

Presentation, Interaction, and Case Studies II

Spence, *Information Visualization*
Chapter 5 (*Chapter 4 optional*)

Thursday 15 Nov 2007
Polle Zellweger

Today's Lecture

Presentation

- where/how (& whether) to present represented items

Interaction

- manipulating the view to see desired items

Case Studies

- Gapminder
- EZChooser
- Baby NameVoyager
- MetroKC
- oSkope
- FishCal/DateLens
- Viz4All

Presentation

Fundamental problem

- Too much data

Space limitations

- Overview + detail views
- Focus + context distortion
- Pan + zoom transitions

Time limitations

- Animation
- Rapid Serial Visual Presentation

Fundamental Problem

Scale: Most datasets don't fit on the display

- Too many variables (target of multi-d viz)
- Too many cases (equally common)

Therefore, user must focus on specific variables and/or cases

Issues raised by focusing:

- How to specify focus?
- What is the relationship of focus to the rest of the data?
- How does the user shift focus?
 - Find new focus
 - Stay oriented

Standard Solution: Scrolling

Provide a larger virtual screen by allowing user to move with a scroll bar

Issues:

- Only one focus
- Efficient scrolling requires cognitive map
 - Must know contents of virtual screen (no overview first)
 - Must know the relationship between the current focus and the desired focus
 - Must map relationship between current and next foci to the elevator positions on the scroll bar

Approach 1: Overview + Detail

Provide both overview and detail displays

Two ways to combine:

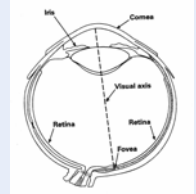
- Time - Alternate between overview and detail sequentially
- Space - Use different portions of the screen

Gapminder



Approach 2: Focus + Context

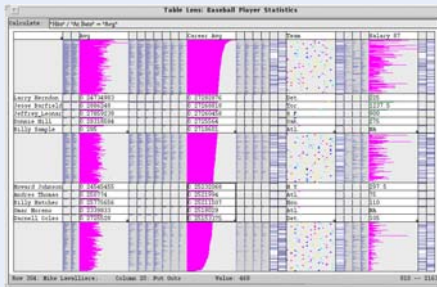
Overview + Detail
Integrated into a single display



Rationale

- Two separate displays split attention
- Zooming hides the context
- Human vision has both fovea and retina

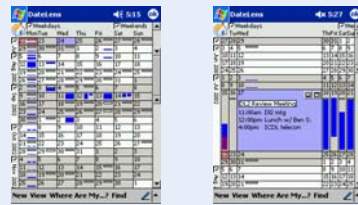
Example – Table Lens



From Xerox PARC and Inlight

FishCal / DateLens

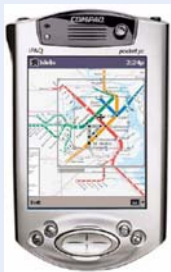
2D distortion



Bederson et al, '04

[Video](#)

Fisheye maps

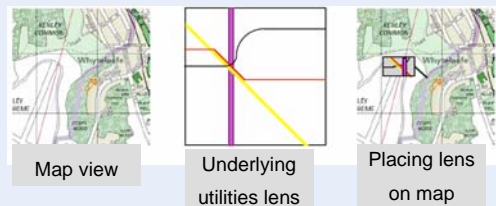


[Spence Video 15](#)

Magic Lenses

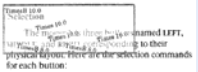
Movable lenses that show a modified view

[Stone et al, Xerox PARC]




