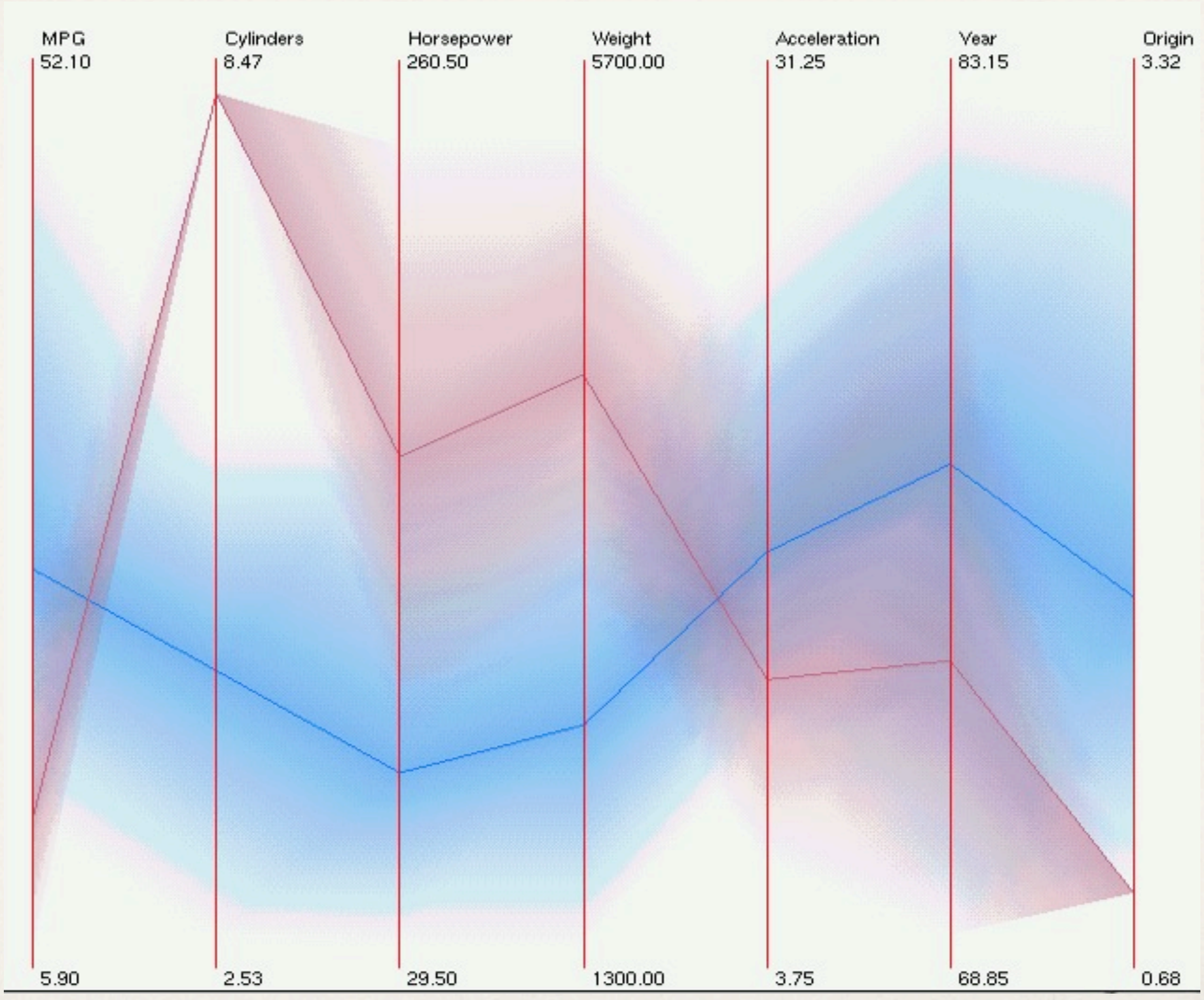
Aggregation

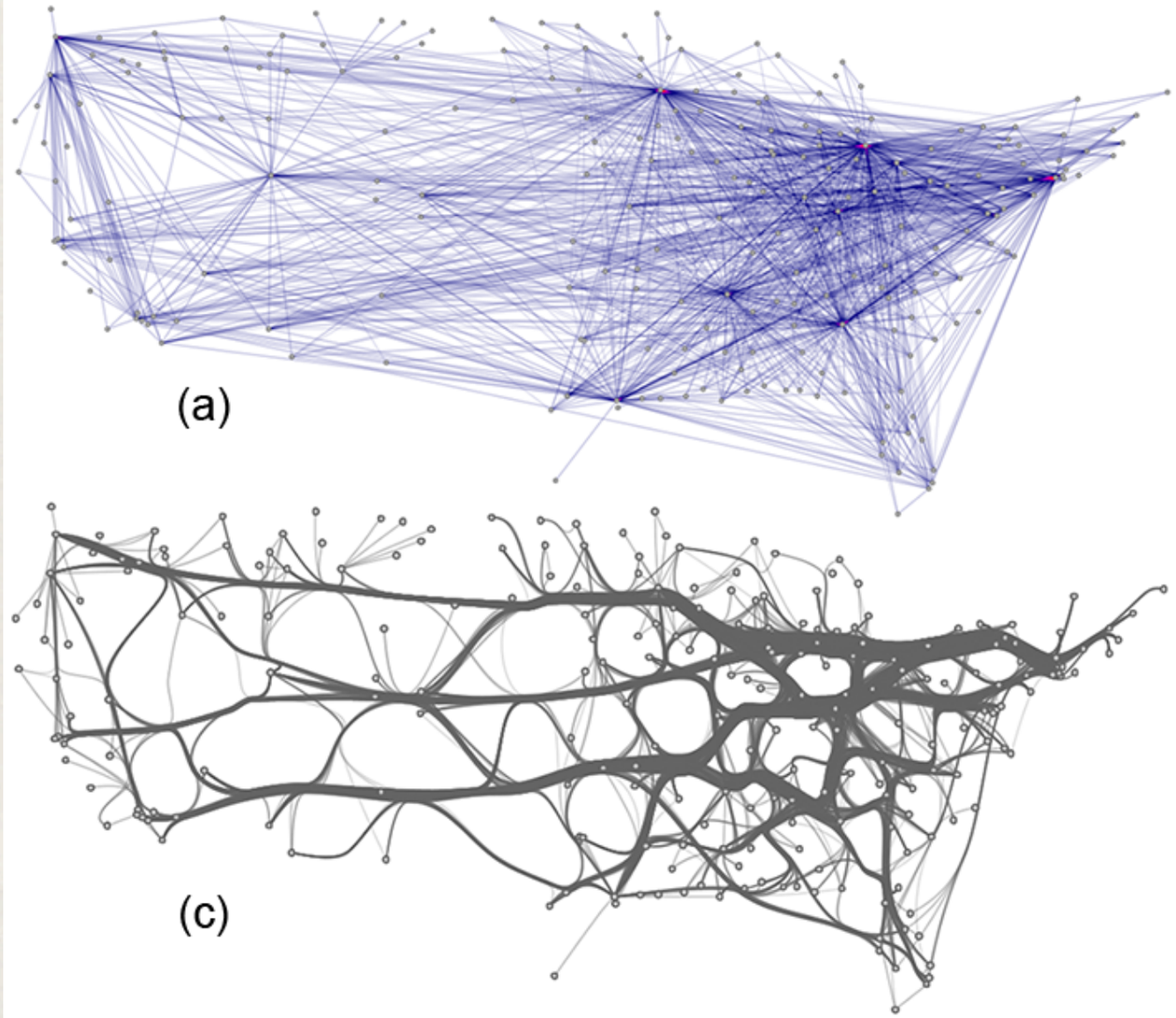


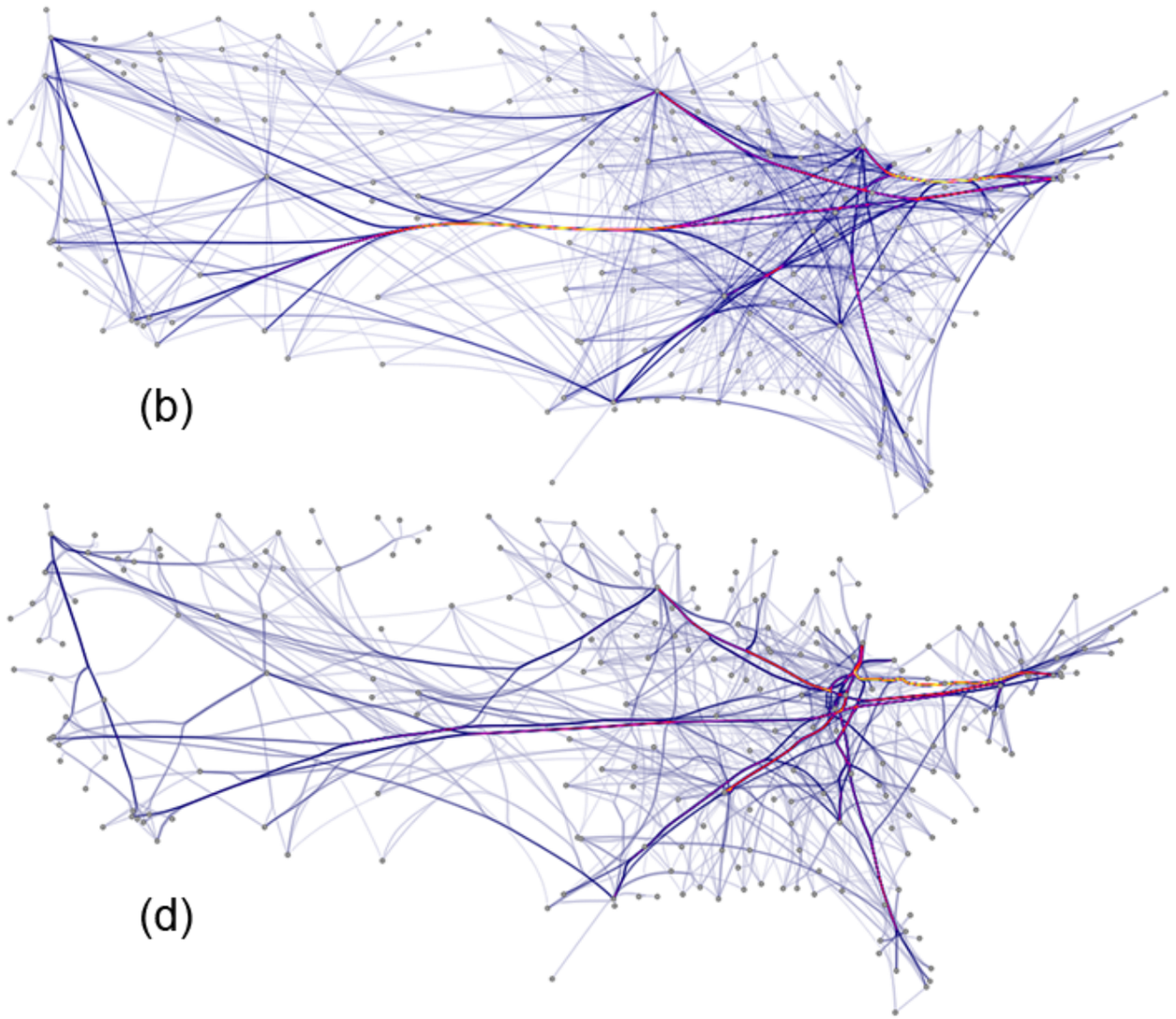
Aggregation



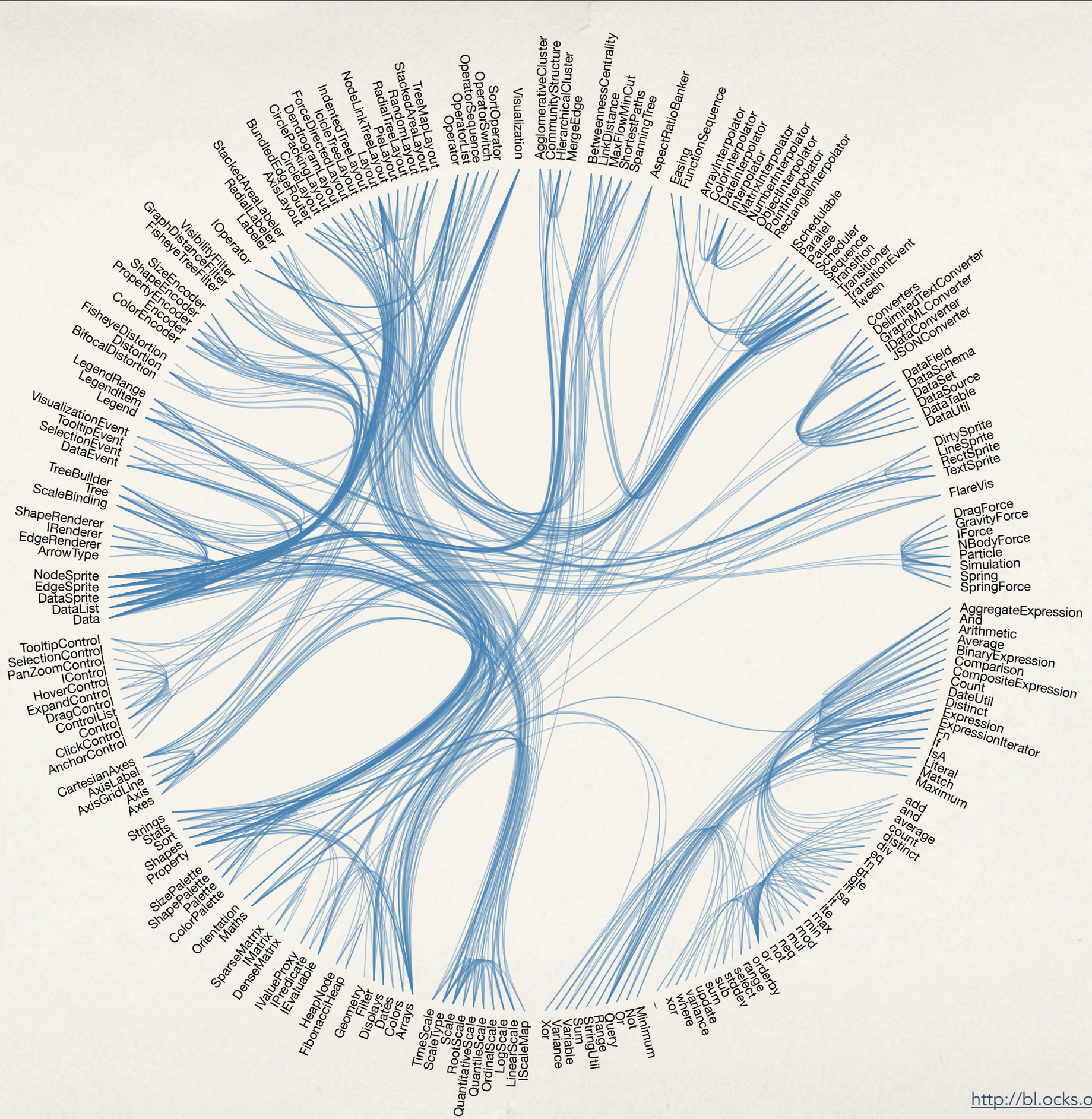
Aggregation





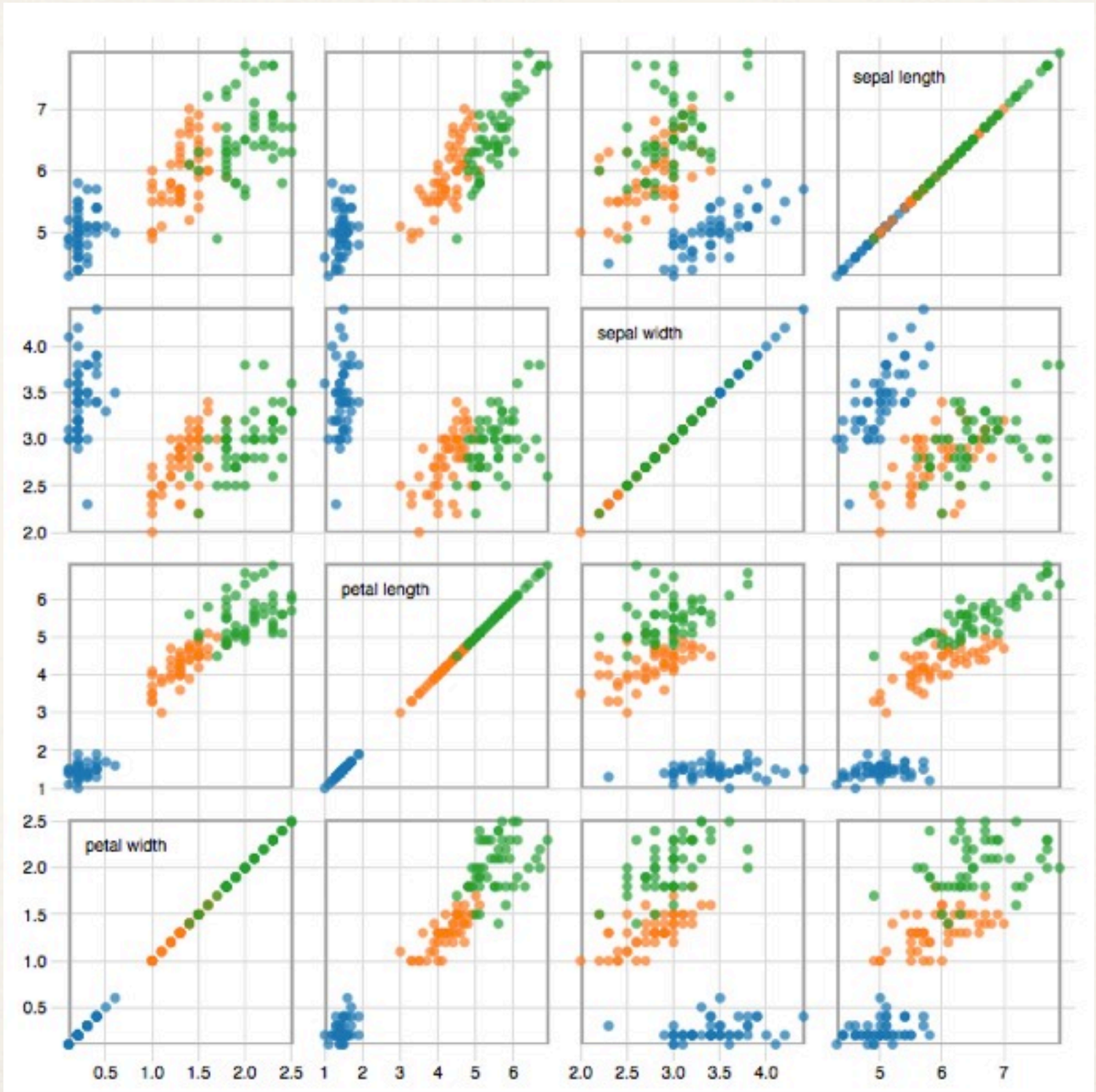


Holden and van Wijk, “Force Directed Edge Bundling for Graph Visualization”, 2009



