Wrap-up

Info424 Information Visualization
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TA: Marilyn Ostergren

Overview

Left to do
Course summary
Discussion
Course evaluation forms
Flash in brief

Left to Do

Remaining due dates:
- ASAP, Post P6, Packaged Tableau maps lab
- Mon, 12/10, PF for P6, Tableau extra credit (7 am)
- Wed, 12/12, P7 (7 am)

Grades pending
- Tableau maps lab, Hall of Fame/Shame
- P5, P6, P7
- Watch your folders

Final grades through UW

P7: Final Writeup

Goal: Summarize, evaluate
Written report
- Concise, insightful
- 4-6 pages long (double-spaced)
- Additional pages for figures

Summarize project
- Like P6, but in report form
- Include figures as needed
- Full storyboards on the web

Project evaluation (group)
- What did you learn?
- What worked well, and what didn't?

Individual reflection on the project

Grading

Point system: 1000 points
- Class participation 100
- Project-related activities 535
- Assignments & labs 285
- Midterm 80

Individual: 645
Group: 355

iSchool Guidelines

Questions?

Course Overview

What is infovis? What's important to know?
Course goals and structure
Discussion: What worked, what didn't
Write formal evaluations

What is Information Visualization?

Graphical presentation of information

Using vision to think —*J. Bertin*

Data → Pictures → Insight

Using perception to amplify cognition

The purpose of visualization is insight, not pictures

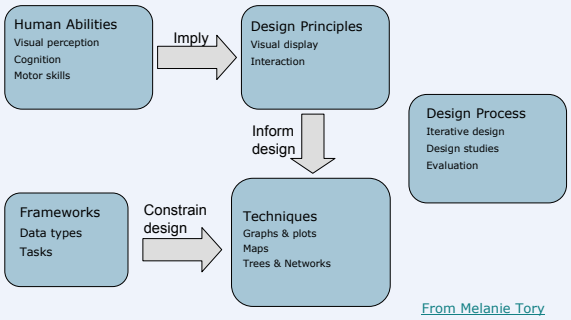
Mapping data to pictures

Interactive

Understand fundamentals
- Data (types, mappings)
- Effective pictures (types, techniques)
- Effective interaction (types, techniques)
- Viewers (perceptual & cognitive models)

For specific projects
- Tasks & users (User-centered design)
- Available data
- Resources (media, tools, systems, time, money, etc.)

Visualization Components



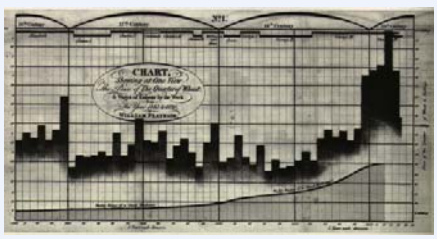
From Melanie Tory

Traditional InfoVis

Visual depiction (art), writing, numbers
Cartography
Classic Examples
- Scheiner (1662-1630)
- Playfair (1786)
- Snow, Nightengale, Minard (mid-1800's)
- Maunder (1874-1904)
- Beck (1931)

William Playfair, 1786

Published the first presentation graphics

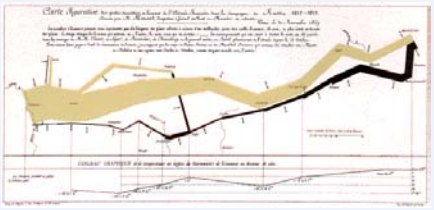


Dr. John Snow, 1845

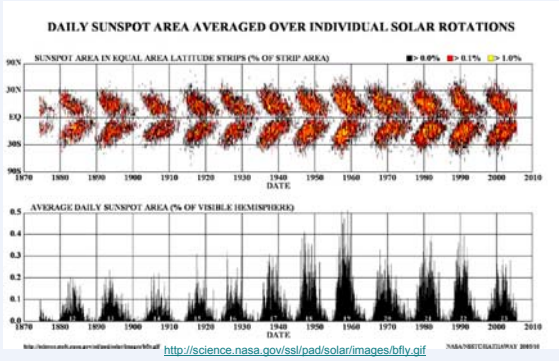
London cholera epidemic

Charles Minard, 1869

Napoleon's march



From Maunder (1874-1904)



Harry Beck, 1931

London Underground schematic map

Digital Infoviz

How does computing enhance visualization?