More Magic Lenses


Magnifying & wireframe lenses



Font labelling lens




2 detail lenses on a map



Composing 2 lenses

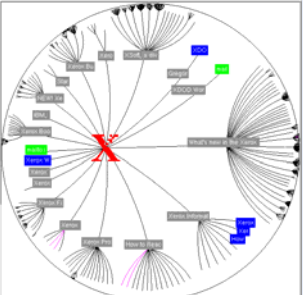
Videotape

More Focus + Context: Halos



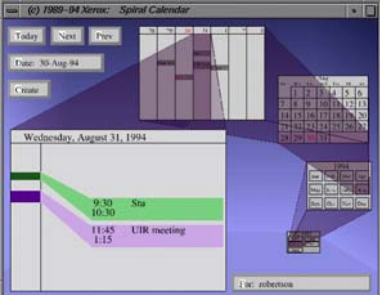
Baudisch et al, 2003

Hyperbolic Browser



The Document Company, Xerox 855 -- 870
Lamping, Rao UIST'94

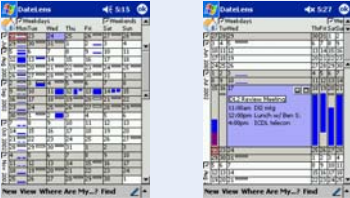
Spiral Calendar



Mackinlay, Robertson, Deline UIST'94

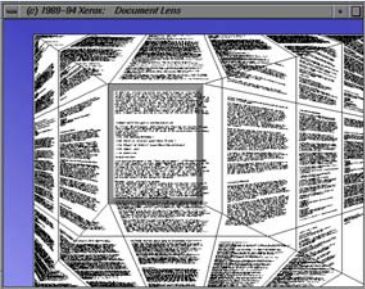
FishCal / DateLens

2D distortion



Bederson et al. '04 Video

Document Lens



Robertson, Mackinlay UIST'93

Approach 3: Panning and Zooming

Panning

- Smooth movement of camera across scene (or scene moves and camera stays still)

Zooming

- Increasing or decreasing the magnification of the objects in a scene

Useful for changing focal point

ZUI = Zoomable User Interface

Slide adapted from John Stasko

PhotoMesa

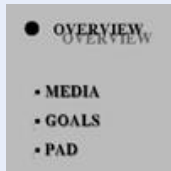


Bederson '01

[Demo](#)

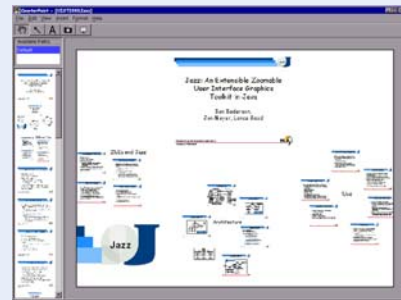
Pad+ + Presentation Tool

Ken Perlin, NYU



CounterPoint Presentation Tool

Zooming UI to organize & show PowerPoint slides



Good, 2001

Time Limitations

Rapid Serial Visual Presentation

- Present data sequentially (and often quite rapidly)
- Like riffing the pages of a book to browse the contents

Gapminder



Floating RSVP

for online purchasing



Spence Video 20

Manually controlled RSVP

for browsing film library



Spence Video 21

Spence's Interaction Model

Information spaces

- discrete
- continuous

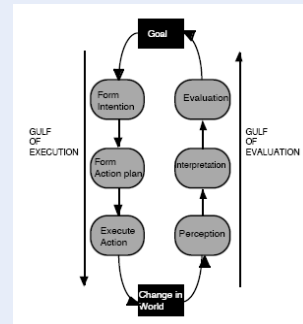
Interaction modes

- continuous
- stepped
- passive
- composite

User intentions

- explore, seek, opportunistic, involuntary

Norman's Action Cycle



Example 1

Minard map vis

Info space?

Interaction mode?



Example 1

Minard map vis

Static display
(discrete info space)

No physical interaction
(passive interaction)



Example 1.5

InfoCanvas

Info space?

Interaction mode?



Spence Video 7

Example 1.5

InfoCanvas

Discrete info space

- picture elements show state of environment

Moving display (passive interaction)

- peripheral awareness



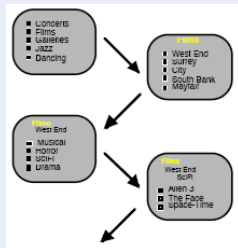
Spence Video 7

Example 2

Entertainment kiosk (also WWW)

Info space?

Interaction mode?

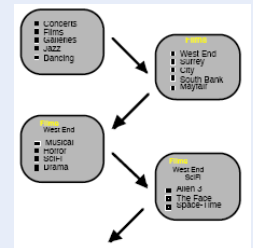


Example 2

Entertainment kiosk (also WWW)

Discrete info space

Stepped interaction



Example 2.5

Tableau Software

Info space?

Interaction mode?



Demo

Example 2.5

Tableau Software

Discrete info space

Stepped interaction

- Display changes occur on mouse up
- History mechanism supports user exploration



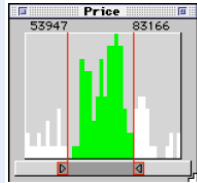
Demo

Example 3

Attribute Explorer

Info space?

Interaction mode?



