

# Visualisasi Informasi

## Pengenalan (Definisi, Prinsip, Contoh Teknik) Hirarki

## Data, Data Everywhere

- Our world is bustling in data
- Computers, internet and web have given people more access to it (but it's been here all along)
- How do we make sense of it?
- How do we harness this data in decision-making processes?

## Three Approaches

- Software Agents
  - Computational agent that carries out user's request
- Data Mining
  - Software that analyzes database and extracts "interesting" features
- Information Visualization
  - Visual tools to help users better examine the data themselves

## London Subway



## Information Visualization

- What is “Information”?
  - Items, entities, things which do not have a direct physical correspondence
  - Notion of abstractness of the entities is important too
- What is “visualization”?
  - The use of computer-supported, interactive visual representations of data to amplify cognition.  
From [Card, Mackinlay Shneiderman '98]

MANTRA : Overview first, zoom and filter,  
then details on demand -- Ben Shneiderman

## Information Visualization

- Essence:
  - Taking items without a physical correspondence and mapping them to a 2-D or 3-D physical space.
  - Giving information a visual representation that is useful for analysis and decision-making
- Visuals help us think
  - External cognition
  - Provide a frame of reference, a temporary storage area
- “The purpose of visualization is insight, not pictures”
  - Insight  
Discovery, decision making, explanation
- Domains : Text, Statistics, Financial/business data, Internet, information, Software, ...

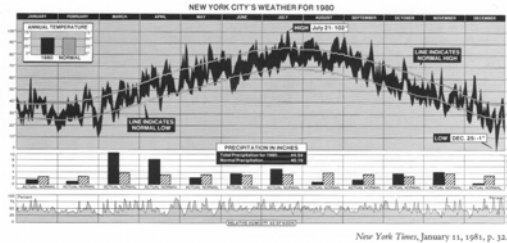
## Components of Study

- Data analysis
  - Data items with attributes or variables
  - Generate data tables
- Visual structures
  - Spatial substrate, marks, graphical properties of marks
- UI and interaction
- Analytic tasks to be performed

## Tasks in Info Vis

- Search
  - Finding a specific piece of information
    - How many games did the Braves win in 1995?
    - What novels did Ian Fleming author?
- Browse
  - Look over or inspect something in a more casual manner, seek interesting information
    - Learn about crystallography
    - What has Jane been up to lately?
- Analysis
  - Comparison-Difference
  - Outliers, Extremes
  - Patterns
- Assimilate
- Categorize
- Locate
- Identify
- Rank
- Associate
- Reveal
- Monitor
- Maintain awareness
- ...

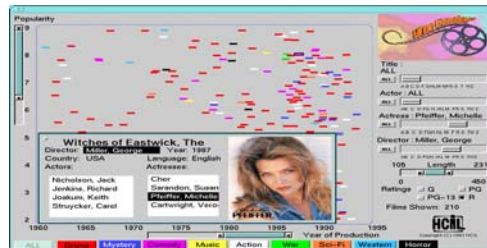
## Examples



NYC weather  
2220 numbers

Tufte, Vol. 1

Data Mountain  
Video  
Books  
Demo



Film Finder

## InfoVis Techniques

- Aggregation
  - Accumulate individual elements into a larger unit to be presented as some whole
- Overview & Detail
  - Provide both global overview and detail zooming capabilities
- Focus + Context
  - Show details of one or more regions in a more global context (eg, fisheye)
- Drill-down
  - Select individual item or smaller set of items from a display for a more detailed view/analysis
- Brushing
  - Select or designate/specify value, then see pertinent items elsewhere on the display


## Issues

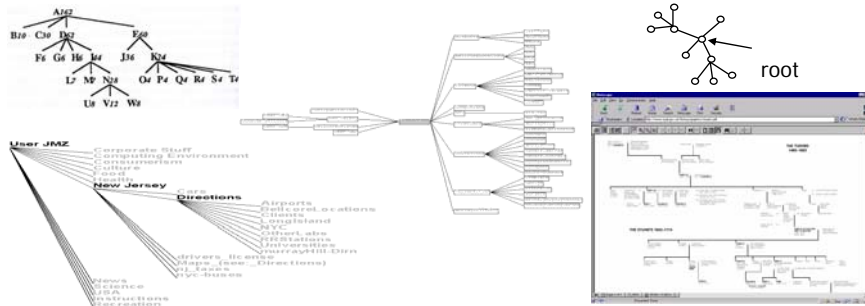
- Graphic design
  - Extremely important in information visualization
  - Should reveal data and relationships, not obscure them
  - Tufte books provide many guidelines
- Scalability
  - Presentation of information becomes really interesting as the size of the data grows
  - Run out of pixels at some point
  - Requires aggregation, navigation, ...
- Interaction
  - Computer provides interactive capability that we do not have in printed page
  - Often, must navigate and examine different views of data to gain insight

## Visualizing Hierarchies

- Definition
  - Ordering of items in which particular items are parents or ancestors of others
- Example: File System
  - Folders/Directories with folders/subdirectories and files inside
- Variety of hierarchies technique
  - Traditional tree views, alternatives, space-filling views

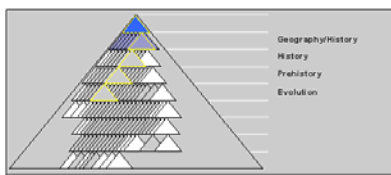
# Trees

- Hierarchies often represented as trees 
- Root at top, leaves at bottom
- Sample representation

