Focus+Context Display and Navigation Techniques for Enhancing Radial, Space-Filling Hierarchy Visualizations

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Hierarchies and Trees

Node-link

Hyperbolic tree
Lamping & Rao

Treemap
Shneiderman & Johnson

CHEOPS
Beaudoin, Parent & Vroomen

ConeTree
Card, Mackinlay & Robertson
Radial Space-Filling

Chuah

Andrews &
Heidegger

InfoVis '98

InfoVis '00
SunBurst
Appears in:
Empirical Study

- Compared SunBurst to Treemap (borderless) on a variety of file browsing tasks
  - SunBurst performed as well (or better) in task accuracy and time
  - Learning effect - Performance improved with Treemap on second session
  - Strong subjective preference (51-9) for SunBurst
  - Participants cited more explicit depiction of structure as an important reason

To appear: International Journal of Human-Computer Studies
Special issue on Empirical Studies of InfoVis, 2000
SunBurst Negative

In large hierarchies, files at the periphery are usually tiny and very difficult to distinguish.
Fix: Objectives

- Make small slices bigger
- Maintain full circular space-filling idea
- Allow detailed examination of small files within context of entire hierarchy
- Don’t alter ratios of sizes
- Avoid use of multiple windows or lots of scrollbars
- Provide an aesthetically pleasing interface in which it is easy to track changes in focus
3 Solutions

- Three visualization+navigation techniques developed to help remedy the shortcoming
  - Angular detail
  - Detail outside
  - Detail inside
Design 1 - Angular Detail
Design 2 - Detail Outside
Design 3 - Detail Inside
Video

4 minutes
On conf tape
Angular Detail

- Most "natural"
- Least space-efficient
- Most configurable by user
Detail Outside

- Exhibits non-distorted miniature of overview
- Somewhat visually disconcerting
- Focus is quite enlarged (large circumference and 360°)
- Relatively space efficient
Detail Inside

• Perhaps least intuitive and most distorting
• Items in overview are more distinct (larger circumference)
• Interior 360° for focus is often sufficient
Key Components

- Two ways to increase area for focus region: larger sweep angle and longer circumference
- Smooth transitions between overview and focus allow viewer to track changes
- Always display overview
- Allow focus selections from anywhere: normal display, focus or overview regions
Implementation

- Utilizes fundamental animation update routine
  - Example: Detail Outside (called 3 times)
    - Shrink global view
    - Focus region grows out
    - Focus regions wraps around global view
  - Smooth interpolation between start-end position and angle
Speed Considerations

- Don’t draw small slices
- Cache small and large images of entire hierarchy, reload rather than draw
- During animation transitions, only draw the 100 largest slices (don’t use thresholding)

-> Consistent speed as hierarchy grows (really dependent on processor & graphics)
Preferences

- Within our group, each method has its backers
- Needs more careful study
- Run study like our earlier one to identify performance benefits and subjective preferences
Potential Follow-on Work

- Multiple foci
- Varying radii for different levels in hierarchy
- Use quick-keys to walk through neighboring files
- Smarter update when choosing new focus region from existing focus
- Fourth method: expand angle of focus in place by compressing all others
For More Information...

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