Spence Video 5

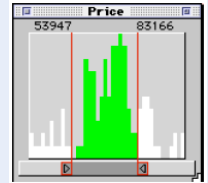
Example 3

Attribute Explorer

Discrete info space

Continuous interaction

- user can move sliders smoothly => display changes during mouse motion



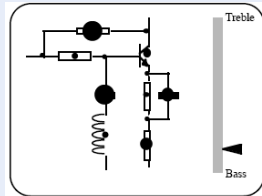
Spence Video 5

Example 3.5

Circuit Design

Info space?

Interaction mode?



Spence Video 1

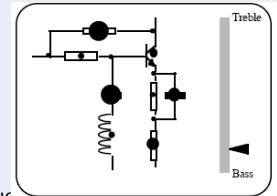
Example 3.5

Circuit Design

Continuous info space

Continuous interaction

- Circle size varies continuously to user moves => dynamically-triggered popout of correlation



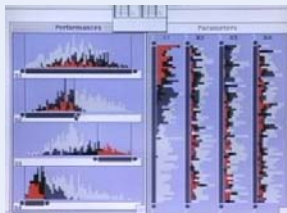
Spence Video 1

Example 4

Influence Explorer

Info space?

Interaction mode?



Spence Video 31

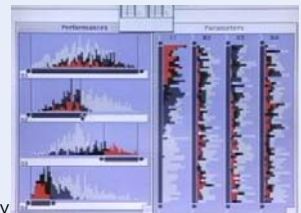
Example 4

Influence Explorer

Discrete info space

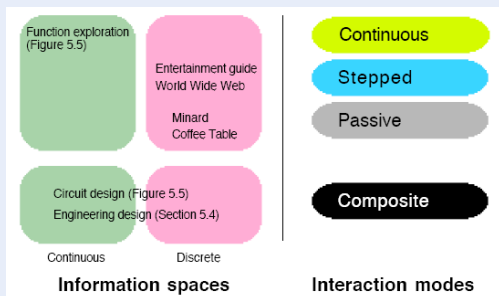
Composite interaction

- uses brushing histograms technique
- bar color shows sensitivity

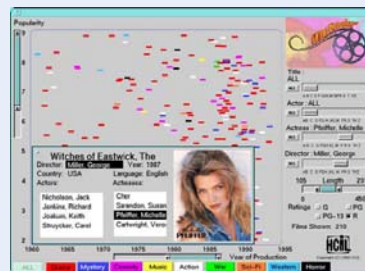


Spence Video 31

Spence's Interaction Model



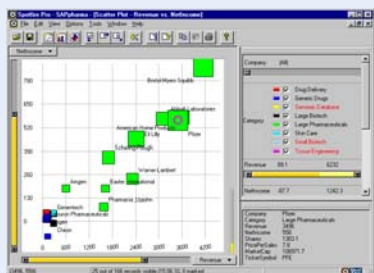
FilmFinder



[Video](#)

Slide adapted from John Stasko

Spotfire



<http://www.spotfire.com/>

Slide adapted from John Stasko

Spotfire Features

- Starfield display
- Tight coupling
 - features to guide the user
 - rapid, incremental, reversible interactions
 - display invariants
 - continuous display
 - progressive refinement
 - details on demand

Slide adapted from John Stasko

Movable Filter - Magic Lens



Enhanced Dynamic Queries via Movable Filters
Ken Fishkin & Maureen Stone
CHI 1995

Slide adapted from John Stasko

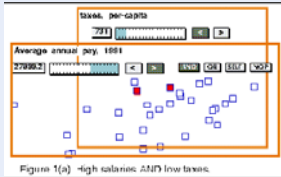
Magic Lens

- Arbitrarily-shaped (usually rectangular) region with some operation that changes the user's view of the data
- Movable
 - Stackable
 - Augmented by parameters that control the display

Slide adapted from John Stasko

Queries Via Magic Lenses

High Salaries AND
Low Taxes

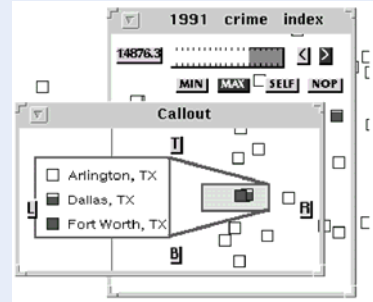


High Salaries OR
Low Taxes



Slide adapted from John Stasko

Real-valued Query



Slide adapted from John Stasko

Advantages

- Liveness
- Flexibility
- Ability to specify complex queries
- Don't use as much real estate for controls