Data & Representation

- Quantity and complexity
- Organize, query, filter, transform
- Many orders of magnitude larger, faster

Presentation

- Speed and complexity
- Repeatable, parameterizable
- Many orders of magnitude faster, more flexible

Supports dynamic change (data & presentation)

Makes infovis ubiquitous

Digital InfoVis Milestones

Calcomp plotter (1959)
Sketchpad (1963)
Bertin (1967)
Molecular graphics (1969)
Visicalc (1969)
Spence circuit simulator (1971)
Lotus 1-2-3, Excel (early 1980s)
Visualization white paper (1987)
InfoVis conference (1994)

Interaction

How does interaction enhance visualization?

Presentation

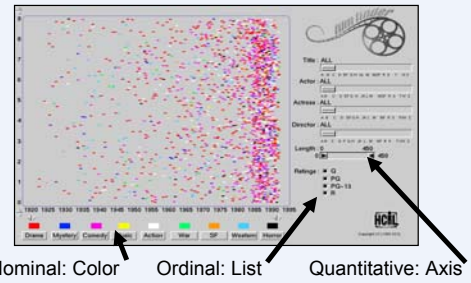
- Dynamically adaptive (selecting, sorting, filtering)
- Dynamic reading/exploration (pan, zoom, tool tips)
- Dynamic cross-linking (brushing, coordinated views)

Data & Representation

- Customized queries, filtering
- Customized data structuring (alternate schema)
- Dynamic update

