

CS W4170

Information Visualization 2

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Fisheye Views G. Furnas, CHI 86

```
28         t[0] = (t[0] + 10000)
29         - x[0];
30         for(i=1;i<k;i++){
31             t[i] = (t[i] + 10000)
32                 - x[i]
33                 - (1 - t[i-1]/10000);
34             t[i-1] %= 10000;
35         }
36         t[k-1] %= 10000;
37         break;
38     case 'e':
>39         for(i=0;i<k;i++) t[i] = x[i];
40         break;
41     case 'q':
42         exit(0);
43     default:
44         noprint = 1;
45         break;
46     }
47     if(!noprint){
48         for(i=k - 1;t[i] <= 0 && i > 0;i--);
49         printf("%d",t[i]);
50         if(i > 0) {
```

Conventional view of C program

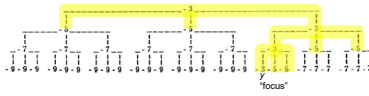
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Fisheye Views G. Furnas, CHI 86

```

1 #define DIG 40
2 #include <stdio.h>
...4 main()
5 {
6     int c, i, x[DIG/4], t[DIG/4], k = DIG/4, noprint = 0;
...8     while((c=getchar()) != EOF){
9         if(c >= '0' && c <= '9'){
...16         } else {
17             switch(c){
18                 case '+':
...27                 case '-':
...38                 case 'c':
>>39                 for(i=0;i<k;i++) t[i] = x[i];
40                     break;
41                 case 'q':
...43                 default:
...46             }
47             if(!noprint){
...57             }
58         }
59         noprint = 0;
60     }
61 }

```



First-order fisheye view of C program, where focus is line 39 (same number of lines, redrawn using compaction)

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Fisheye Views G. Furnas, CHI 86

```

1 #define DIG 40
2 #include <stdio.h>
3
4 main()
5 {
6     int c, i, x[DIG/4], t[DIG/4], k = DIG/4, noprint = 0;
7
8     while((c=getchar()) != EOF){
9         if(c >= '0' && c <= '9'){
10             x[i] = 10 * x[i] + (c - '0');
11             for(i=i+1;i<k;i++){
12                 x[i] = 10 * x[i];
13                 x[i-1] /= 10000;
14             }
15         }
16         else {
17             switch(c){
18                 case '+':
19                     t[i] = t[i] + x[i];
20                     for(i=i+1;i<k;i++){
21                         t[i] = t[i] + x[i];
22                         t[i-1] /= 10000;
23                     }
24                     t[k-1] /= 10000;
25                     break;
26                 case '-':
27                     t[i] = t[i] + (x[i] + 10000);
28                     x[i] = 0;
29                     for(i=i+1;i<k;i++){
30                         t[i] = t[i] + x[i];
31                         t[i] = t[i] + 10000;
32                         t[i-1] /= 10000;
33                     }
34                     t[k-1] /= 10000;
35                     break;
36                 case 'c':
37                     for(i=0;i<k;i++) t[i] = x[i];
38                     break;
39                 case 'q':
40                     if(!noprint){
41                         printf("%d", t[i]);
42                     }
43                     noprint = 1;
44                     break;
45             }
46         }
47         if(!noprint){
48             for(i=k-1;i>0;i--){
49                 printf("%d", t[i]);
50                 if(i % 10 == 0) printf("\n");
51             }
52             printf("\n");
53             for(i=0;i<k;i++) x[i] = 0;
54         }
55         noprint = 0;
56     }
57 }

```

First-order fisheye
(underlined code) vs.
conventional view (boxed
code)

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Fisheye Menus

In the sense of
variable magnification
relative to a focus

- Apple macOS dock with “Magnification” enabled
 - But, remember Fitts’s Law!



