CS W4170
Information Visualization 2

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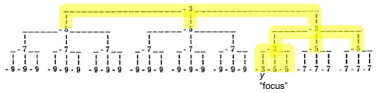
Fisheye Views *G. Furnas, CHI 86*

```
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

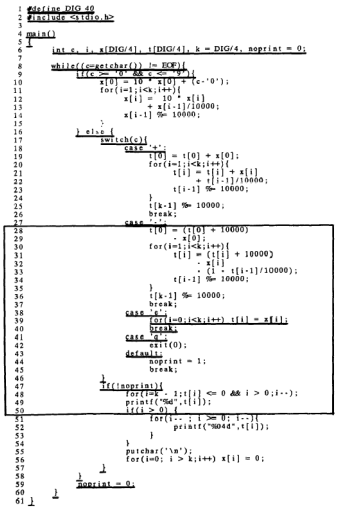
Fisheye Views *G. Furnas, CHI 86*

```
   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 'e':
>>39                             for(i=0;i<k;i++) t[i] = x[i];
  40                             break;
  41                       case 'q':
..43                       default:
..46                   }
..46                   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)

Fisheye Views *G. Furnas, CHI 86*



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

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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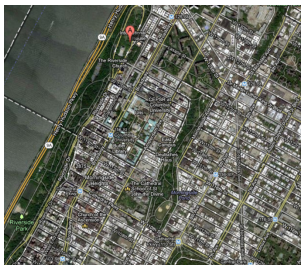
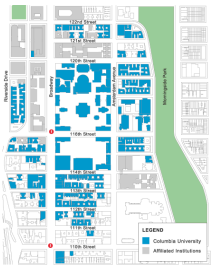
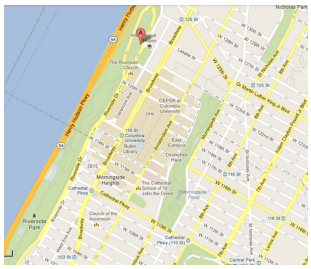
Data Types: 2D Spatial

- Inherently spatial data
  - Maps







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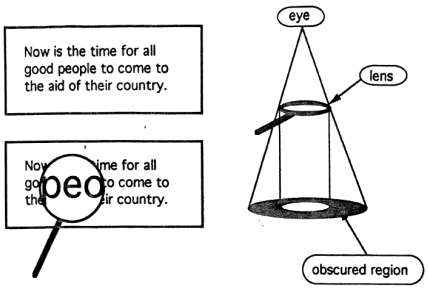
Data Types: 2D Spatial

- Use of distortion viewing to provide "focus+context"
  - Change scale in focus relative to context

Simple magnification loses context



Robertson and Mackinlay, *UIST 93*

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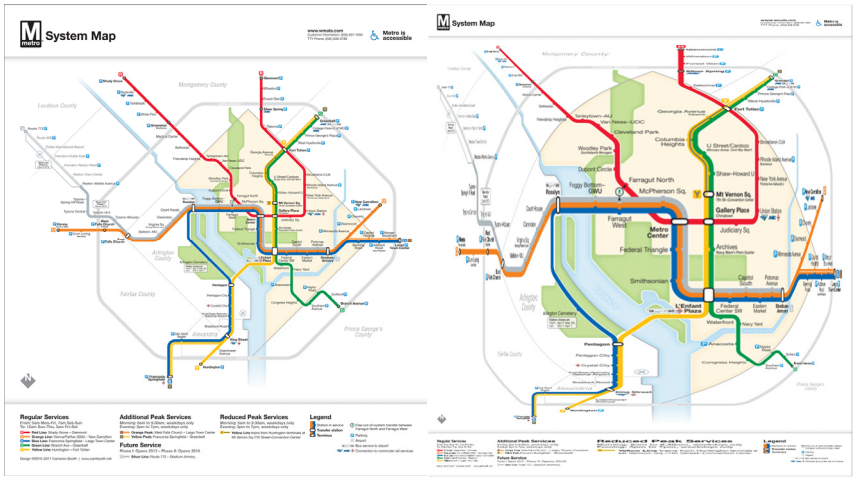
Data Types: 2D Spatial

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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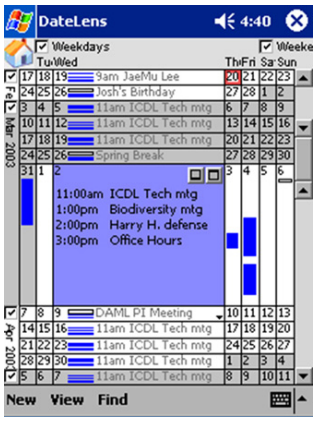
Data Types: 2D Spatial