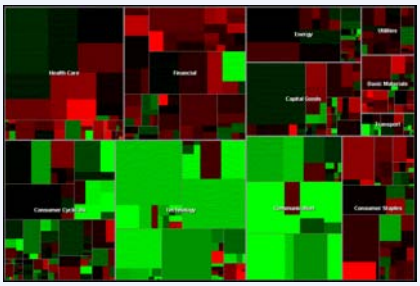
Example: FilmFinder, 1994

Ahlberg & Shneiderman, U of Maryland Video



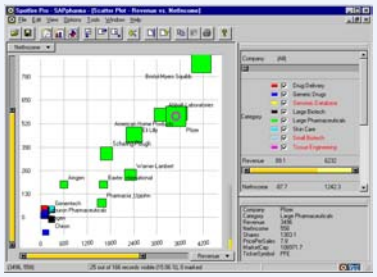
TreeMaps

SmartMoney's Map of the Market



http://www.smartmoney.com/marketmap/marketmap.html

Spotfire



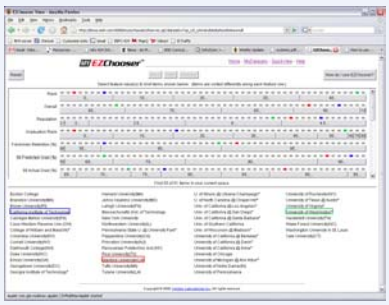
http://www.spotfire.com/

Slide adapted from John Stasko

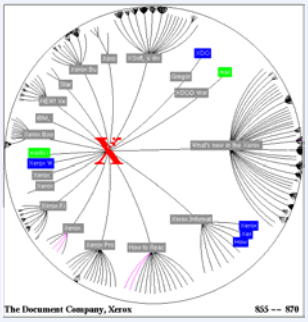
EZChooser

http://brisa.merl.com:8080/myezchooser/

Demo

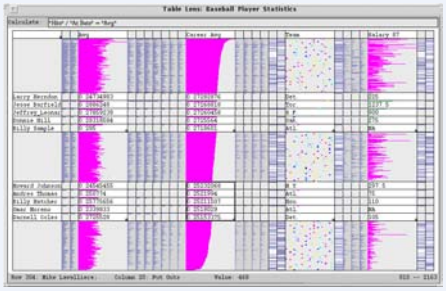


Hyperbolic Browser



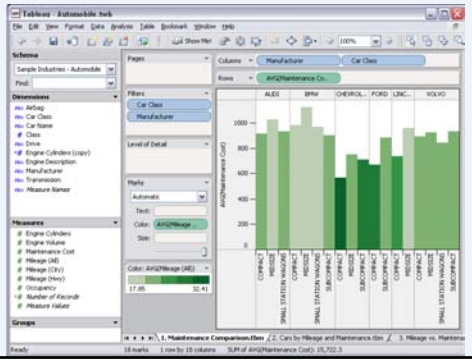
Lamping, Rao UIST'94

Example – Table Lens



From Xerox PARC and Inxight

Tableau Software



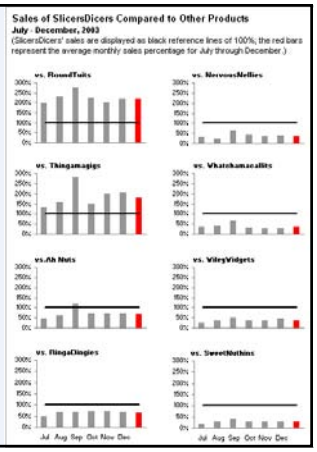
Stephen Few

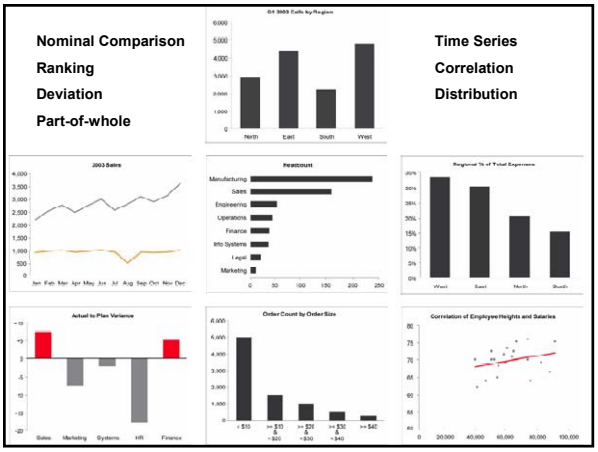
Communication focus

What:
Sales relative to other products

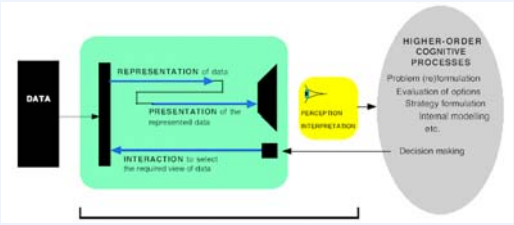
To whom:
The manager in charge

Type of graph: Deviation





Interactive InfoVis



Data, Representation, Presentation, Interaction, Perception, Cognition

Fundamentals

Data (types, mappings)
Effective pictures (types, techniques)
Effective interaction (types, techniques)
Viewers (perceptual & cognitive models)

Data & Information

Distill data to information
Traditional data taxonomies
- Numeric (continuous, sequential, ordinal…)
- Categorical (includes text and symbols)
- Relationships

Process, structure
- Data or information?
- Borders on illustration

Real-world data
- Schema limitations
- Badly formed data (outliers)
- Missing data

Effective Pictures

High-level
- Tufte's principles of excellence, integrity
- Excellent examples

Low-level
- Psychophysics
- Bertin's graphical vocabulary (semiotics)

Techniques

Structural taxonomy

Tables (TableLens, Excel…)
Data graphs
- Bar charts, numeric graphs, scatter plots…

Maps
- Location maps, data maps
- Stylized maps (route maps, tube maps…)

Graphs and networks
- Trees, TreeMap, Star Tree…
- General graphs

What else?
- Structures, process
- Calendars, dynamic text…

Effective Interaction

High-level
- Shneiderman's tasks (overview, filter, details, …)
- Excellent examples

Low-level
- Displays, input devices
- Response time, latency

Techniques

Techniques

Static and Dynamic

Micro/Macro, Overview+detail
Small multiples, multiple views/windows
Lenses & distortions
Layering, color
Pan, zoom, sort, filter, brush, mouse-over