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Data Types: 2D Spatial

- Inherently spatial data
 - Maps

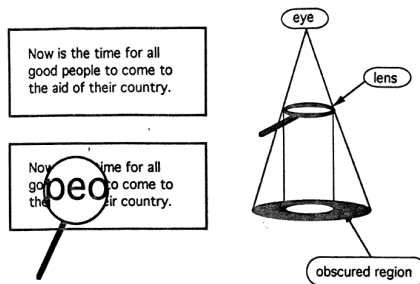


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Data Types: 2D Spatial

- Use of distortion viewing to provide “focus+context”

Simple magnification loses context



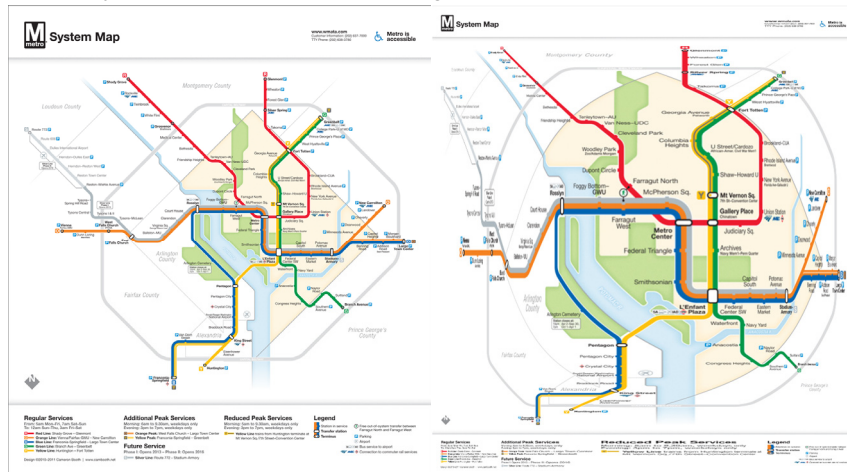
Robertson and Mackinlay, *UIST 93*

- Change scale in focus relative to context

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Data Types: 2D Spatial

Inherently spatial data: Distortion viewing applied to a map



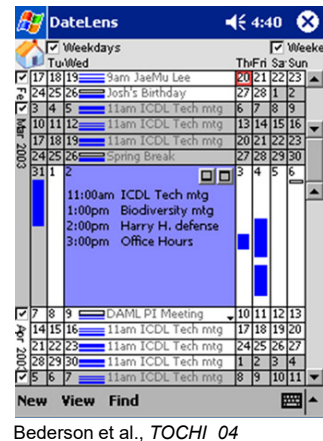
Redrawn version of DC Metro Map
<http://www.cambooth.net/washington-metro-diagram-my-last-word/>

Distortion viewing applied to redrawn DC Metro Map
<http://holisticsofa.com/category/visualization/page/3/>

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Data Types: 2D Spatial

- Abstract data
 - Need to select bindings to XY coordinates
 - Can use *semantic zoom*
 - Zooming (magnification/minification) that changes the representation (e.g., shape, format, level of detail) instead of or in addition to geometric scale

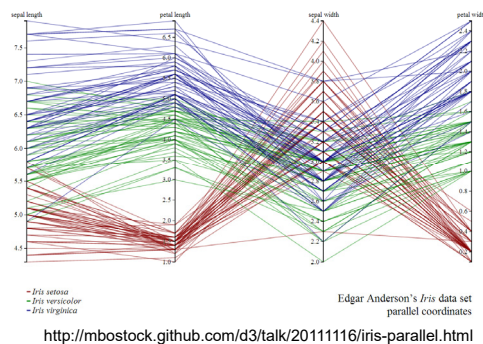


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Data Types: Multidimensional