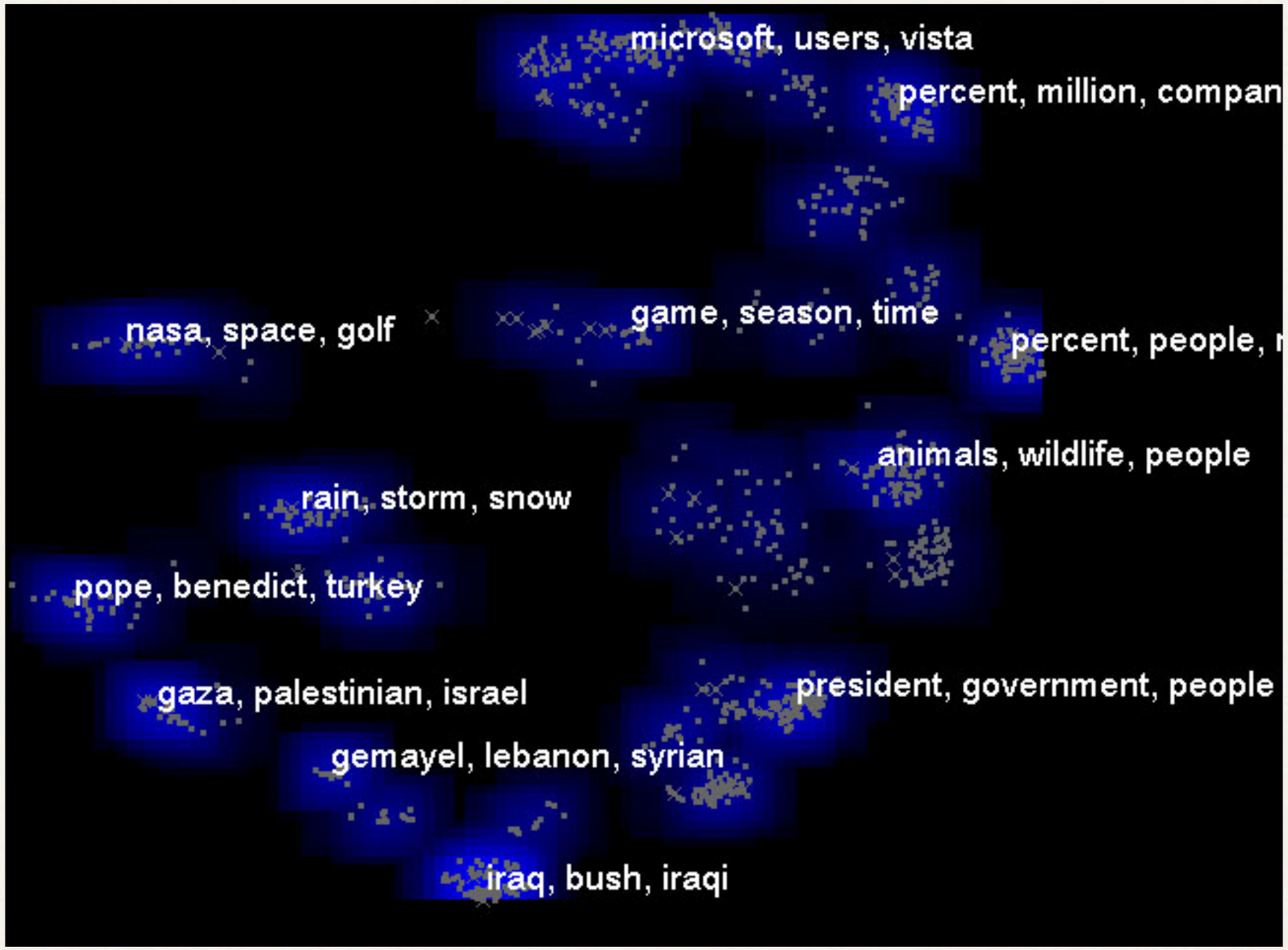
http://bl.ocks.org/mbostock/1044242

Clustering



http://bl.ocks.org/mbostock/4063663

Clustering

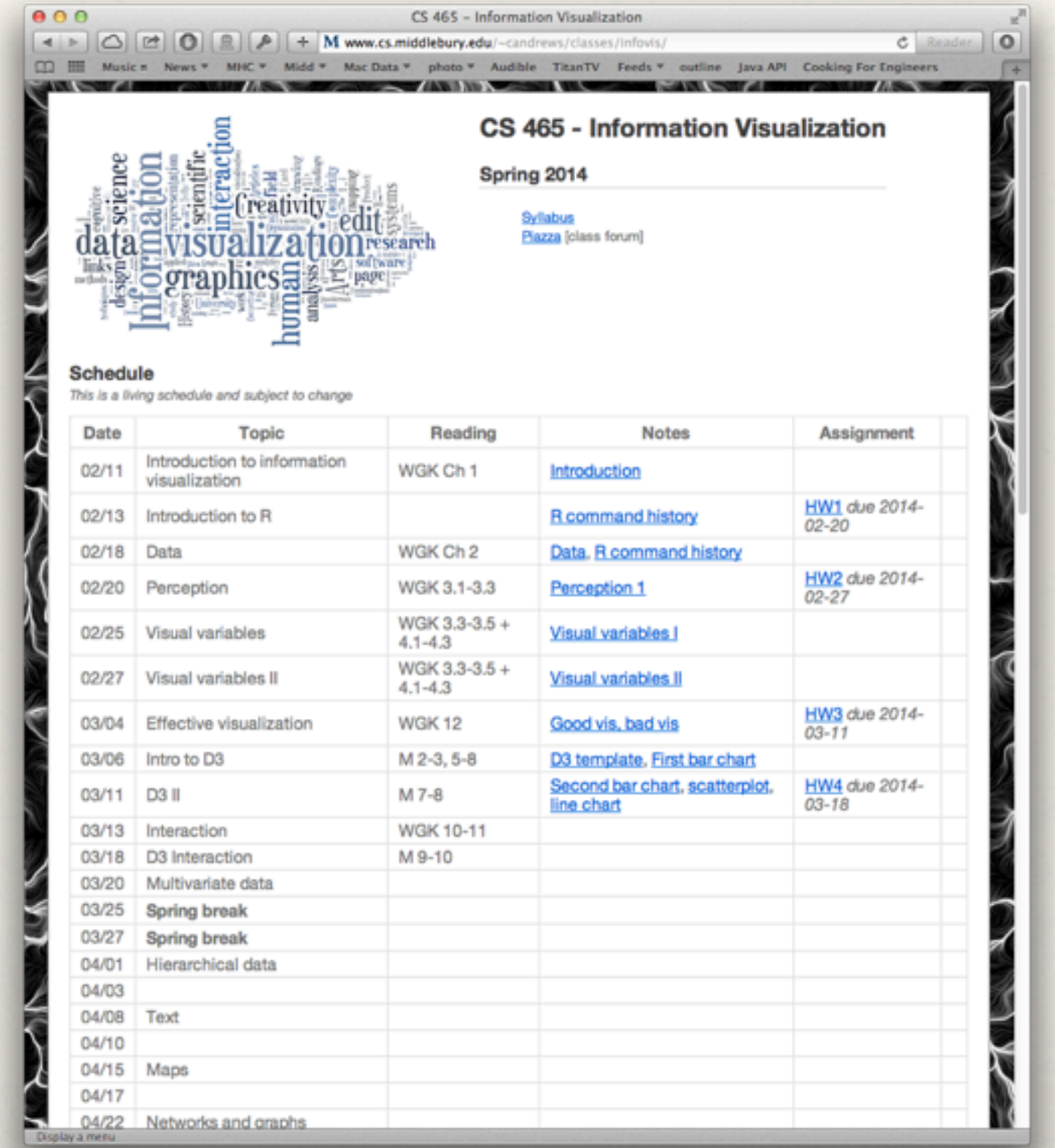


InSpire, PNNL

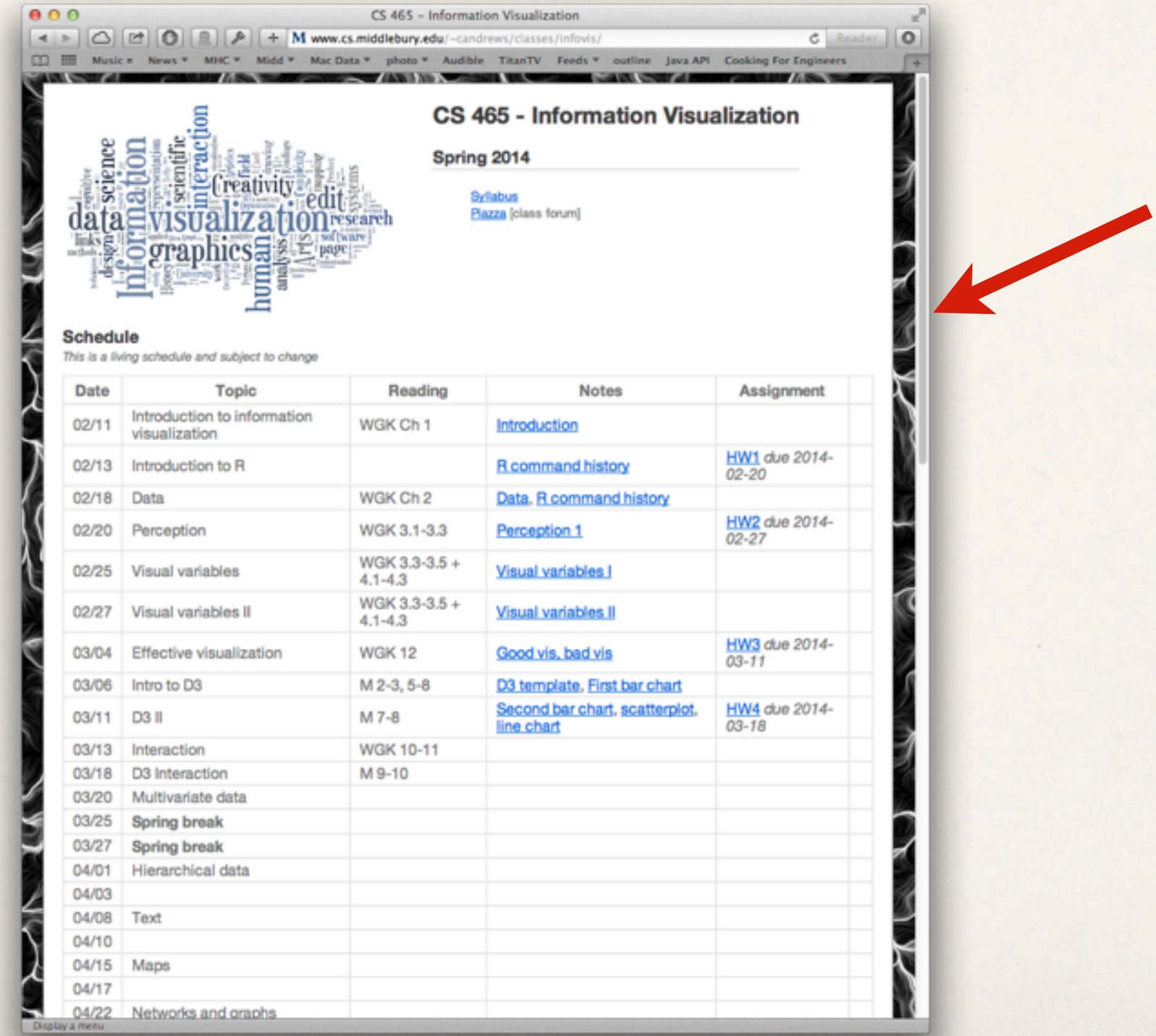
Navigation

Show me the **Navigation** data!

