Information Visualization In Practice

How the principles of information visualization can be used in research and commercial systems

Putting Information Visualization Into Practice

A Common Problem
• There is too much information to represent all at once
• Providing all the details all at once is not useful (results overload)
• Context is lost when the details of only subset of the information is shown.

Applying the principles of information visualization
Too Much Information To Show All At Once

Another Example Of The “Large Data Set – Limited Display Space Problem” : Games

Dungeon Master (Java version) http://www.cs.pitt.edu/~alandale/dmjava/
Too Much Information To Show All At Once

Approaches to the problem:

1) Scrolling
2) Magnification
3) The DragMag
4) Transparent overlays
5) Overview and detail
6) Focus and context
7) Zooming

1) Scrolling

From http://www.dansmc.com/microfiche.jpg
2) **Magnification: Inline**

Image from "Information Visualization" by Robert Spence

2) **Magnification: Mutually Exclusive**

Icewind Dale © Interplay productions

Applying the principles of information visualization
2) **Magnification: Mutually Exclusive**

![Image from "Information Visualization" by Robert Spence](image1.png)

3) **The DragMag**

![Image from "Information Visualization" by Robert Spence](image2.png)
4) **Transparent Overlays**

![Diagram of Transparent Overlays](Image from "Information Visualization" by Robert Spence)

Diablo © Blizzard
5) **Overview And Detail: Separate**

Images from "Information Visualization" by Robert Spence

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5) **Overview And Detail**

Defender © Midway Home Entertainment Ltd.
6) Focus And Context

• Again the amount of the information is too large to display all at once.

• With this approach detailed view can still be viewed within its surrounding context.

![Image: Leung and Apperly TOCHI'94]

Approaches To Applying A Focus And Context View

1. Employ selective omission

2. Employ a fisheye view
The Fisheye Lens: Photography

Image from: http://rick_oleson.tripod.com/

Fisheye View
Fisheye View: Visual Cues For The Distortion

Distortion is understandable through the use of a grid and shading

Table Lens

Housing Market for Santa Clara County, CA - March 2000
Focus And Context: Distortion In One Dimension

• Distortion in the X-dimension

The Perspective Wall

Image from “Information Visualization” by Robert Spence
**Fisheye Menus**

Bederson, B.B. (May 2000)  
University of Maryland  
www.cs.umd.edu/hcil/fisheymenu/

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**Focus And Context: Distortion In Two Dimensions**

- Distortion in both the X and Y dimensions

Images from "Information Visualization" by Robert Spence
Distortion In Two-Dimensions: A Calendar System

Image from "Information Visualization" by Robert Spence

DocumentLens

Robertson / Mackinlay ACM UIST 1993
7) **Zooming**

Pad++: A Zoomable Graphical Sketchpad for Exploring Alternate Interface Physics

Bederson et al

*Journal of Visual Languages and Computing*, 7, 1996

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Browsing of digital images


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**Visual Information-Seeking Mantra**

- Overview first, zoom and filter, then details on demand
- Overview first, zoom and filter, then details on demand
- Overview first, zoom and filter, then details on demand
- Overview first, zoom and filter, then details on demand
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Ben Shneiderman, *Designing the User Interface* 3rd Ed. 1997 p523
Dynamic Queries: HomeFinder

The yellow dots above are homes in the DC area for sale. You may get more information on a home by selecting it. You may drag the 'A' and 'B' distance markers to your office or any other location you want to live near. Select distances, bedrooms, and cost ranges by dragging the corresponding slider boxes on the right. Select specific home types and services by pressing the labeled buttons on the right.

HomeFinder: The Details

Start with an overview of the data

Dynamic queries (rapid, incremental, reversible actions)

- All results are displayed instantly
- No "search button"
- Prevents errors

Direct manipulation of

- Queries
- Query results
- Can be interacted with like real-world objects

Details on Demand

- When the data set is small enough additional information can be provided

FilmFinder: The Details

FilmFinder employs many of the principles employed in HomeFinder:

- Overview of the data
- Zoom and filter through
  - Dynamic queries
  - Direct manipulation
- Details on demand

But with FilmFinder system there are additional concepts:

- Starfield display
  - The entire data base can be viewed and manipulated on one screen
- Tight coupling of interface components (to the state of the system)
A Student Project: HomeBay

Dynamic Queries

Radar Overview

Progressive details on demand

481 Student Project (April, 2000) Rob Pearson, Kashama Wills and James Chisan

Multiple Views Of A Large Data Set: PhotoFinder

University of Maryland
Human Computer Interaction Laboratory
http://www.cs.umd.edu/hcil/

Applying the principles of information visualization
Representing Connectivity

• The problem of having large data set – but limited display space must still be dealt with

• Also there is the additional problem of showing how things in a large data set relate e.g., How to show Internet connections between servers?

• Some issues:
  • Occlusion of information
  • Edge crossing
  • Overwhelming quantity of edges

Representing Phone Network Connections

Images from “Information Visualization” by Robert Spence
Which Folder Has The Most Documents?

Where Am I? Where Was I Going?
Cone Trees

Robertson / Mackinlay / Card
Cone Trees: Animated 3D Visualizations of Hierarchical Information. Proc ACM CHI'91

Demo: http://startree.inxight.com/

Xerox Parc/Inxight
Applying the principles of information visualization
What You Now Know

Ways of dealing with the “large data set but limited display space” problem
1) Scrolling
2) Magnification
3) The DragMag
4) Transparent overlays
5) Overview and detail
6) Focus and context
7) Zooming

The information seeking mantra and how it has been applied in the HomeFinder and FilmFinder systems

Problems and some solutions when representing connectivity in large data sets

Interface Design And Usability Engineering

This diagram is a variation of the one presented by Saul Greenberg