E.g., <http://www.parallelcoordinates.de/paco/>

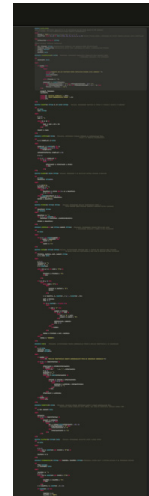
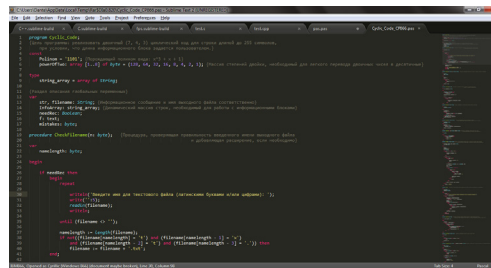
- Abstract data
 - *Parallel coordinates* (A. Inselberg)
 - N variables represented by N parallel axes
 - Multivariate point depicted as a polyline connecting vertices on axes
 - Interaction
 - Limit range on axis
 - Scale axis
 - Reorder axes



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Tasks: Overview

- Panning/scrolling over display
- Separate “overview” display with “you are here” marker
 - E.g., Sublime Text 2



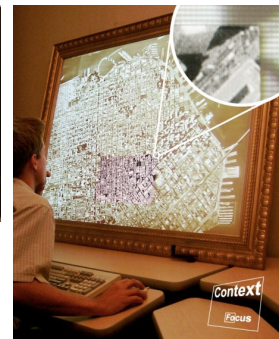
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Tasks: Overview

- Focus+context
 - Handle overview and zoom tasks in same display
 - Focus items receive greater
 - Magnification and/or
 - Level-of-detail
 - Alternatively, two geometrically registered displays can be used
 - Feiner & Shamash, 91
 - Baudisch et al., 01
 - Jones et al., 13



S. Feiner & A. Shamash, *UIST 91*
Focus = flat panel;
Context = Head-worn display



P. Baudisch, N. Good, & P. Stewart, *UIST 01*
Focus = flat panel;
Context = projector

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Tasks: Overview

- Focus+context
 - Handle overview and zoom tasks in same display
 - Focus items receive greater
 - Magnification and/or
 - Level-of-detail
 - Alternatively, two geometrically registered displays can be used
 - Feiner & Shamash, 91
 - Baudisch et al., 01
 - Jones et al., 13



Not really information visualization, but builds on this work,...

B. Jones, H. Benko, E. Ofek, & A. Wilson, *CHI* 2013
Focus = flat panel TV;
Context = projector illuminating room

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Tasks: Zoom

- Current example: Prezi



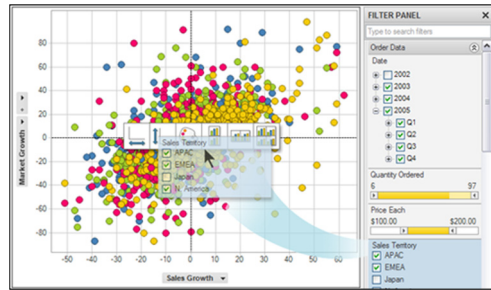
Chris Fisher
Holly Lobprise
Annie Nam
Brittini Ping

prezi.com

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Tasks: Filter

- Narrow scope by eliminating (or de-emphasizing) “uninteresting” items
- Dynamic queries
 - Widgets specify queries
 - Satisfied interactively during manipulation
 - Filmfinder: <http://www.open-video.org/details.php?videoid=708>
 - Google instant
- Examples in which filters are satisfied after widget manipulation
 - spotfire.tibco.com/demos
 - bluenile.com “Search for Diamonds”



spotfire.tibco.com

Search for Diamonds

ASTOR Diamonds cut for brilliance

Shape: Round, Princess, Emerald, Asscher, Cushion, Pear, Oval, Marquise, Heart, Baguette, Trillion, Other

Price: \$10,000 to \$2,723,137

Color: D to Z

Clarity: VVS1 to I1

Carat: 0.01 to 20.07

View: All Diamonds (6,154), Best Selling (20), Compare (3)