Conventional navigation

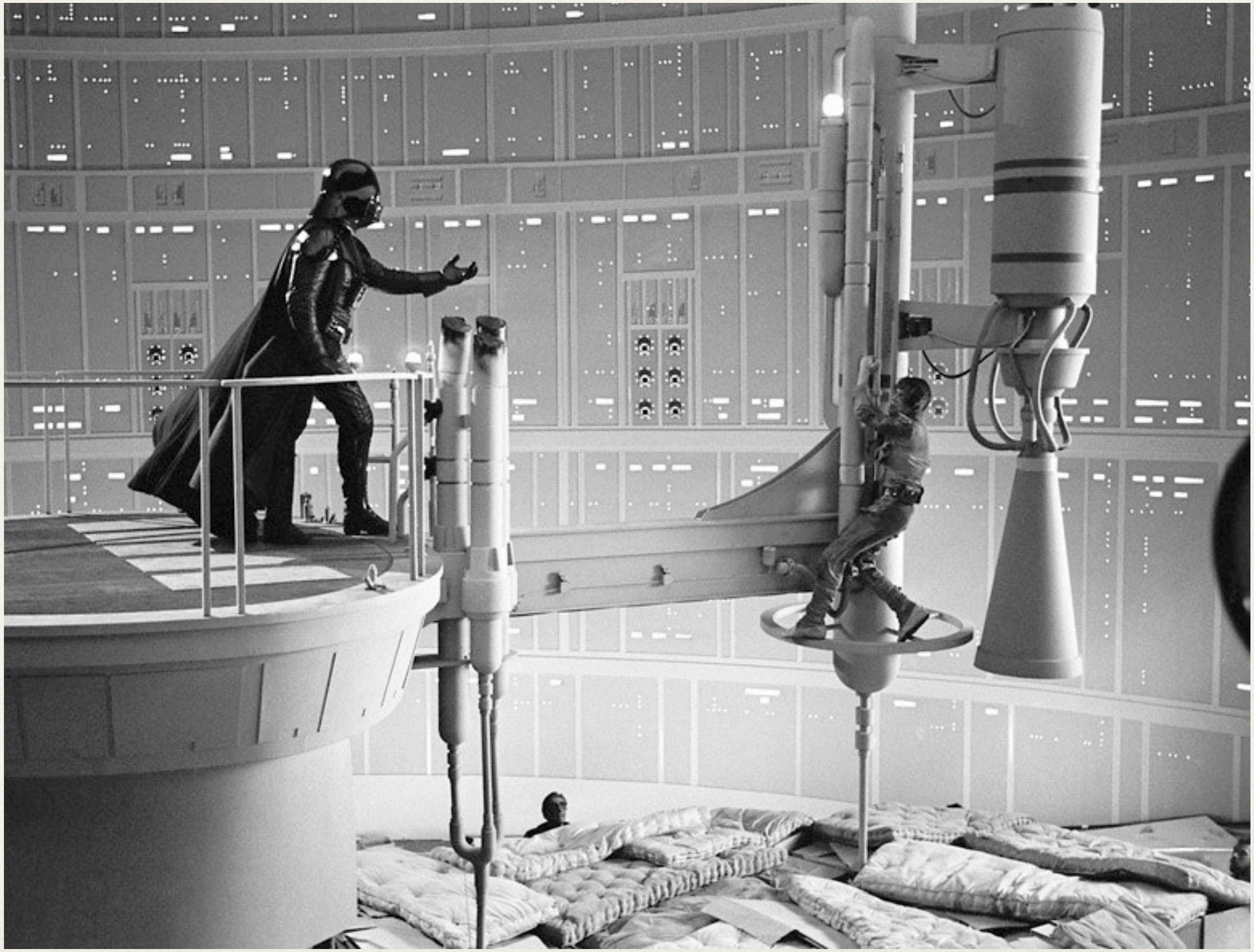


Conventional navigation

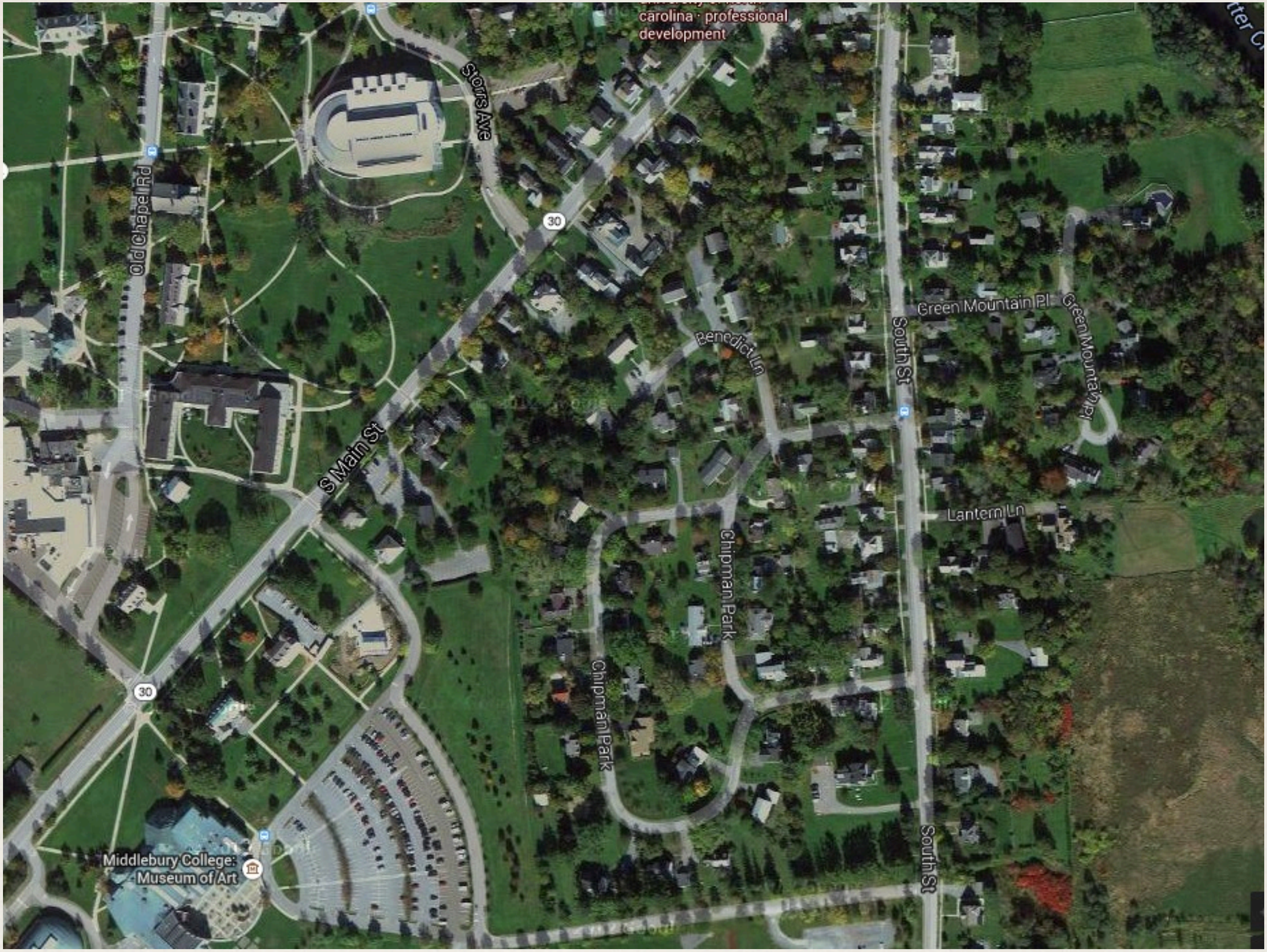


The keyhole problem

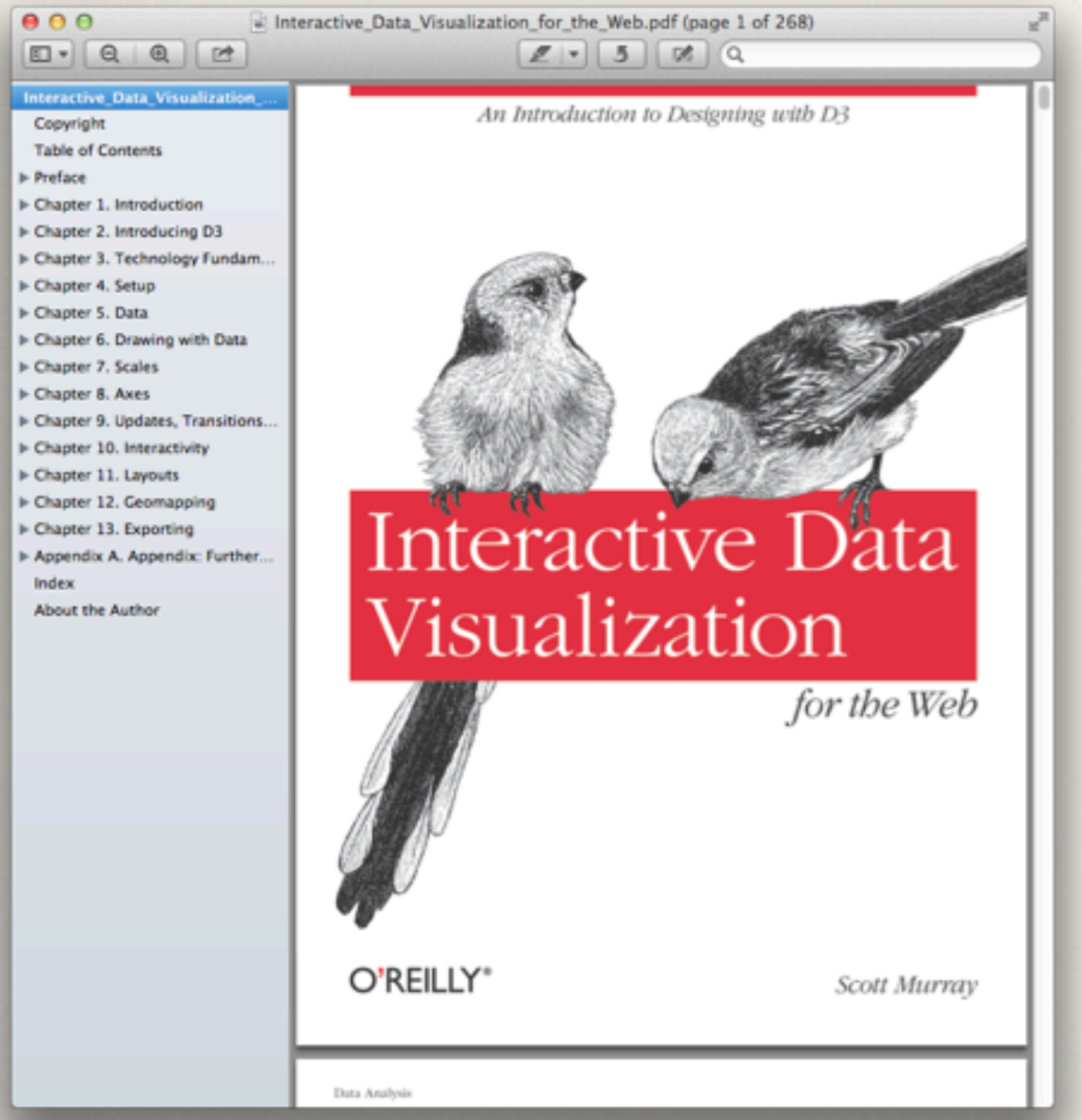
The keyhole problem

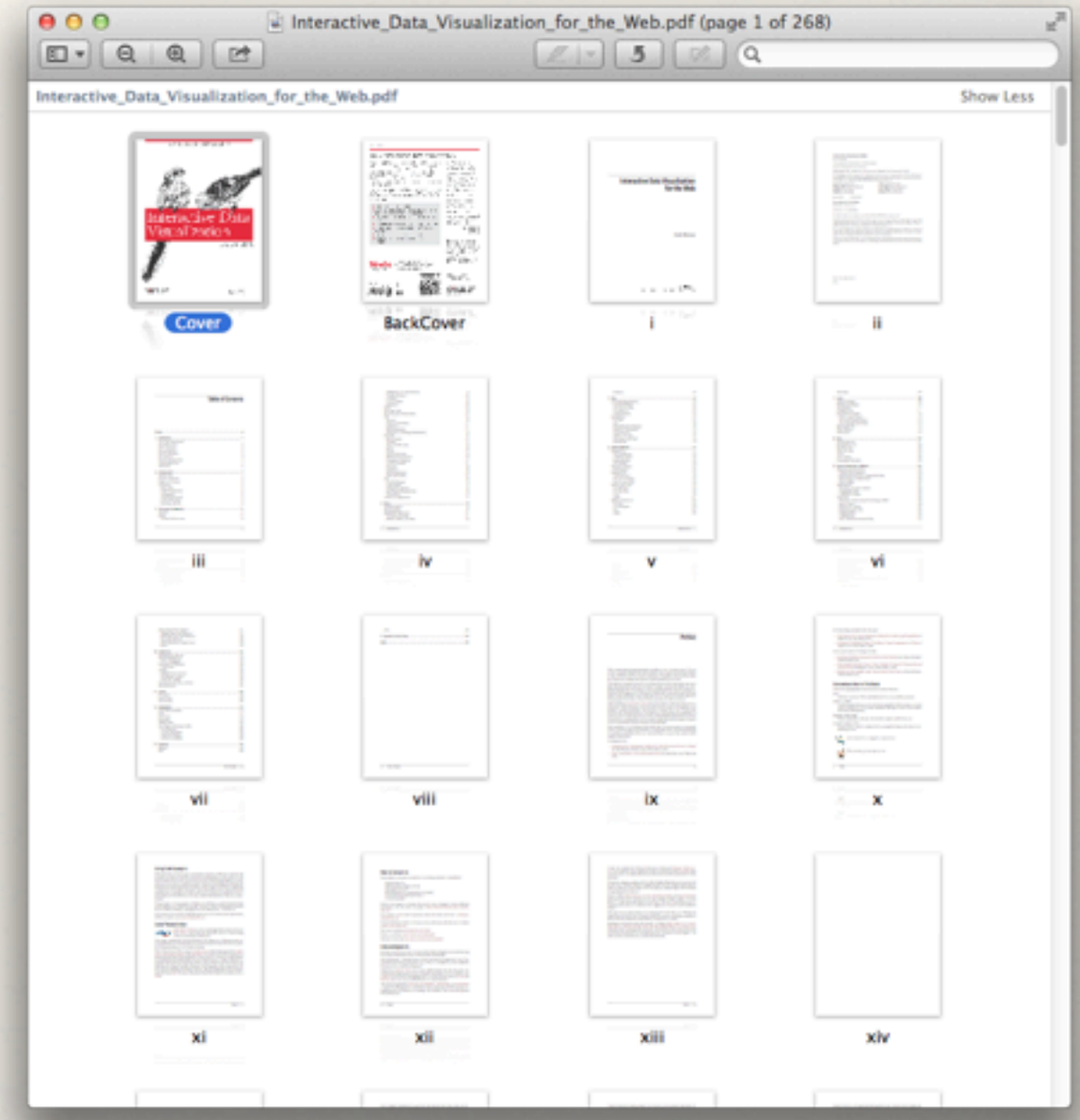


The keyhole problem


carolina · professional development
Storrs Ave
Old Chapel Rd
30
S Main St
Benedict Ln
South St
Green Mountain Pl
Green Mountain Pl
Lantern Ln
Chipman Park
Chipman Park
30
Middlebury College: Museum of Art
South St

Text document overview





Text document overview

census1.html — UNREGISTERED

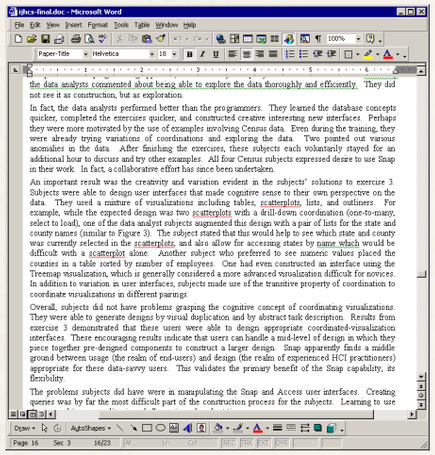
census1.html

```
32
33          function makeScatterplot(){
34              var margin = {top:20, bottom:20, left:60, right: 20};
35              var width = 500, height = 500;
36              var xValue = function(d){return d[0]};
37              var yValue = function(d){return d[1]};
38              var xScale = d3.scale.linear();
39              var yScale = d3.scale.linear();
40              var xAxis = d3.svg.axis().scale(xScale).orient("bottom");
41              var yAxis = d3.svg.axis().scale(yScale).orient("left");
42
43
44
45              function chart(selection){
46
47                  selection.each(function(data){
48
49                      xScale.range([0,width - margin.left - margin.right])
50                      .nice()
51                      .domain(d3.extent(data, xValue));
52
53
54                      yScale.range([height - margin.top - margin.bottom, 0])
55                      .nice()
56                      .domain(d3.extent(data, yValue));
57
58                      var svg = d3.select(this).append("svg")
59                      .attr({width:width, height:height});
60
61                      var canvas = svg.append("g")
62                      .attr("transform","translate("+margin.left +","+margin.top+")");
63
64                      // create the dots
65                      var dots = canvas.selectAll("circle")
66                      .data(data)
67                      .enter()
68                      .append("circle");
```