Art and Design view
CS/HCI/Engineering view

Viewers

Low-level
- Structures of vision
- Preattentive effects
- Gestalt principles
- Attention, change blindness

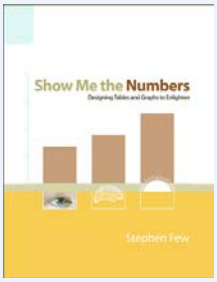
Bertin's Semiotics
Problem solving
- Cognitive models
- Knowledge crystalization

User-centered design

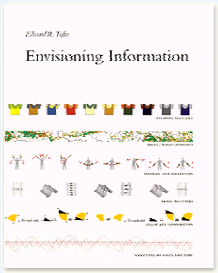
Info 424 Goals

Students will be able to:

- Describe the key design guidelines and techniques used for the visual display of information, including their relationship to human perception
- Design interactive visualizations to support human activities, using real data and a user-centered process
- Explore and critically evaluate a wide range of visualization techniques and applications

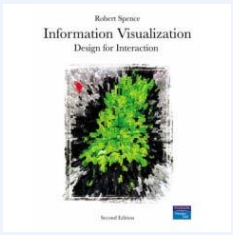


Show Me the Numbers
Designing Tables and Graphs to Enlighten
Stephen Few (2004)



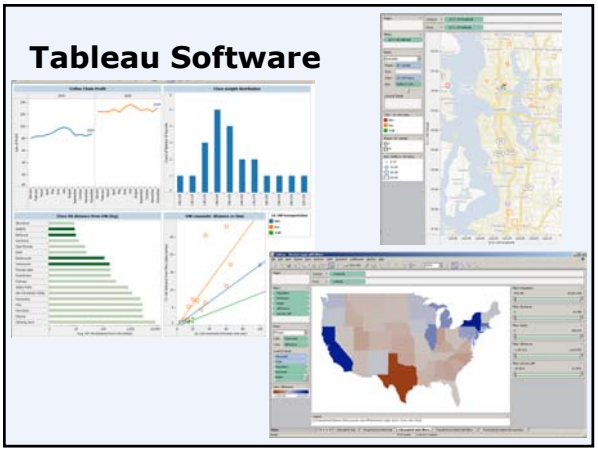
Envisioning Information
Edward Tufte (1990)

The Eyes Have It:
A Task by Data Type Taxonomy…
Ben Shneiderman (1996)



Information Visualization
Robert Spence (2006)

Tableau Software



Course Roadmap

Week 1
- Overview & fundamental concepts

Weeks 2-4
- Quantitative visualization in depth
- *Show Me the Numbers* & Tableau

Weeks 5-8
- *Envisioning Information*
- Interactive visualization

Weeks 9-11
- Project
- Design studies & guest speakers

Readings
4-6 assignments, mostly tied to labs
Midterm

Project

Individual Assignments

General
- Analyze and critique visualizations (Name Voyager, Vis Critique, Hall of Fame/Shame)
- Use Tableau to explore, refine and visualize real-world data (Tableau I, II , Maps)
- Explore and compare visualization systems (Trees)
- Midterm on Few's principles

Project-related
- Use Tableau to explore, refine and visualize project data (P2)
- Provide feedback on classmates' projects, including critiquing visualizations (PF for P4, P6)

Project

In teams of 3-4 students, design and simulate an interactive visualization system based on real data

Phase I (P1-P3)
- Select, analyze and present your data
- Use Few's principles and Tableau
- Goal: Establish data and tasks

Phase II (P4-P7)
- Design interactive demonstration
- Use brainstorming, user-centered design
- Design phase and "implementation" phase
- Evaluation & testing
- Present last week of class
- Goal: Apply user-centered design to visualization

Self-evaluation

The good
- Few and Tableau
- Storyboarding projects
- Individual assignments
- More class interaction—in class and across projects

To improve
- Critiques and analysis
- Better balance: Few, Tufte, Interactive Vis
- More doing, less talking
- Better use of assignments
- Continue to refine the project

Discussion

Student suggestions