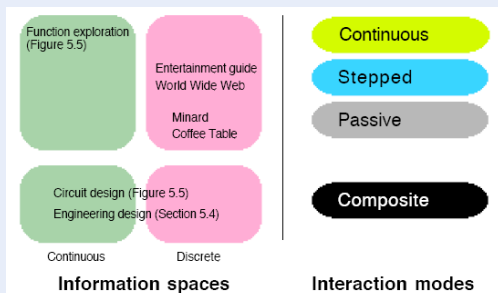
Slide adapted from John Stasko

Disadvantages

- More complex than DQ sliders
 - Not quite as easy to learn and use
- More difficult to implement

Slide adapted from John Stasko

Summary: Spence's Interaction Model



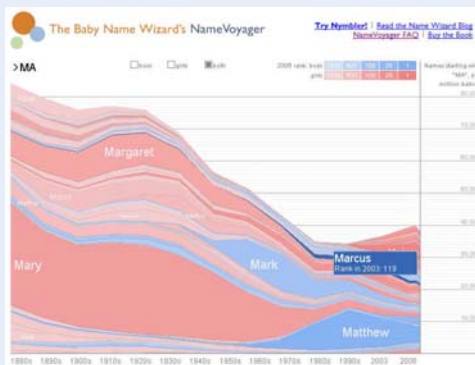
More Case Studies

- Gapminder
- Baby NameVoyager
- MetroKC
- oSkope
- FishCal/DateLens
- Viz4All
- EZChooser

Recalling Shneiderman's Tasks

- Overview: see overall patterns, trends
- Zoom: see a smaller subset of the data
- Filter: see a subset based on values, ...
- Details on demand: see values of objects
- Relate: see relationships, compare values
- History: keep track of actions & insights
- Extract: mark & capture data

Baby Name Wizard Name Voyager



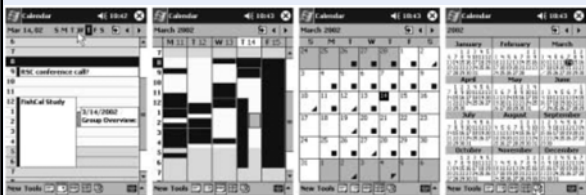
Adding functionality

- Supporting comparison
 - one idea:*
 - ways to select up to 20 names, perhaps by dragging each one to a saved names area
 - draw a color-coded line graph for each saved name all displayed in the standard time-series 1900-2006
 - other ideas?*
- One-stop shopping for prospective parents
 - derivations of names, country of origin
 - meanings of names
 - related names, nicknames, other language forms
 - famous people with that name
 - more?

Interactive Examples

[U of Maryland Viz4All examples](#)

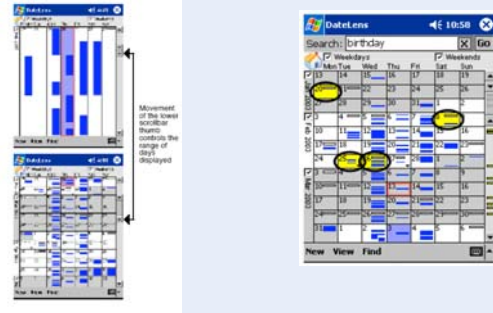
PocketPC calendar tool



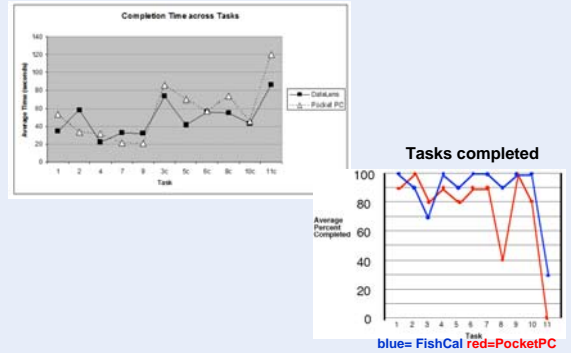
FishCal/DateLens



Scrolling & searching



Evaluation results



Links

- EZChooser
<http://brisa.merl.com:8080/myezchooser/mydatasets.jsp?directory=/showcase>
- Baby NameVoyager
<http://www.babynamewizard.com/namevoyager/Inv0105.html>
- MetroKC <http://transit.metrokc.gov/>
- oSkope <http://oskope.com/>
- FishCal/DateLens <http://www.cs.umd.edu/hcil/datelens/>
- Viz4All
http://www.cs.umd.edu/class/spring2005/cmsc838s/viz4all/viz4all_a.html