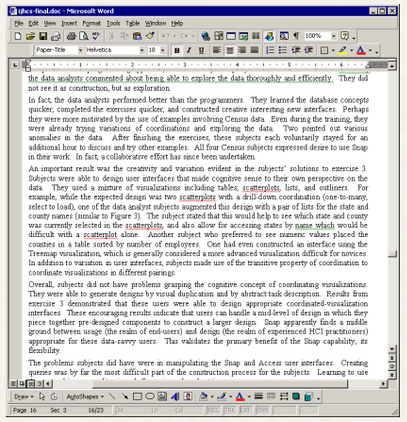
Line 1, Column 16 | Tab Size: 4 | HTML

Navigation strategies

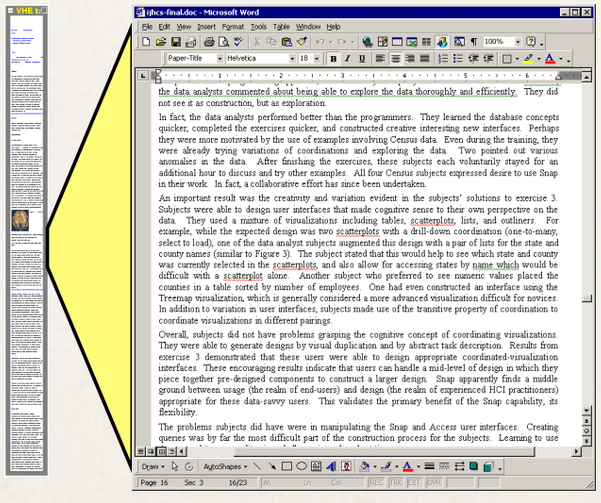
Detail only



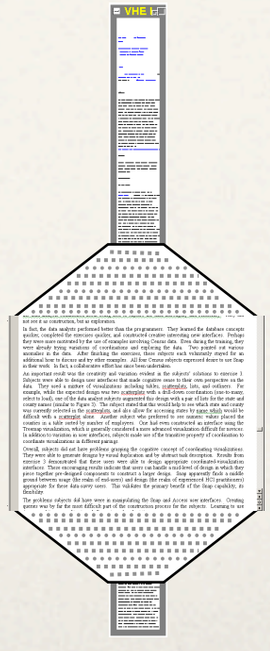
Zooming



Overview + Detail

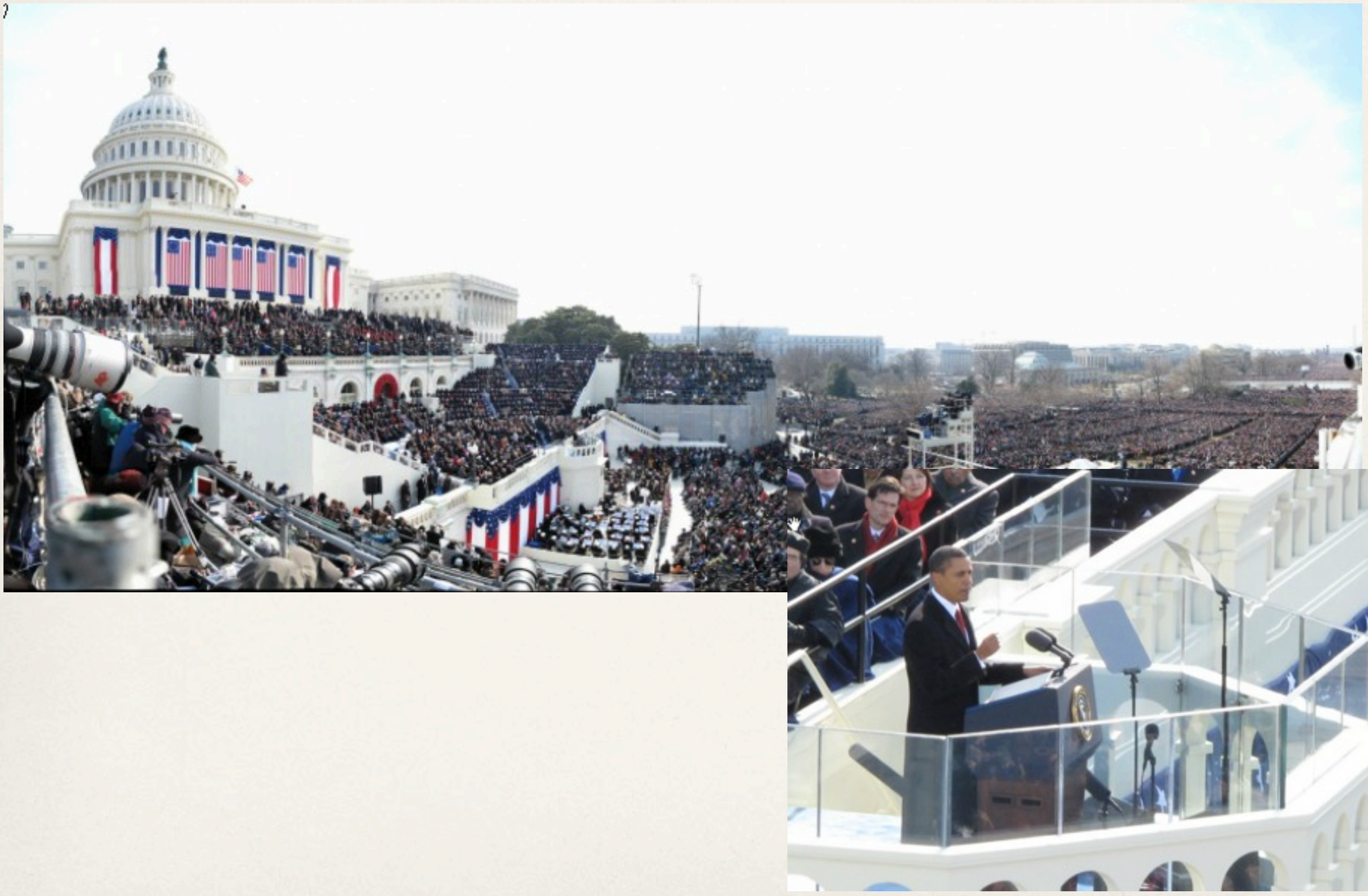


Focus + Context



borrowed from C. North

Pan and zoom

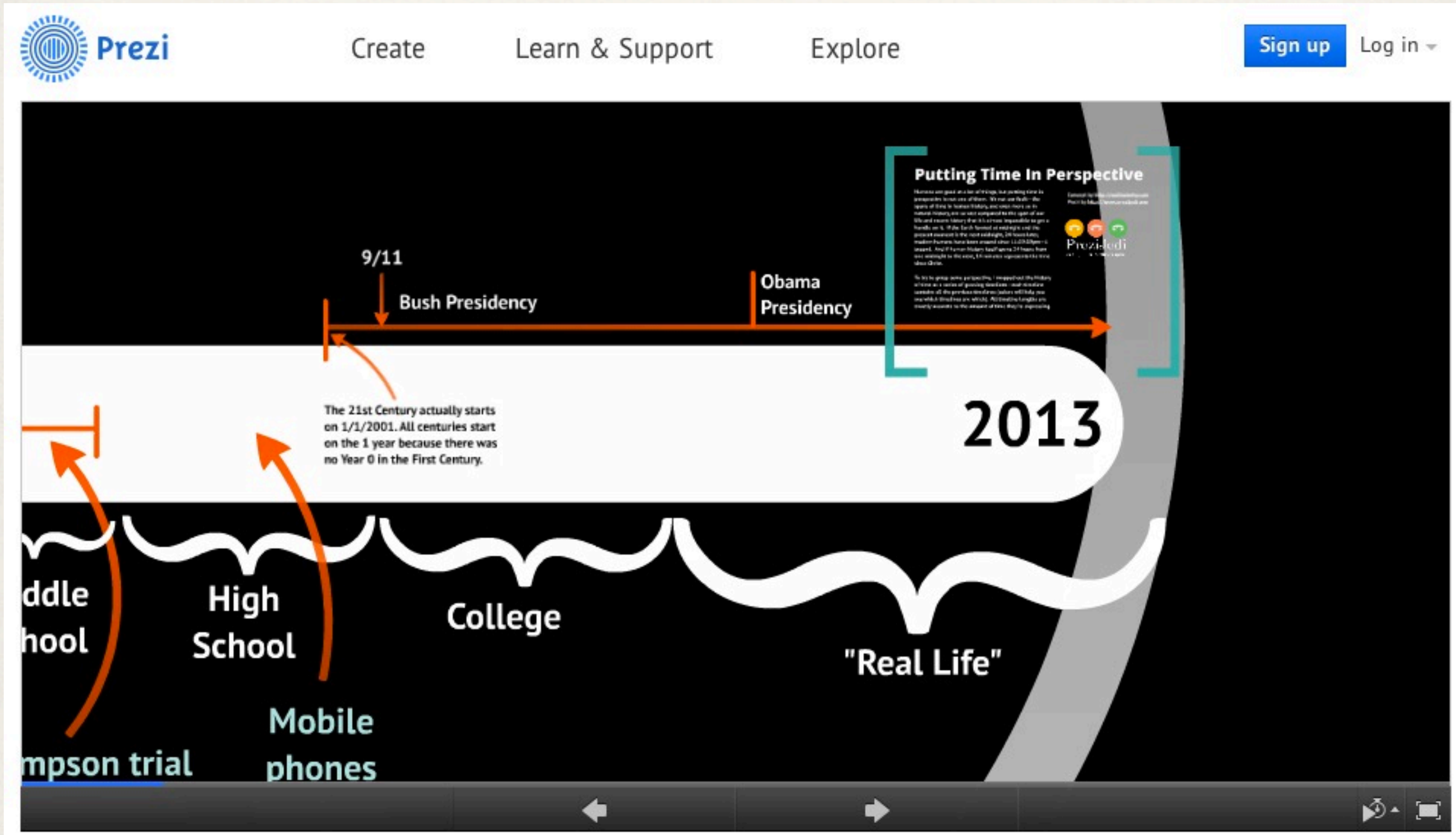


http://gigapan.com/

Pan and Zoom

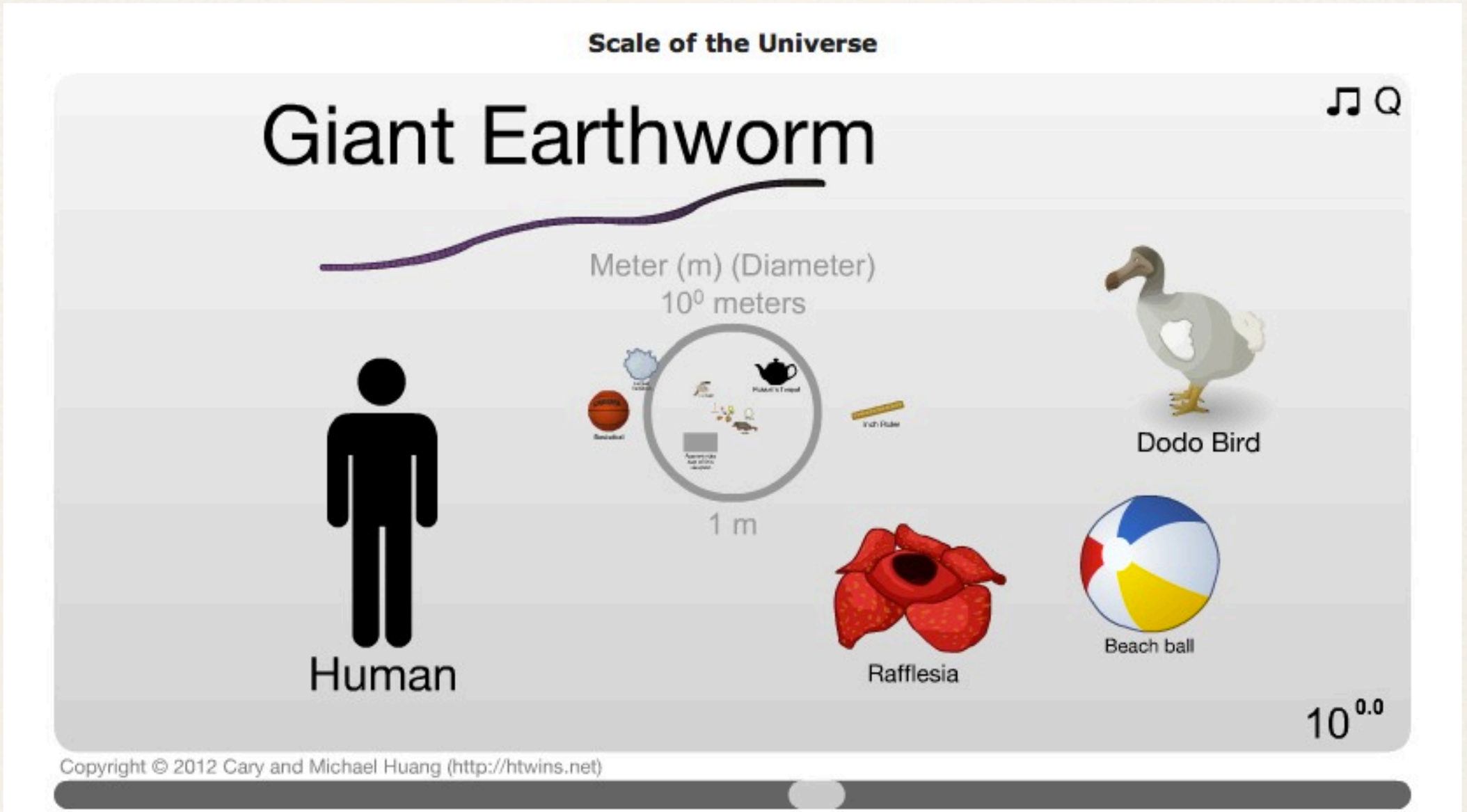

World • United States
N
Alberta
Manitoba
Saskatchewan
Ontario
Quebec
New Brunswick
P.E.I.
Nova Scotia
Maine
Montana
North Dakota
Minnesota
Lake Superior
Ottawa
Wisconsin
Lake Huron
Vt.
N.H.
Gulf of Maine
Idaho
Wyoming
South Dakota
Michigan
Lake Ontario
New York
Iowa
Lake Michigan
Lake Erie
Nebraska
Ohio
Pennsylvania
N.J.
Illinois
Indiana
Washington
UNITED STATES
Utah
Colorado
Kansas
West Virginia
Missouri
Kentucky
Virginia
Oklahoma
Tennessee
North Carolina
Arizona
New Mexico
Arkansas
South Carolina
Alabama
Georgia
Texas
Mississippi
Louisiana
Florida
Atlantic Ocean
Sargasso Sea
250 miles
500 km
Gulf of Mexico
Nassau
© 2014 Microsoft Corporation © 2013 Nokia

Zoomable user interface



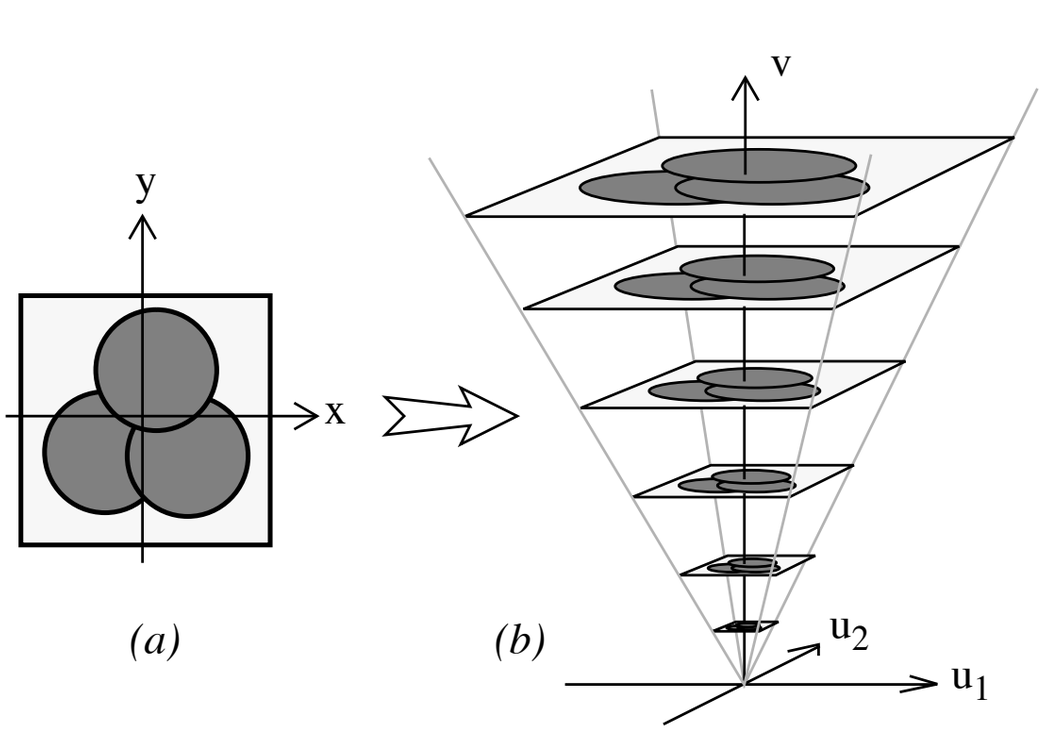
http://prezi.com/veychlhwrdgz/putting-time-in-perspective/

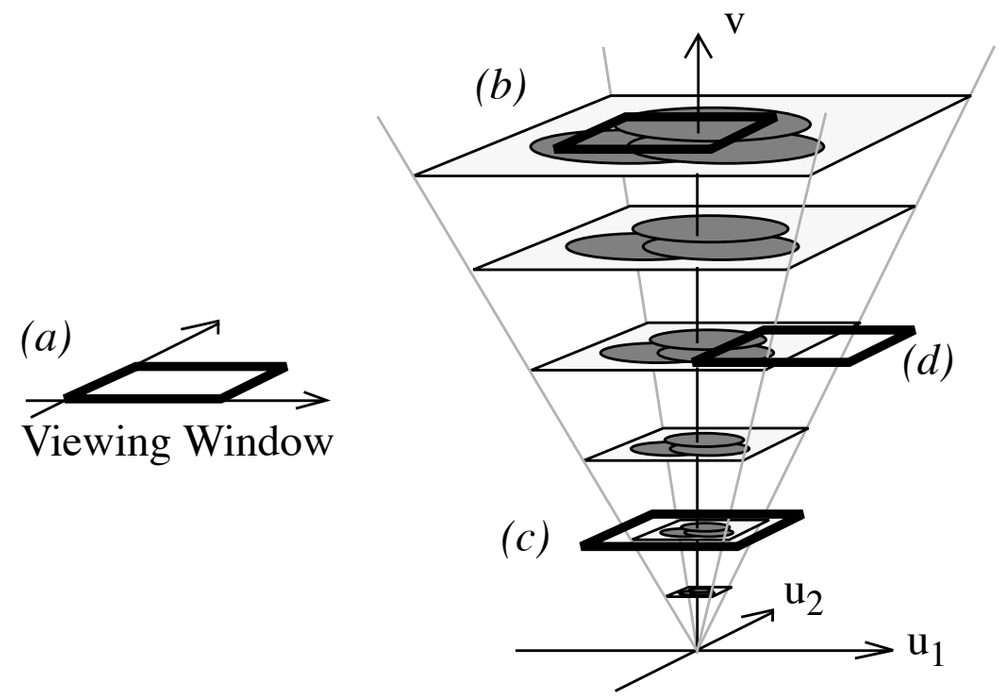
Zoomable user interface



http://scaleofuniverse.com

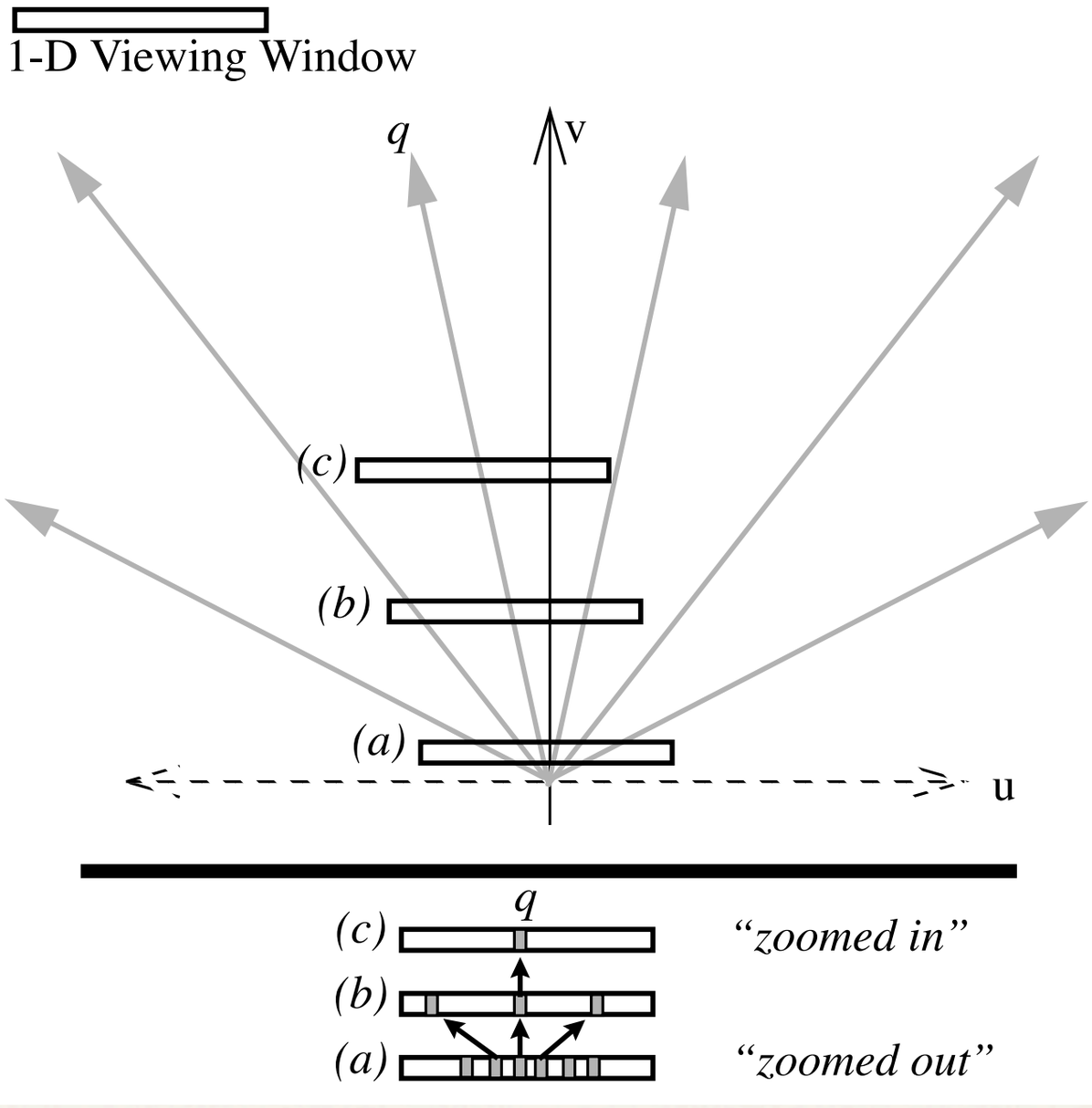
Space-scale diagrams





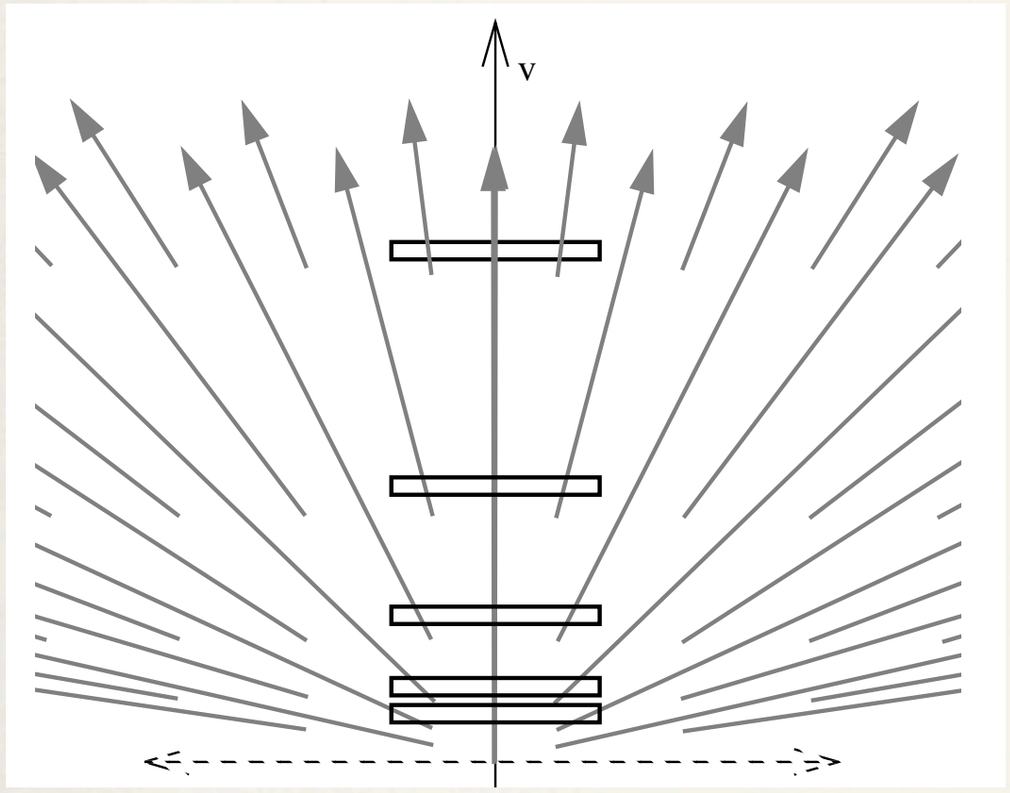
Furnas and Bederson, "Space-Scale Diagrams: Understanding Multiscale Interfaces"