Image	Shape	Price	Carat	Color	Clarity	Setting	Delivery Date
	Round	\$10,001	1.10	Astoria Ideal	H	VVS2	Dec 8
	Round	\$10,005	1.51	Ideal	I	VVS1	Dec 12
	Round	\$10,009	0.93	Ideal	D	IF	Dec 17
	Emerald	\$10,011	1.20	Very Good	D	VVS1	Dec 12
	Round	\$10,011	1.21	Ideal	D	VVS2	Dec 12
	Round	\$10,015	1.02	Ideal	D	VVS1	Dec 17
	Round	\$10,016	1.12	Ideal	D	VVS2	Dec 14
	Round	\$10,016	1.96	Ideal	E	VVS2	Dec 17
	Round	\$10,018	1.19	Ideal	G	VVS1	Dec 12
	Round	\$10,019	1.26	Ideal	F	VVS2	Dec 12
	Round	\$10,021	1.10	Ideal	F	VVS2	Dec 14
	Round	\$10,023	1.05	Ideal	E	VVS2	Dec 14
	Round	\$10,023	1.20	Ideal	G	VVS1	Dec 14
	Round	\$10,025	1.40	Ideal	I	VVS2	Dec 17
	Round	\$10,026	1.19	Ideal	G	VVS2	Dec 17
	Round	\$10,028	1.07	Ideal	F	VVS2	Dec 10
	Emerald	\$10,031	1.28	Very Good	D	IF	Dec 11
	Round	\$10,032	1.19	Ideal	G	VS1	Dec 10
	Round	\$10,032	1.31	Ideal	H	VS1	Dec 10
	Round	\$10,033	1.04	Ideal	E	IF	Dec 14
	Round	\$10,034	1.12	Ideal	E	VVS1	Dec 13
	Round	\$10,035	1.50	Ideal	I	VS1	Dec 17
	Round	\$10,035	1.03	Ideal	F	IF	Dec 14
	Round	\$10,035	1.36	Ideal	H	VS1	Dec 17
	Round	\$10,036	1.40	Ideal	I	IF	Dec 10
	Round	\$10,036	1.24	Ideal	G	VVS2	Dec 10
	Round	\$10,038	1.03	Ideal	F	VVS1	Dec 10
	Round	\$10,041	1.00	Ideal	D	VS1	Dec 12

www.bluenile.com

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Tasks: Details-on-demand

- Present additional information when requested
- Examples
 - Separate window/display
 - “Popup”/overlay/“tool tip”
 - Modify rendering of item to increase detail

All Diamonds (6,177) Best Selling (20) Compare (2)

Image	Shape	Price	Carat	Color	Clarity	Delivery Date
	Round	\$10,001	1.10	Astoria Ideal	H	VVS2
	Round	\$10,005	1.51	Ideal	I	VVS1
	Round	\$10,009	0.93	Ideal	D	IF
	Emerald	\$10,011	1.20	Very Good	D	VVS1
	Round	\$10,011	1.21	Ideal	D	VVS2
	Round	\$10,015	1.02	Ideal	D	VVS1
	Round	\$10,016	1.12	Ideal	D	VVS2
	Round	\$10,016	1.96	Ideal	E	VVS2
	Round	\$10,018	1.19	Ideal	G	VVS1
	Round	\$10,019	1.26	Ideal	F	VVS2
	Round	\$10,021	1.10	Ideal	F	VVS2
	Round	\$10,023	1.05	Ideal	E	VVS2
	Round	\$10,023	1.20	Ideal	G	VVS1
	Round	\$10,025	1.40	Ideal	I	VVS2
	Round	\$10,026	1.19	Ideal	G	VVS2
	Round	\$10,028	1.07	Ideal	F	VVS2
	Emerald	\$10,031	1.28	Very Good	D	IF
	Round	\$10,032	1.19	Ideal	G	VS1
	Round	\$10,032	1.31	Ideal	H	VS1
	Round	\$10,033	1.04	Ideal	E	IF
	Round	\$10,034	1.12	Ideal	E	VVS1
	Round	\$10,035	1.50	Ideal	I	VS1
	Round	\$10,035	1.03	Ideal	F	IF
	Round	\$10,035	1.36	Ideal	H	VS1
	Round	\$10,036	1.40	Ideal	I	IF
	Round	\$10,036	1.24	Ideal	G	VVS2
	Round	\$10,038	1.03	Ideal	F	VVS1
	Round	\$10,041	1.00	Ideal	D	VS1

