

## Interaction

### Lecture 11 CPSC 533C, Fall 2004

25 Oct 2004

Tamara Munzner

- Ware: Interacting with Visualizations
- Ware: Thinking with Visualizations
- Cognitive Co-Processor
- SDM
- Dynamic Queries
  - Exploratory Data Views
  - Influence Explorer

## Ware Interaction

- control loops
  - Fitts' Law
    - time to select depends on distance, target size
  - two-handed interaction
    - coarse vs. fine control: paper vs. pen hold
- learning
  - power law of practice
- vigilance
  - difficult, erodes with fatigue

## Ware Interaction 2

- navigation
  - next time
- rapid zooming
  - next time
- distortion
  - next week
- multiple windows, linked highlighting
  - today!
- dynamic queries
  - today!

## Ware Thinking with Viz

- problem solving loops
  - external representations
- visual working memory
  - low capacity
  - visual attention
  - gist: 100ms
  - change blindness
    - “world is its own memory”

## Memory and Loops

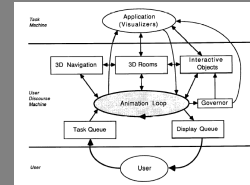
- long term memory
  - chunking
  - memory palaces (method of loci)
- loops
  - problem-solving strategy
  - visual query construction
  - pattern-finding loop
  - eye movement control loop
  - intrasaccadic image-scanning loop

## InfoVis Implications

- visual query patterns
- navigation cost
- multiple windows vs. zoom

## Cognitive Co-Processor

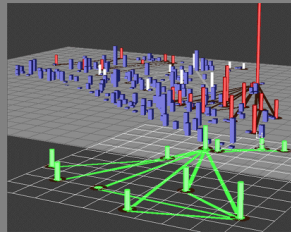
- animated transitions
  - object constancy
  - fixed frame rate required
- architectural solution
  - split work into small chunks
  - animation vs. idle states
  - governor controls frame rate



- [video: 3D rooms]

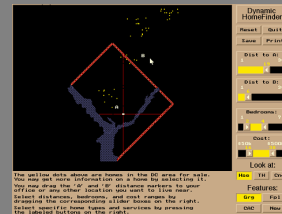
## SDM

- sophisticated selection, highlighting,
- object manipulation
- [video]

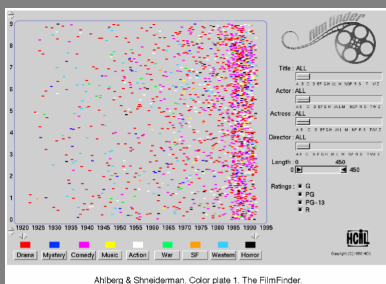


## Dynamic Queries: HomeFinder

- filter with immediate visual feedback
- "starfield": scatterplot
- [video]

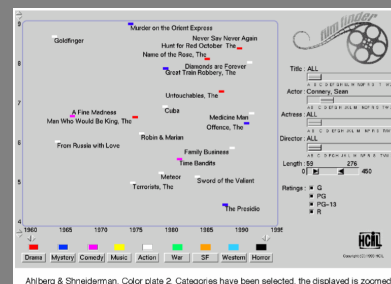


## DQ 2: FilmFinder



Ahberg & Shneiderman, Color plate 1. The FilmFinder.

## DQ 2: FilmFinder



Ahberg & Shneiderman, Color plate 2. Categories have been selected, the displayed is zoomed.

## More Linked Views

key infovis interaction principle

so far: Ware, Trellis, cluster calendar, snap-together, ....

brushing: linked highlighting  
Becker and Cleveland, "Brushing Scatterplots",  
Technometrics 29, 127-142

new examples:  
EDV  
Attribute Explorer

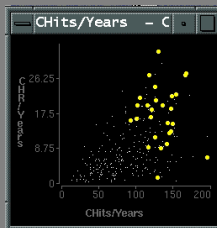
## EDV

Exploratory Data Visualizer

Graham J. Wills. [Visual Exploration of Large Structured Datasets](#). In *New Techniques and Trends in Statistics*, 237-246. IOS Press, 1995.

## Highlighting (Focusing)

Focus user attention on a subset of the data within one graph (from Wills 95)



[www.sims.berkeley.edu/courses/is247/s02/lectures/Lecture3.ppt]

## Link different types of graphs: Scatterplots and histograms and bars

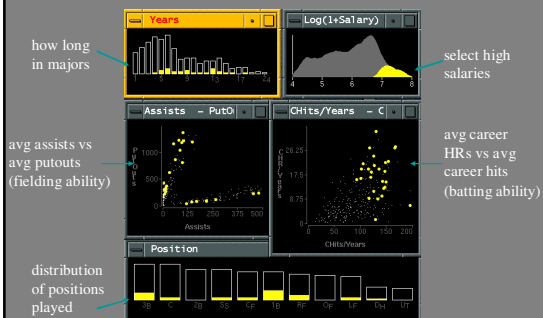
(from Wills 95)



[www.sims.berkeley.edu/courses/is247/s02/lectures/Lecture3.ppt]

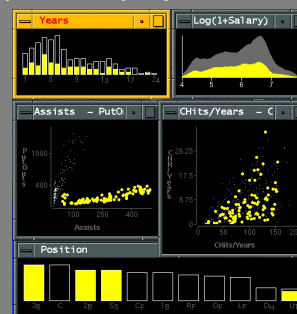
## Baseball data: Scatterplots and histograms and bars

(from Wills 95)



[www.sims.berkeley.edu/courses/is247/s02/lectures/Lecture3.ppt]

## Linking types of assist behavior to position played (from Wills 95)



[www.sims.berkeley.edu/courses/is247/s02/lectures/Lecture3.ppt]

## Influence/Attribute Explorer

- Visualization for Functional Design, Bob Spense, Lisa Tweedie, Huw Dawkes, Hua Su, InfoVis 95

[video]