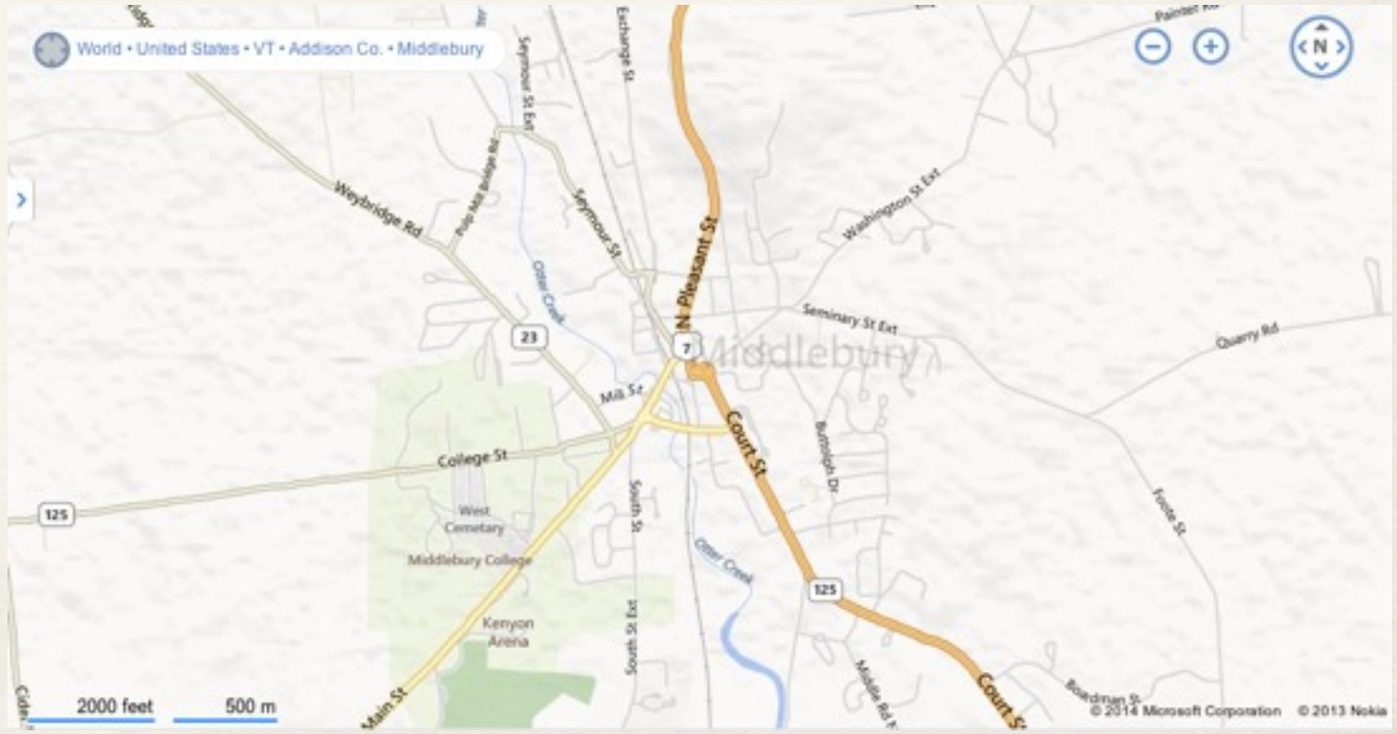
Space-scale diagrams



Furnas and Bederson, “Space-Scale Diagrams: Understanding Multiscale Interfaces”

Semantic zooming





Overview + detail

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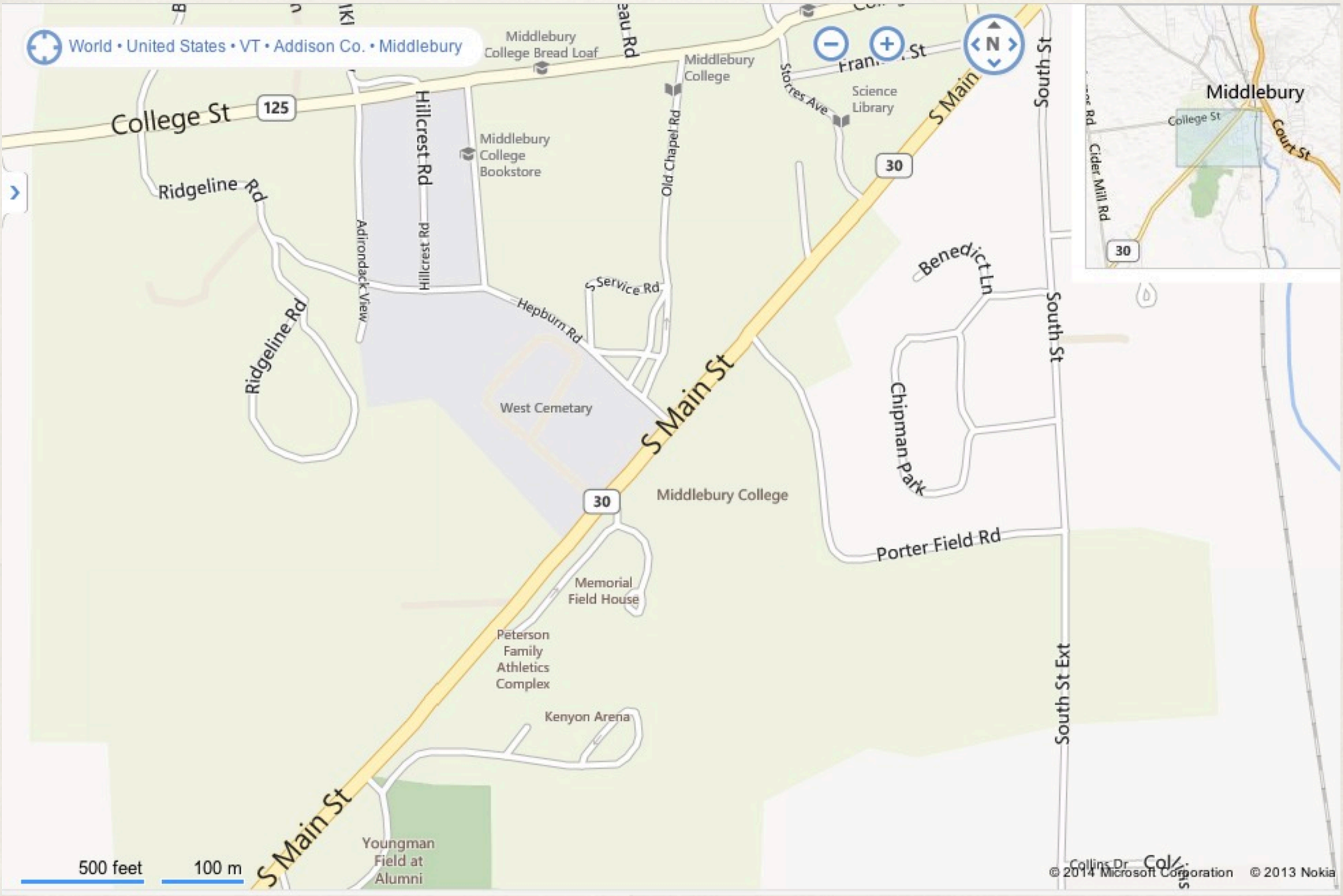
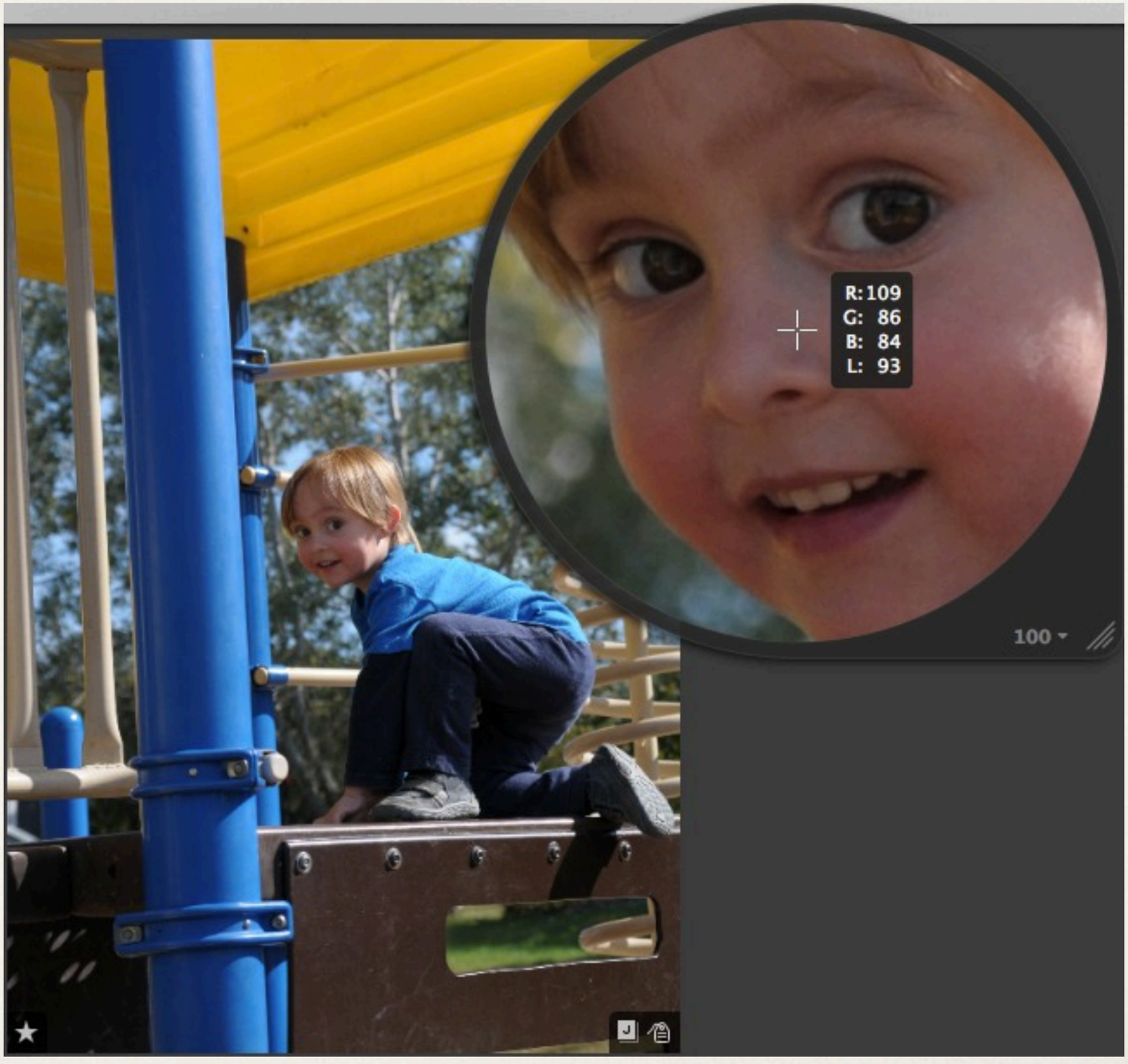
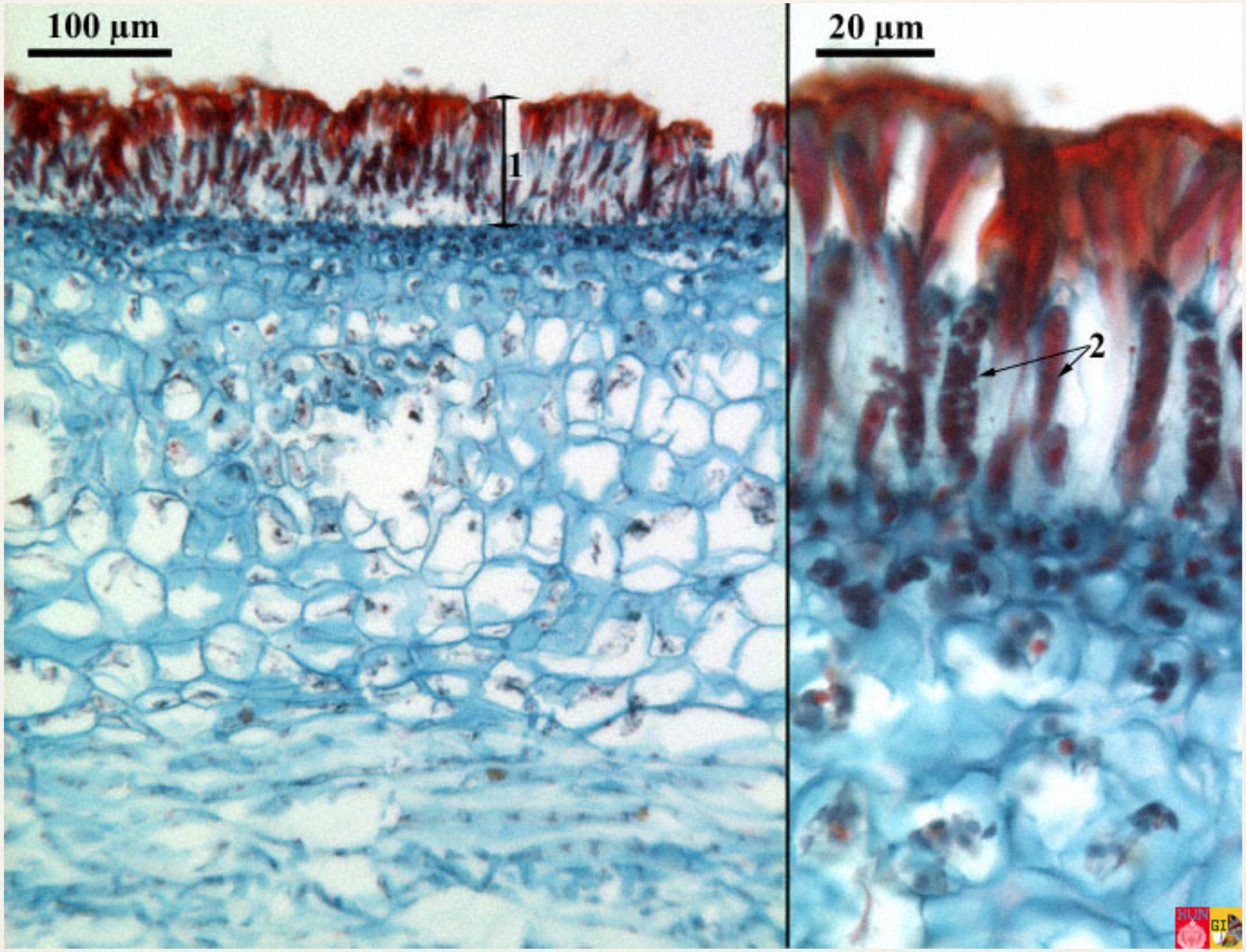