Remove → ← Remove

Play All

Enlarge

View Details

LD11035552 LD11526745

Add to ADD TO ADD TO

Price \$10,015 \$10,016

Carat Weight 1.02 1.06

Shape RD RD

Cut Ideal Ideal

Color D E

Clarity VVS1 VVS2

L/W Ratio 1.01 1.00

Depth % 61.7 61.5

Table % 57.0 59.0

Polish Excellent Excellent

Symmetry Excellent Excellent

Culet None None

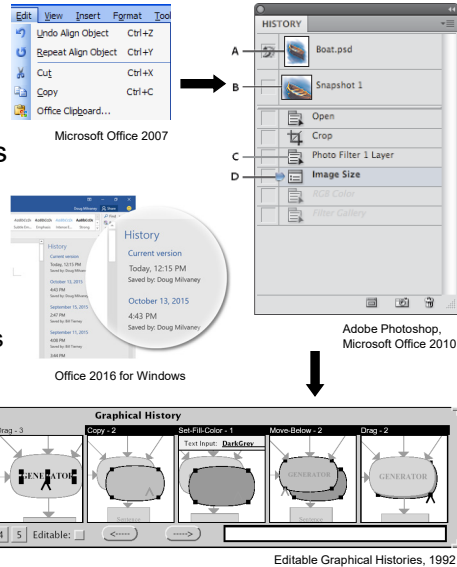
Fluorescence Medium None

www.bluenile.com

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Tasks: History

- Show historical evolution
- Support undo/redo
- Support creation of variants
- Range of examples
 - Single level undo/redo
 - Multilevel undo/redo
 - Photoshop history
 - Non-linear history
 - History brush
 - Editable Graphical Histories
 - Automatically generated tutorials



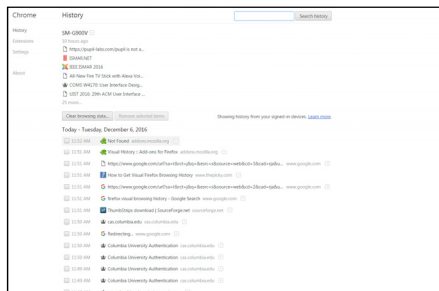
Editable Graphical Histories, 1992

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Tasks: History

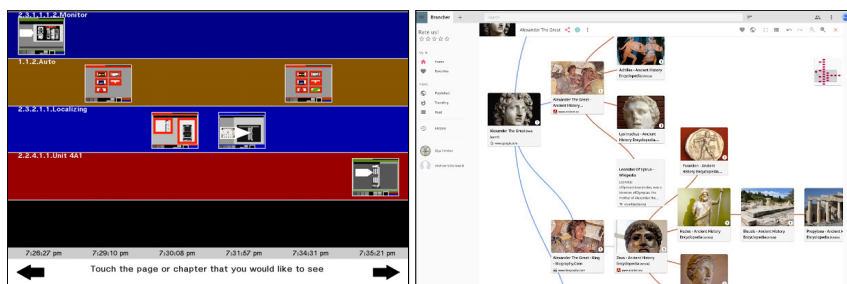
- E.g., hypertext browsing history

Textual:



Google Chrome

Graphical:



S. Feiner, S. Nagy, and A. van Dam, *ACM Trans. on Graphics*, 1982

brancher.io Visual history manager, 2017

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