- 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

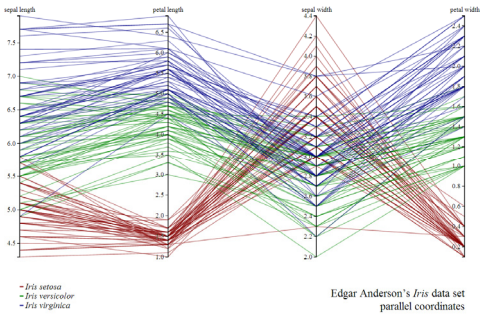


Bederson et al., *TOCHI 04*

Data Types: Multidimensional

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

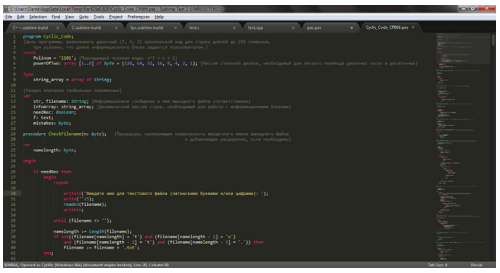
- Abstract data
  - *Parallel coordinates* (A. Inselberg)
    - *N* variables represented by *N* parallel axes
    - Multivariate point depicted as a polyline connecting vertices on axes
    - Interaction
      - Limit range on axis
      - Scale axis
      - Reorder axes



http://mbostock.github.com/d3/talk/20111116/iris-parallel.html

Tasks: Overview

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



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

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

prezi.com

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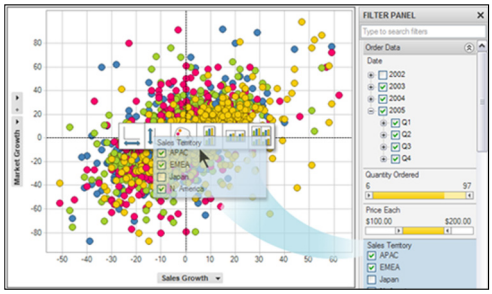
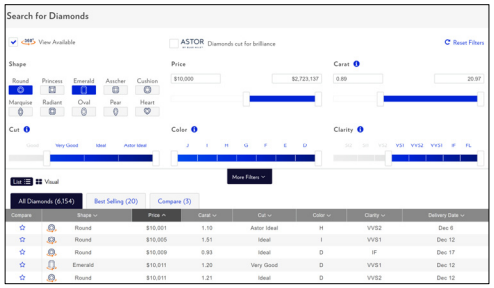
Tasks: Filter

- 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"



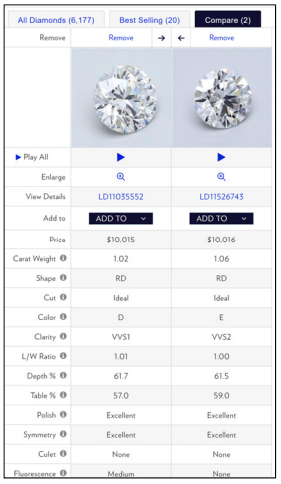
spotfire.tibco.com



www.bluenile.com

Tasks: Details-on-demand

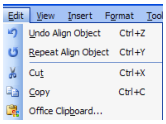
- Present additional information when requested
- Examples
  - Separate window/ display
  - "Popup"/ overlay/ "tool tip"
  - Modify rendering of item to increase detail



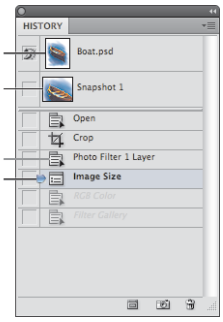
www.bluenile.com

Tasks: History

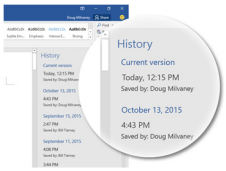
- Show historical evolution
- Support undo/redo
- Support creation of variants
- Range of examples
  - Single level undo/redo
  - Multilevel undo/redo
  - Photoshop history
    - Non-linear history
    - History brush
  - Editable Graphical Histories
  - Automatically generated tutorials



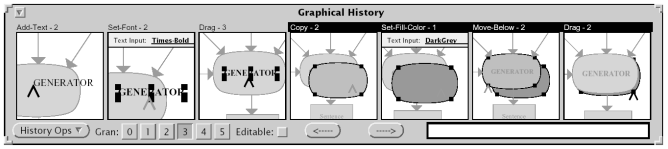
Microsoft Office 2007



Adobe Photoshop, Microsoft Office 2010



Office 2016 for Windows

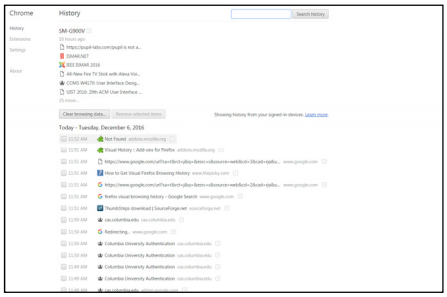


Editable Graphical Histories, 1992

Tasks: History

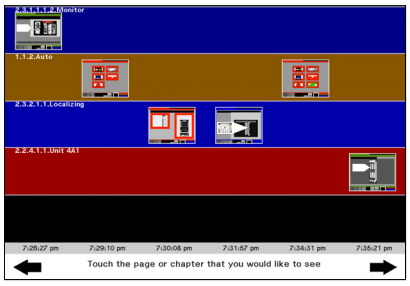
- E.g., hypertext browsing history

Textual:

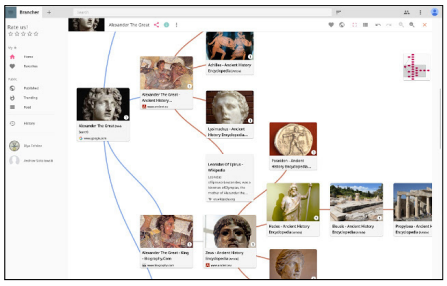


Google Chrome

Graphical:



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



brancher.io Visual history manager, 2017