Overview + detail

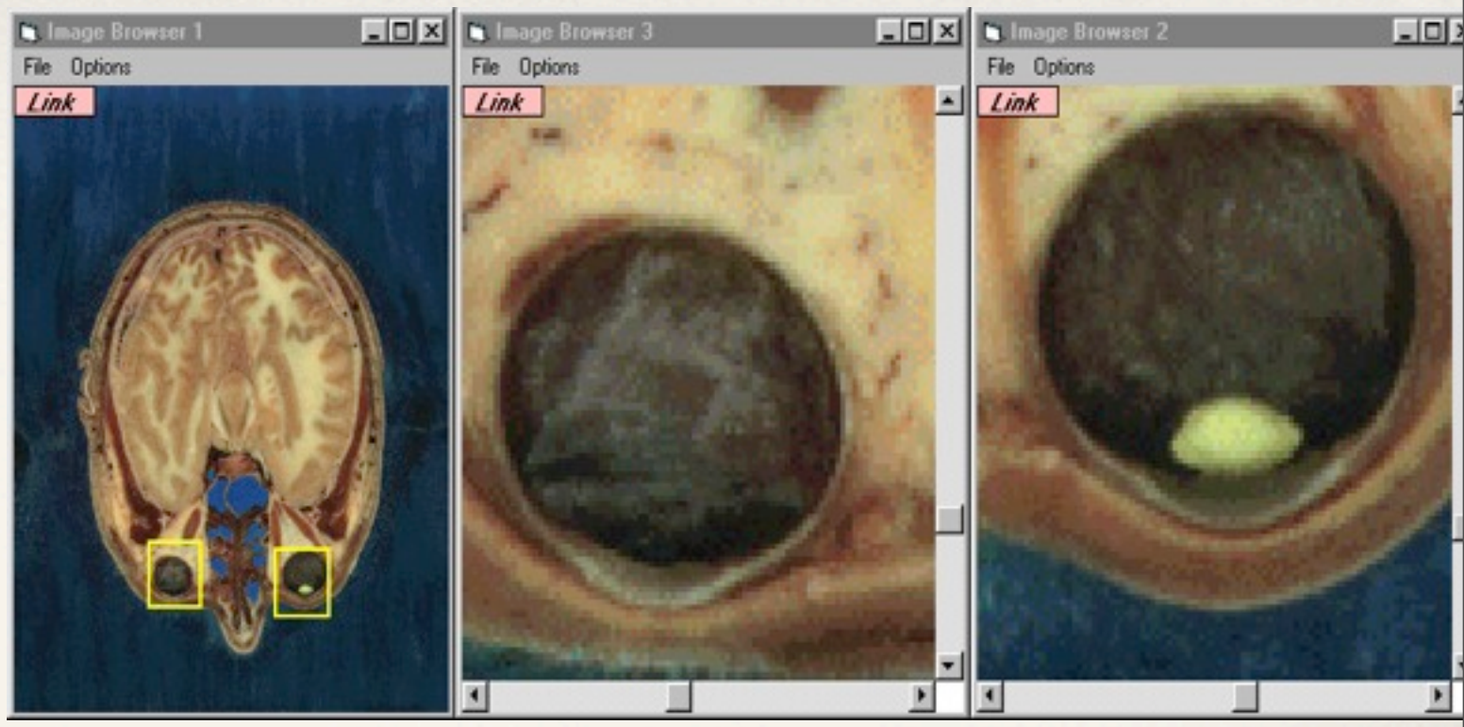


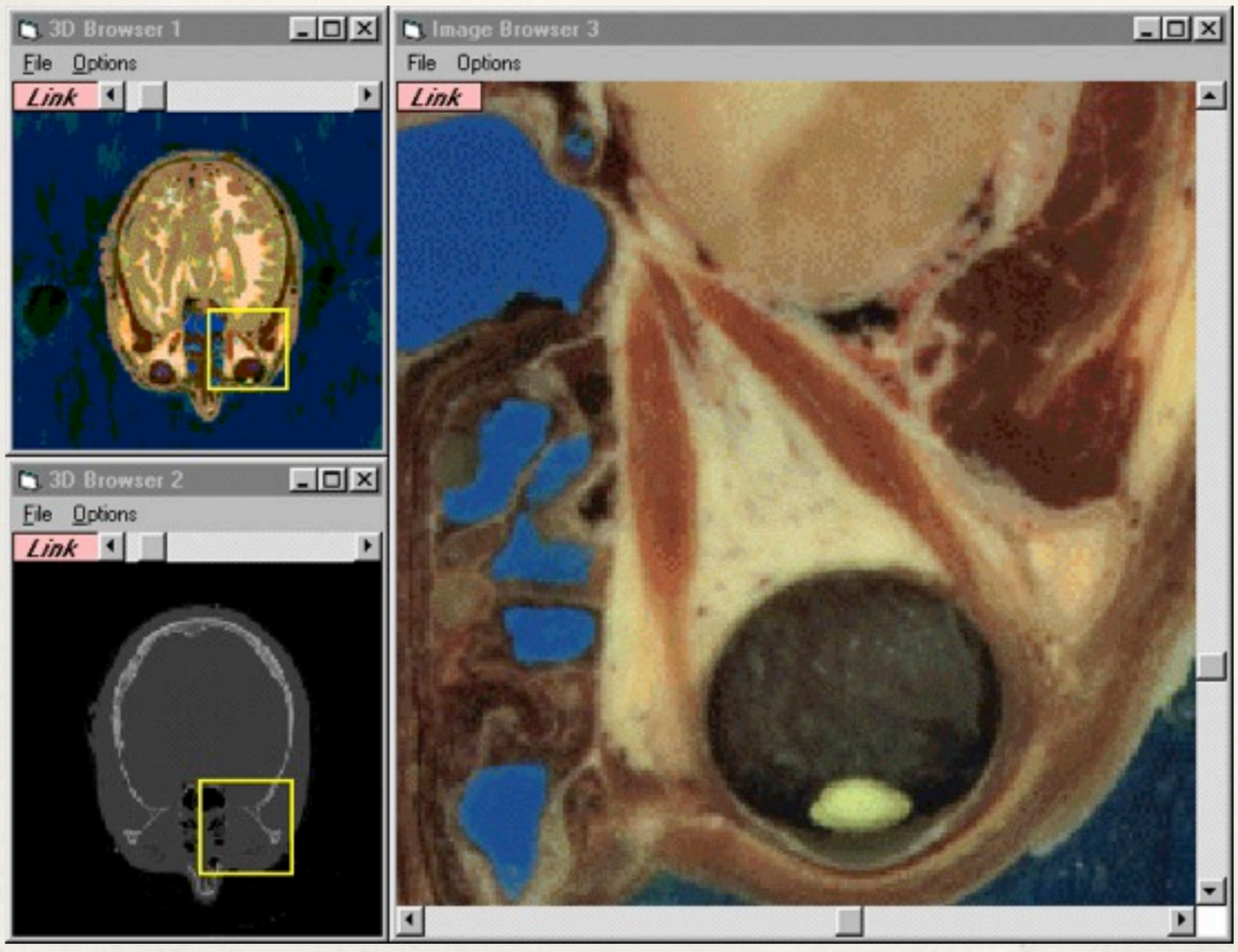
Overview + detail



http://www.vcbio.science.ru.nl/en/image-gallery/show/labels/print/PL0016/

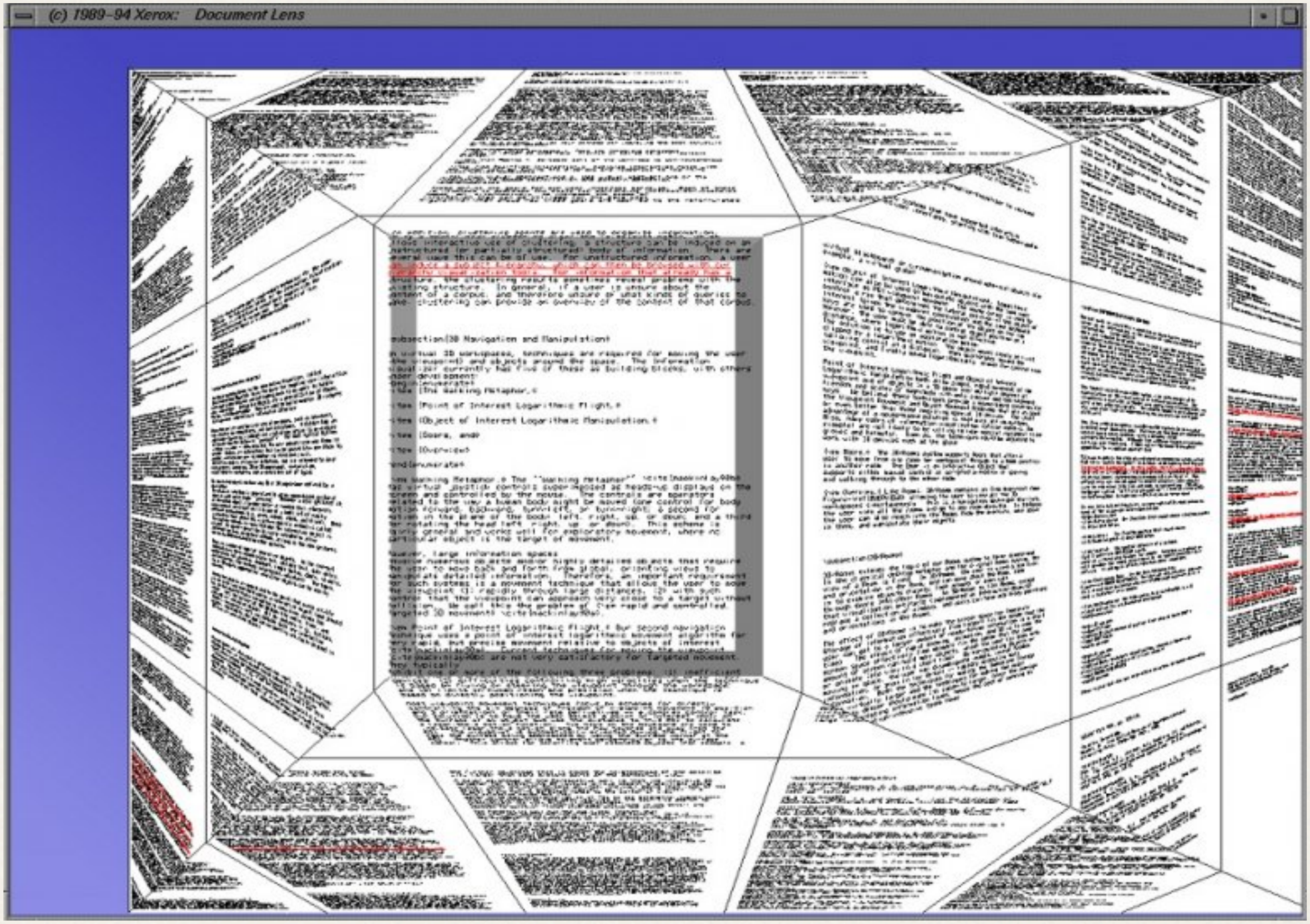
Overview + detail





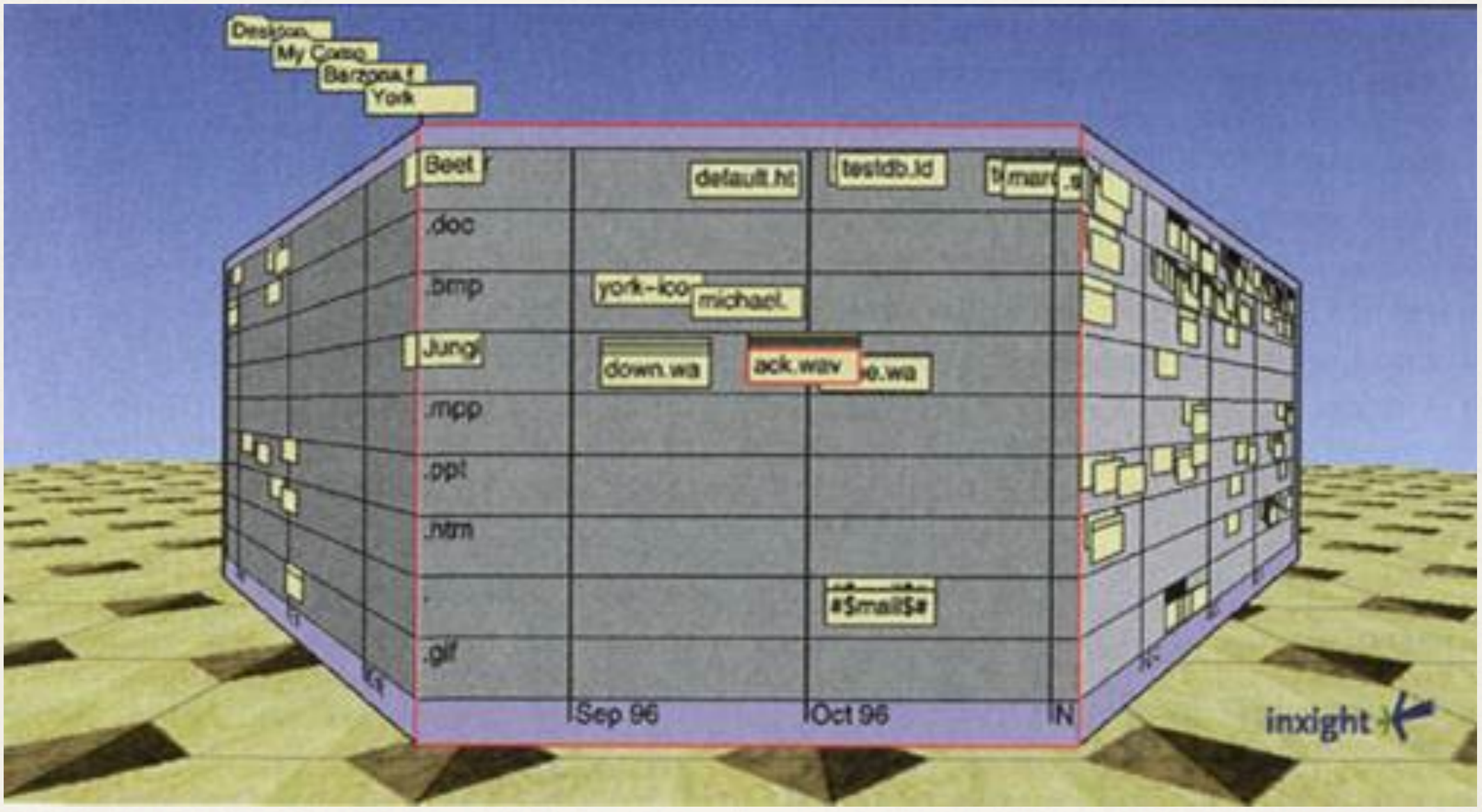
borrowed from C. North

Focus + context



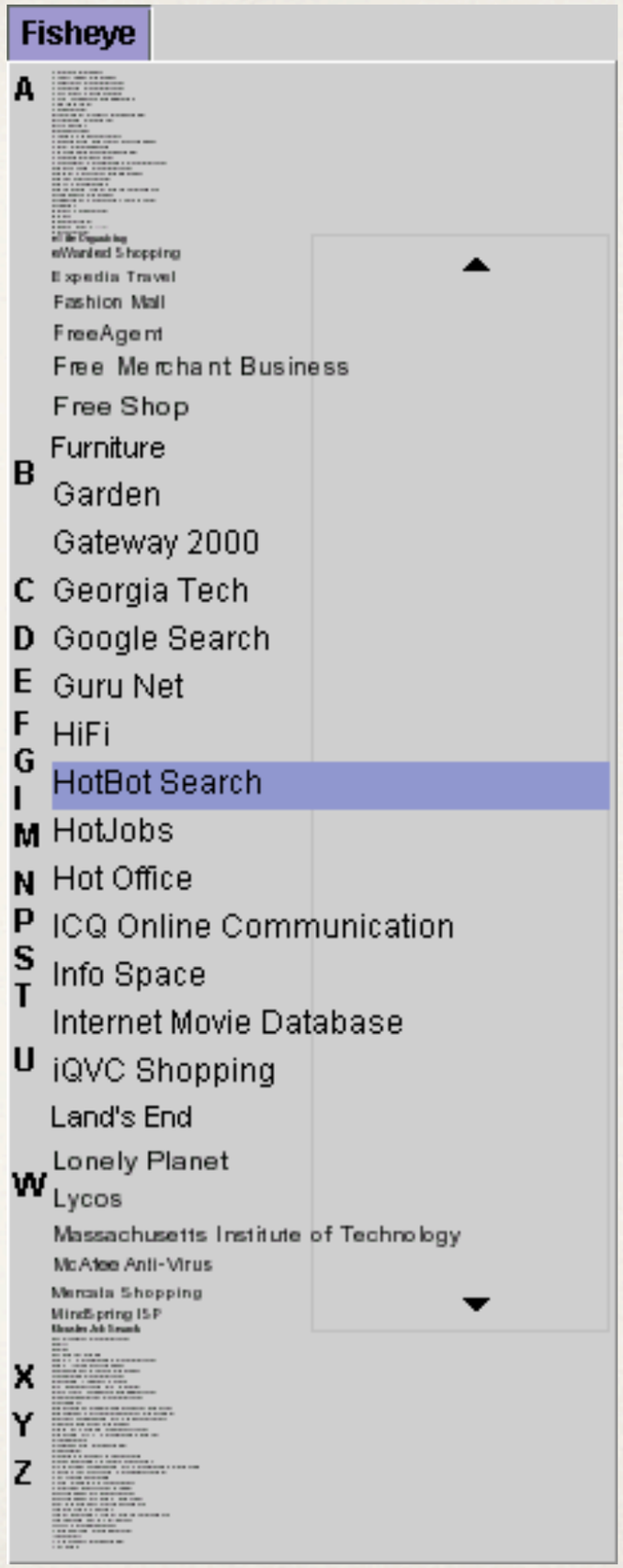
Robertson and MacKinlay, “Document Lens”

Focus + context



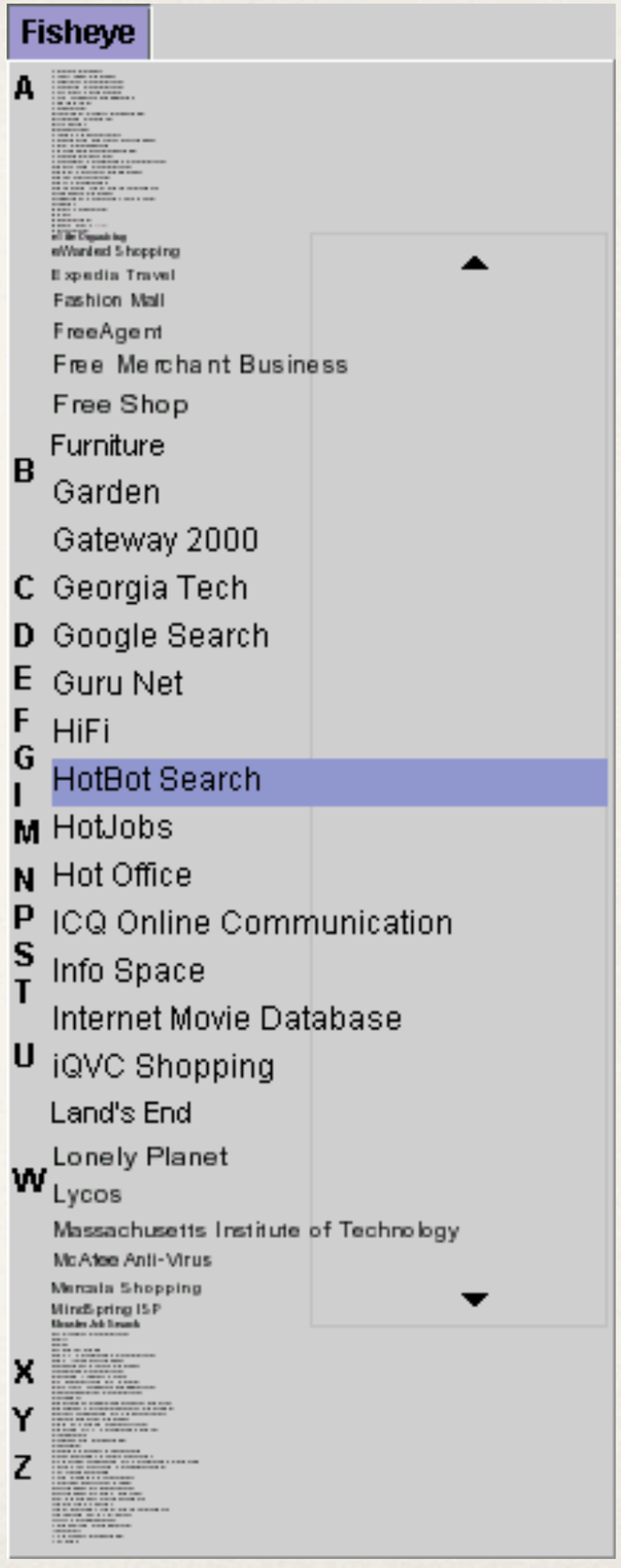
Robertson, MacKinlay, and Card, "Perspective Wall"