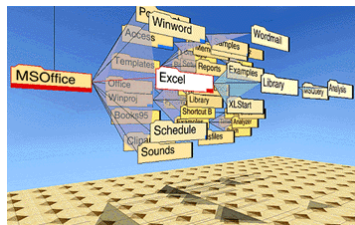


# (Alternative) Another Idea

CHEOPS



ConeTree

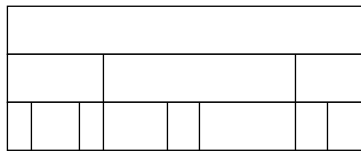


Hyperbolic Geometry (Hyperbolic Tree)



# Space-Filling Representation / Treemap

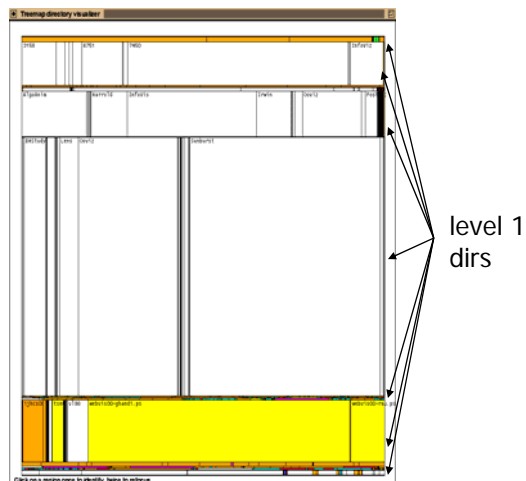
- Space-filling representation developed by Shneiderman and Johnson
- Children are drawn inside their parent / Children are "contained" under parent
- Alternate horizontal and vertical slicing at each successive level



# Treemap

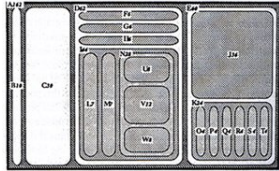
- Example  
File and directory visualizer

white-directories  
color-files

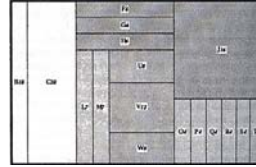




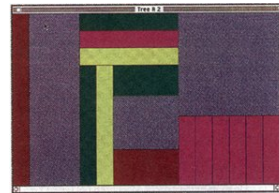
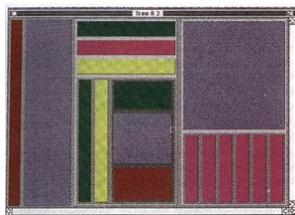
## Nested vs. Non-nested Treemaps



Nested Tree-Map



Non-nested Tree-Map



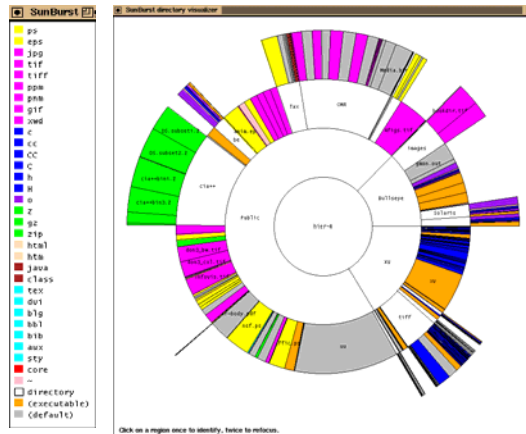
## Treemap Affordances

- Good representation of two attributes: color and area
- Not as good at representing structure
  - What happens if it's a perfectly balanced tree of items all the same size?
  - Also can get long-thin aspect ratios

# Sunburst / Radial Space-Filling Technique

Visualizing file  
and directory structures

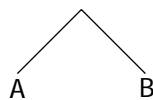
Root dir at center  
Color - file type  
Angle - file/dir size



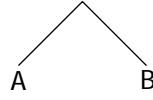
## Experiment

- Compare Treemap and Sunburst with users performing typical file/directory- related tasks
- Evaluate task performance on both correctness and time

Small Hierarchy  
(~500 files)



Large Hierarchy  
(~3000 files)



## Experiment

- 60 participants
- Participant only works with a small or large hierarchy in a session
- Vary order across participants

SB A, TM B	32 on small hierarchies
TM A, SB B	28 on large hierarchies
SB B, TM A	
TM B, SB A	

## Tasks

- Identification (naming or pointing out) of a file based on size, specifically, the largest and second largest files (Questions 1-2)
- Identification of a directory based on size, specifically, the largest (Q3)
- Location (pointing out) of a file, given the entire path and name (Q4-7)
- Location of a file, given only the file name (Q8-9)
- Identification of the deepest subdirectory (Q10)
- Identification of a directory containing files of a particular type (Q11)
- Identification of a file based on type and size, specifically, the largest file of a particular type (Q12)
- Comparison of two files by size (Q13)
- Location of two duplicated directory structures (Q14)
- Comparison of two directories by size (Q15)
- Comparison of two directories by number of files contained (Q16)

## Results and Observation

### Result

- Ordering effect for Treemap on large hierarchies
- Performance trends favored Sunburst, but not clear-cut
- Subjective preference:  
SB (51), TM (9), unsure (1)

### Observation

- SB appeared to convey structure better
- Participants felt TM conveyed size better, but not bore out
- Strategies mattered