Focus + context



Bederson, "Fisheye menus"

Focus + context



Bederson, "Fisheye menus"

Focus + context

Table Lens: Baseball Player Statistics

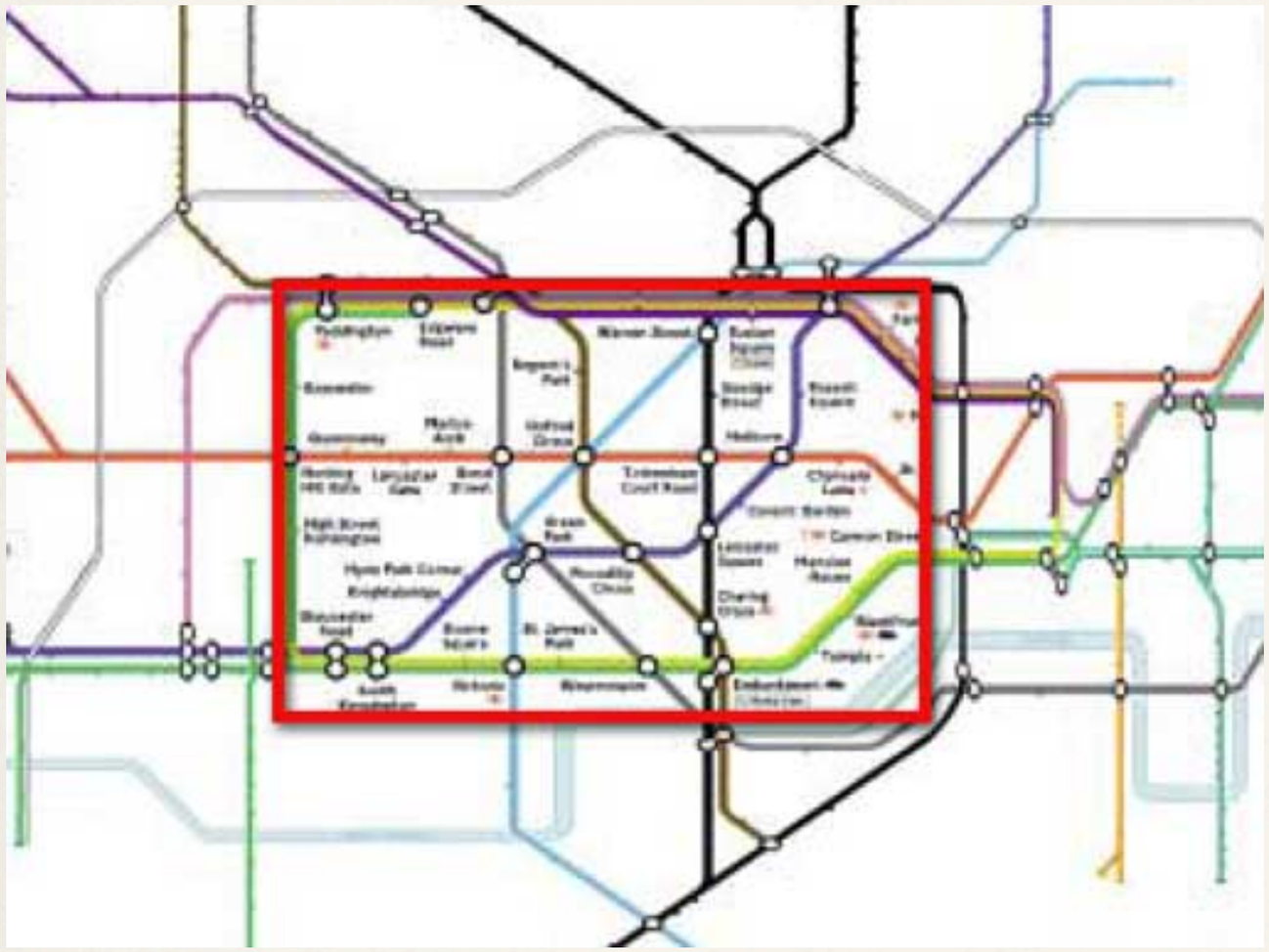
Calculate: "Hits" / "At Bats" = "Avg"

	Avg	Career Avg	Team	Salary 87
Larry Herndon	0.24734983	0.27282876	Det.	225
Jesse Barfield	0.2886248	0.27268818	Tor.	1237.5
Jeffrey_Leonar	0.27859238	0.27260458	S.F.	900
Donnie Hill	0.28318584	0.2725564	Oak.	275
Billy Sample	0.285	0.2718601	Atl.	NA
Howard Johnson	0.24545455	0.25232068	N.Y.	297.5
Andres Thomas	0.250774	0.2521994	Atl.	75
Billy Hatcher	0.25775656	0.25211507	Hou.	110
Omar Moreno	0.2339833	0.2518029	Atl.	NA
Darnell Coles	0.2725528	0.25153375	Det.	105

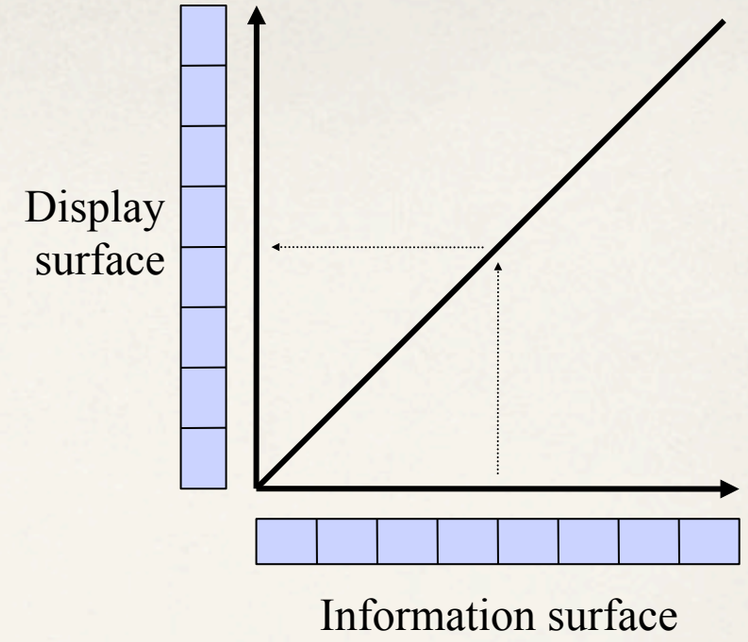
Row 304: Mike Lavalliere; Column 20: Put Outs Value: 468 810 -- 2163

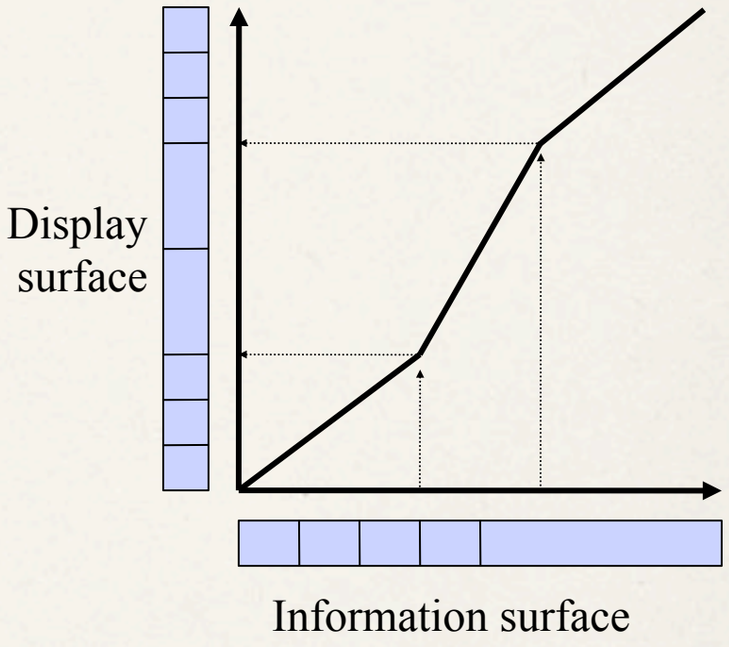
Rao and Card, "The Table Lens: Merging Graphical and Symbolic Representations in an Interactive Focus+Context Visualization for Tabular Information"

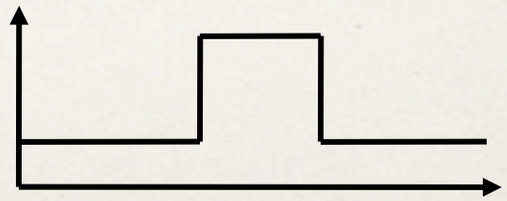
Visual transfer functions



Bifocal

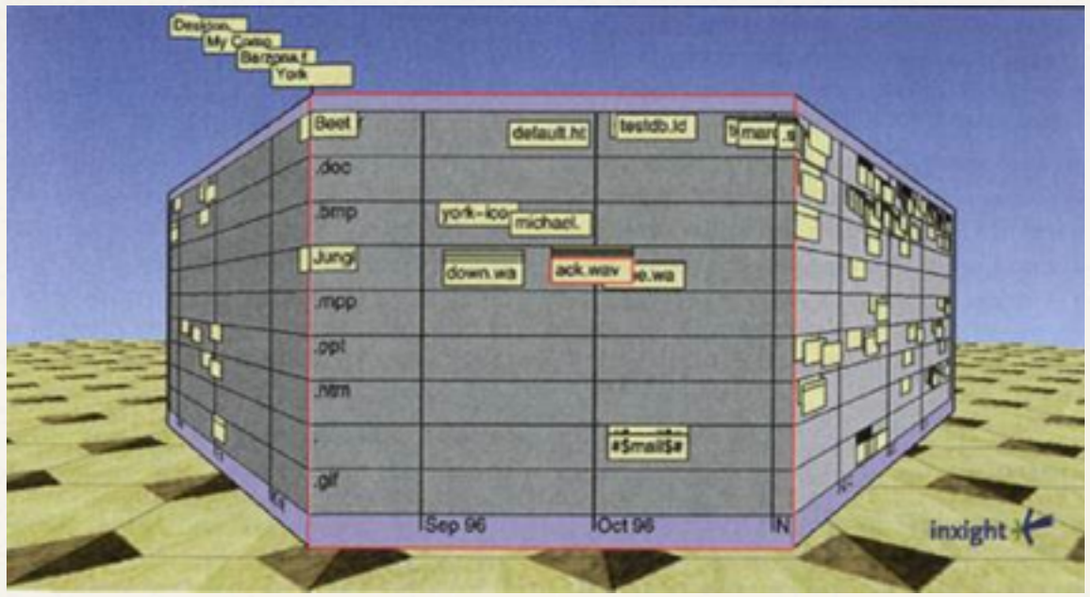


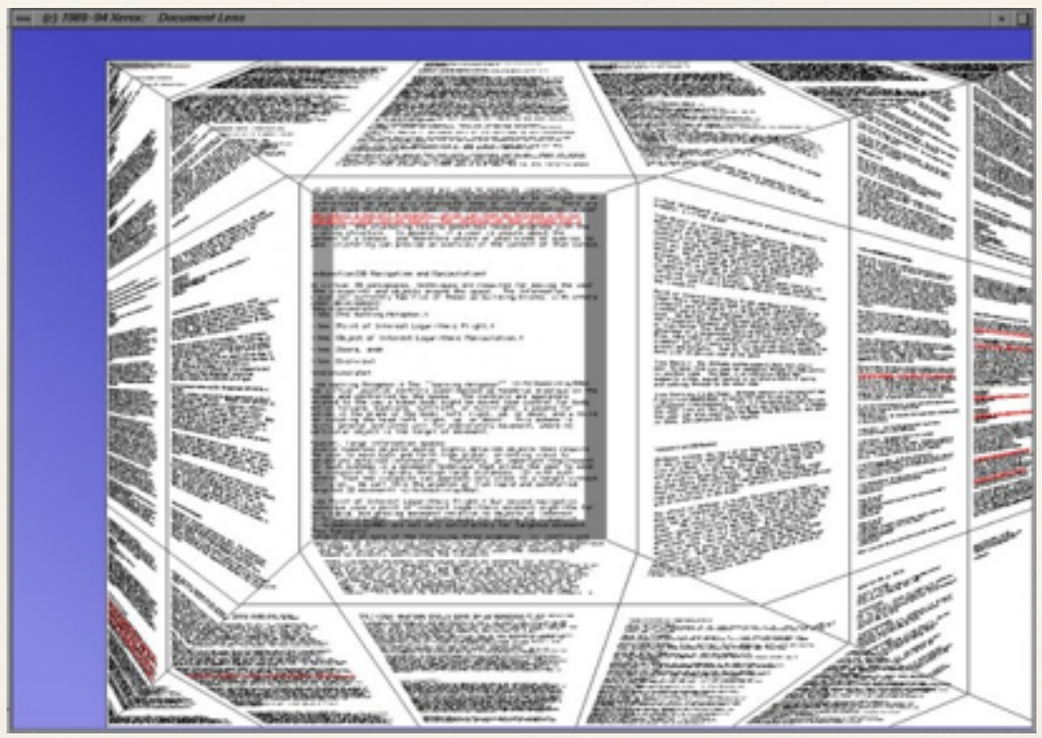


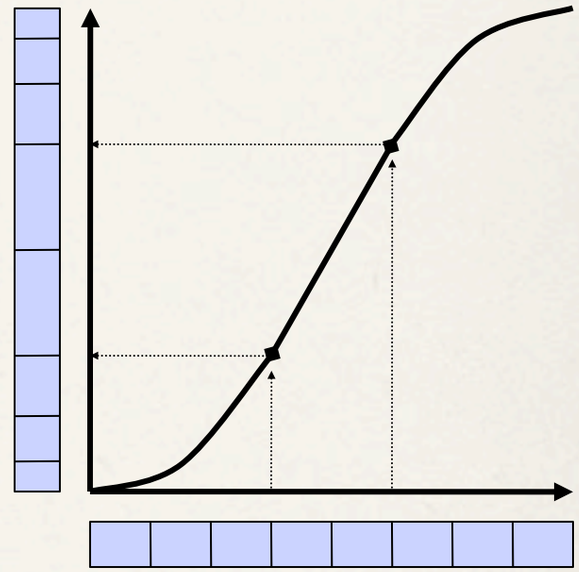


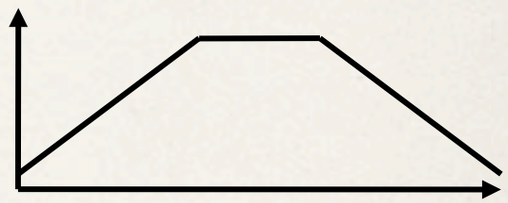
borrowed from C. North

Visual transfer functions





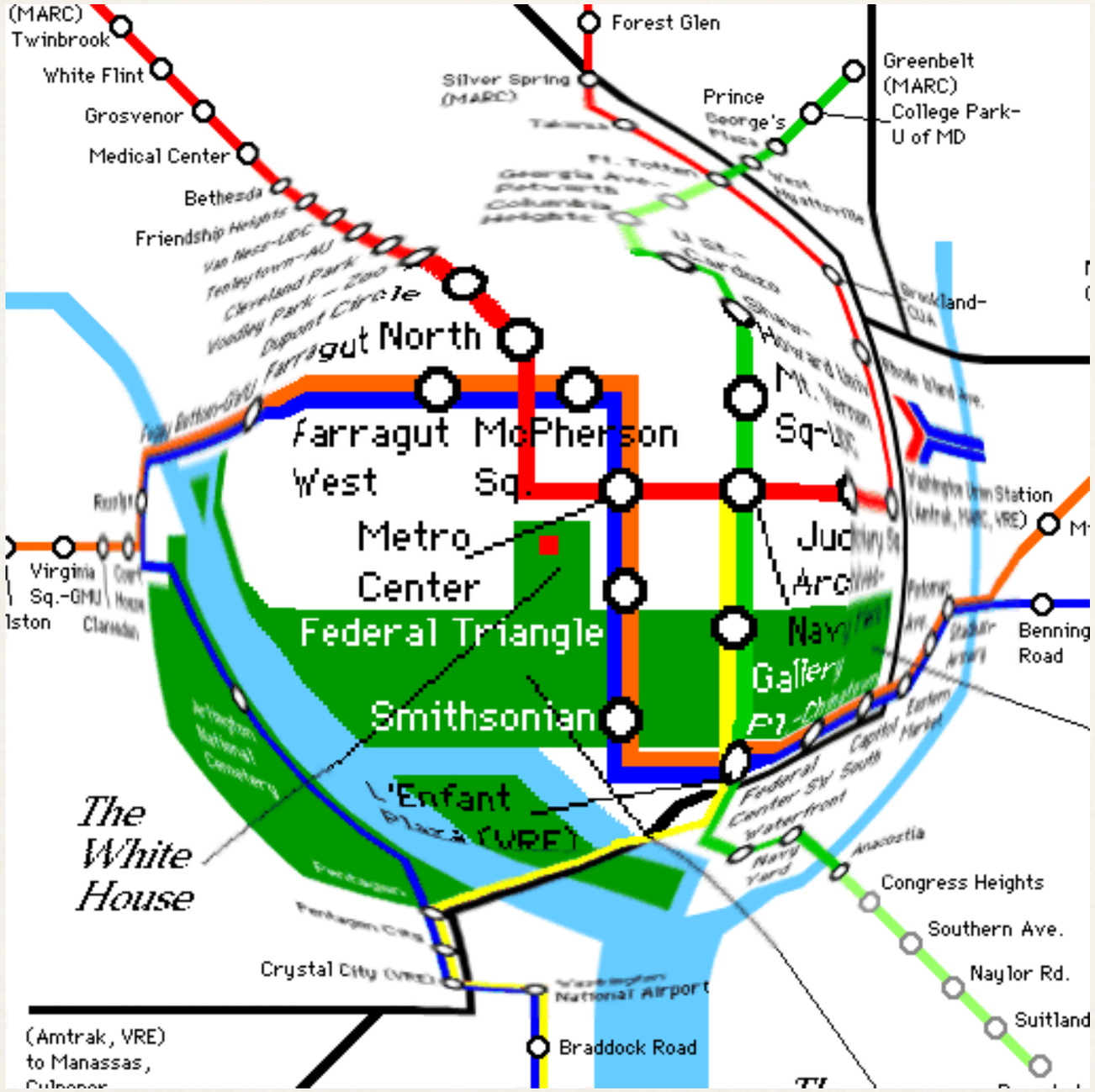


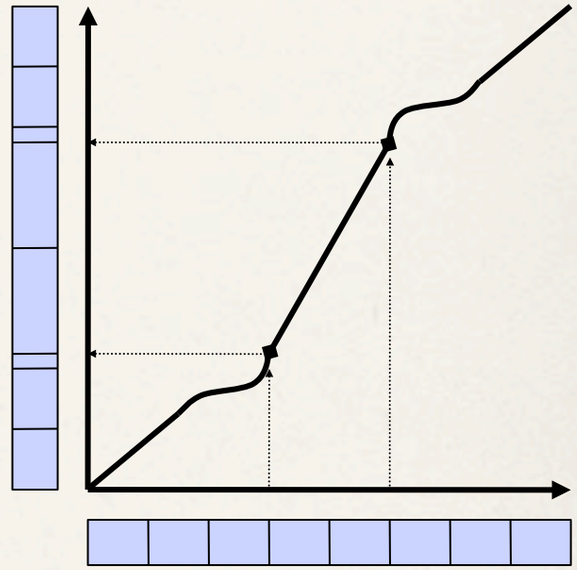


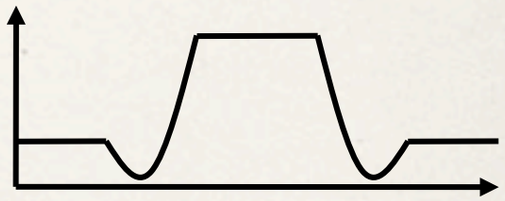
Perspective

borrowed from C. North

Visual transfer functions



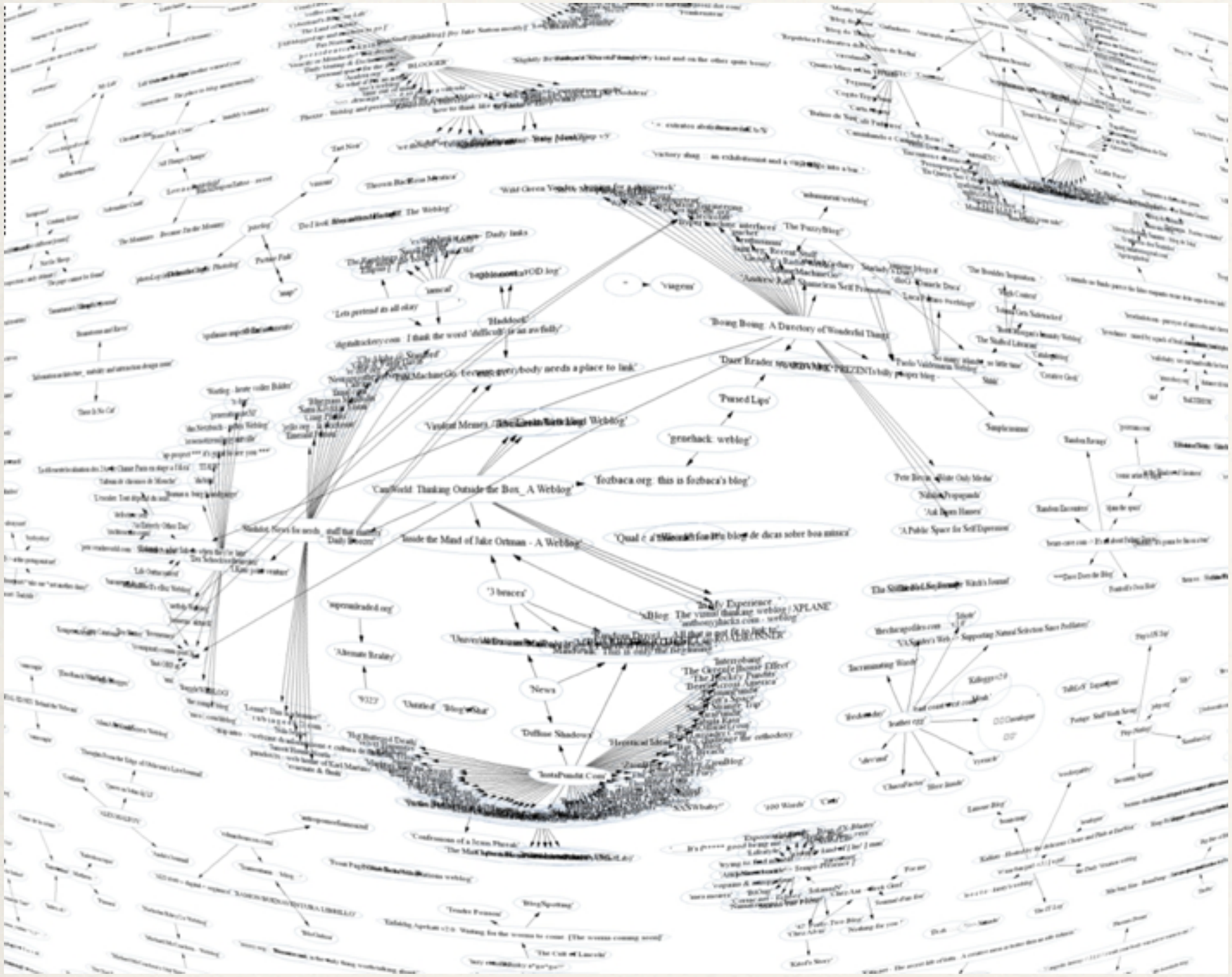


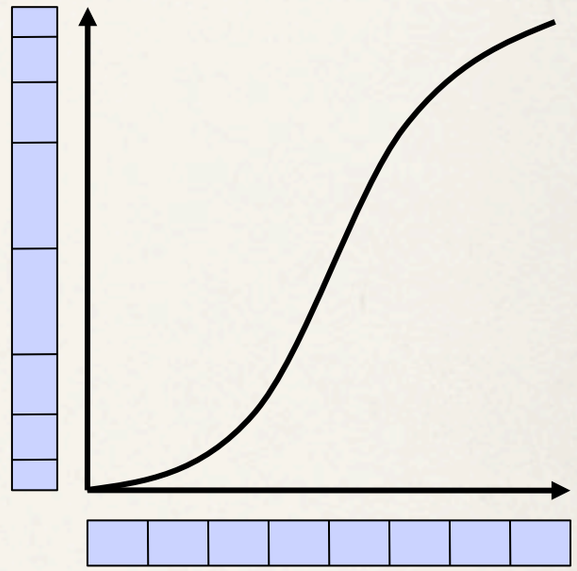


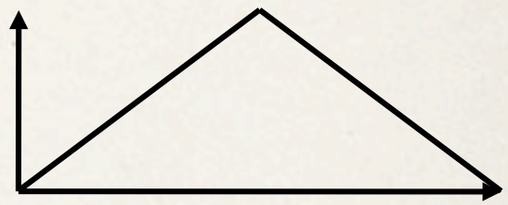
Bubble

borrowed from C. North

Visual transfer functions



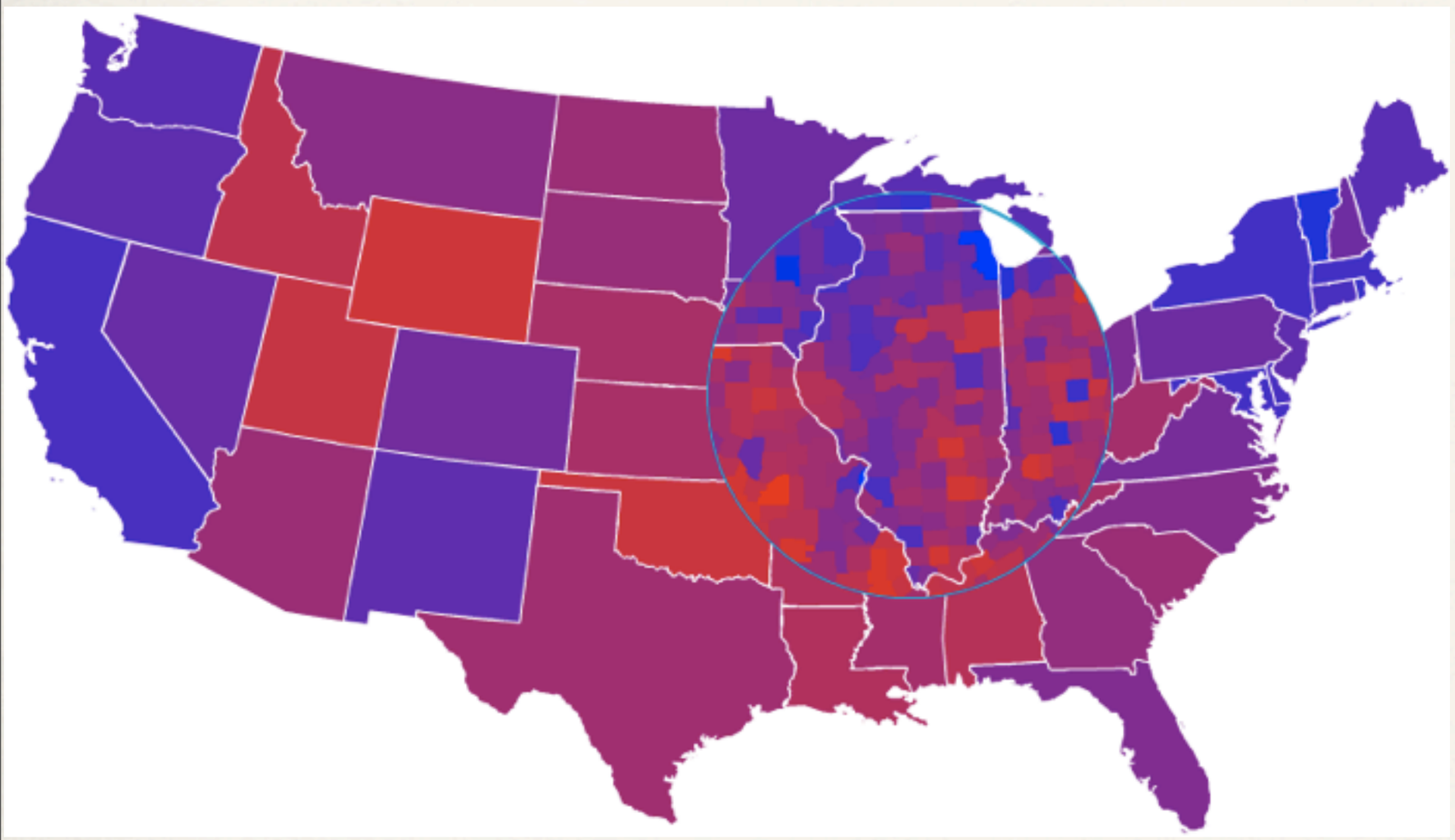


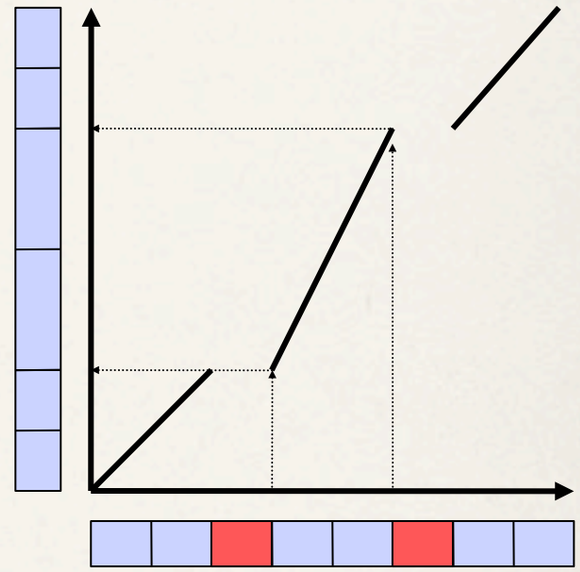


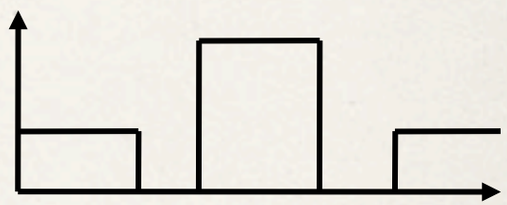
Fish-eye

borrowed from C. North

Visual transfer functions



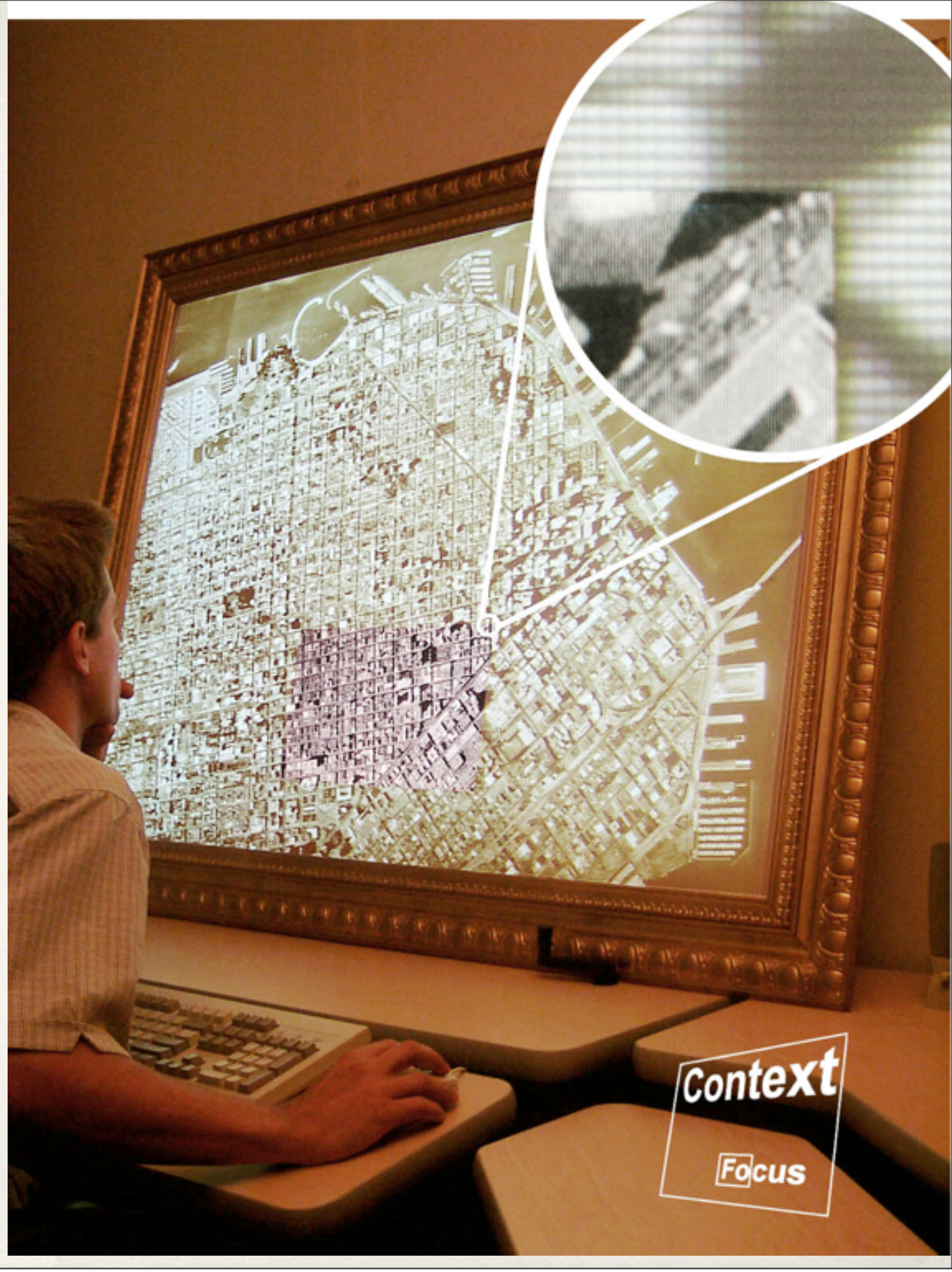




Magnifying glass

borrowed from C. North

Focus + Context Screen



Baudish, “Keeping things in context...”

F+C versus O+D

Focus + Context

+ space efficient
+ smooth transition between detail and context

- distorts the view
- content moves differently than the mouse
- zoom factors are usually small (otherwise the distortion is large)

Overview + Detail

+ scales up to much larger data
+ multiple overviews possible
+ easier to implement

- detail and overview are disconnected
- replicates data
- takes up more screen real estate

borrowed from C. North

Navigation strategies

detail only

pan and zoom

overview + detail

focus + context

detail *without* overview

detail *or* overview

detail *next* to overview

detail *with* overview

borrowed from C. North