

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



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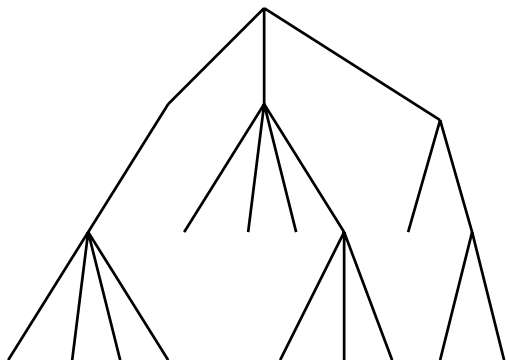
Georgia Institute of Technology



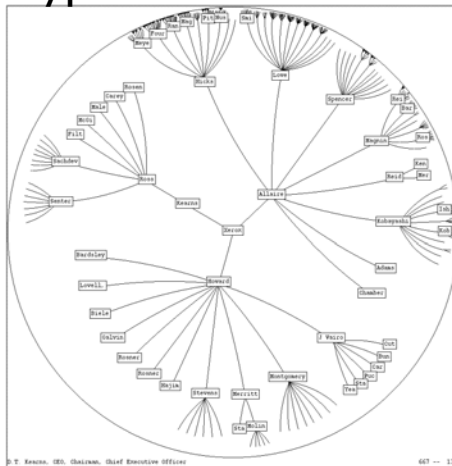
Hierarchies and Trees



Node-link

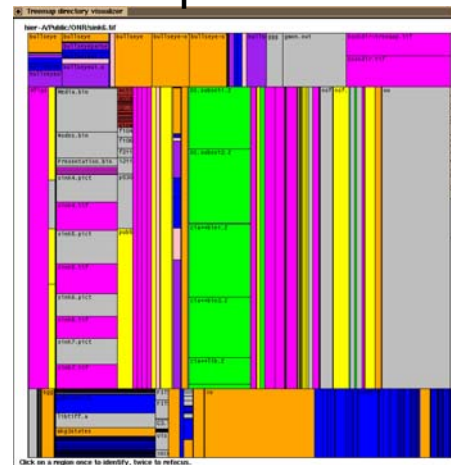


Hyperbolic tree



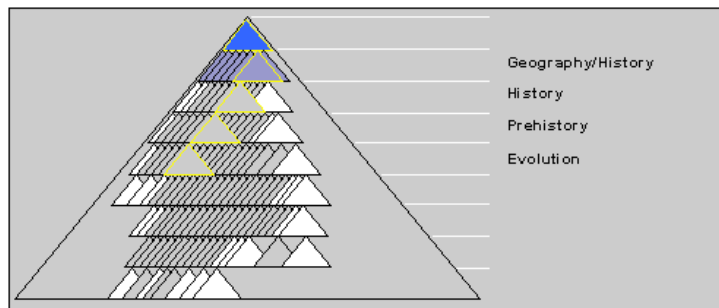
Lamping & Rao

Treemap



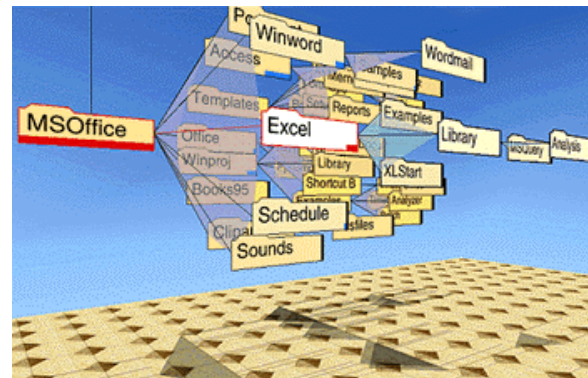
Shneiderman & Johnson

CHEOPS



Beaudoin, Parent & Vroomen

ConeTree



Card, Mackinlay & Robertson

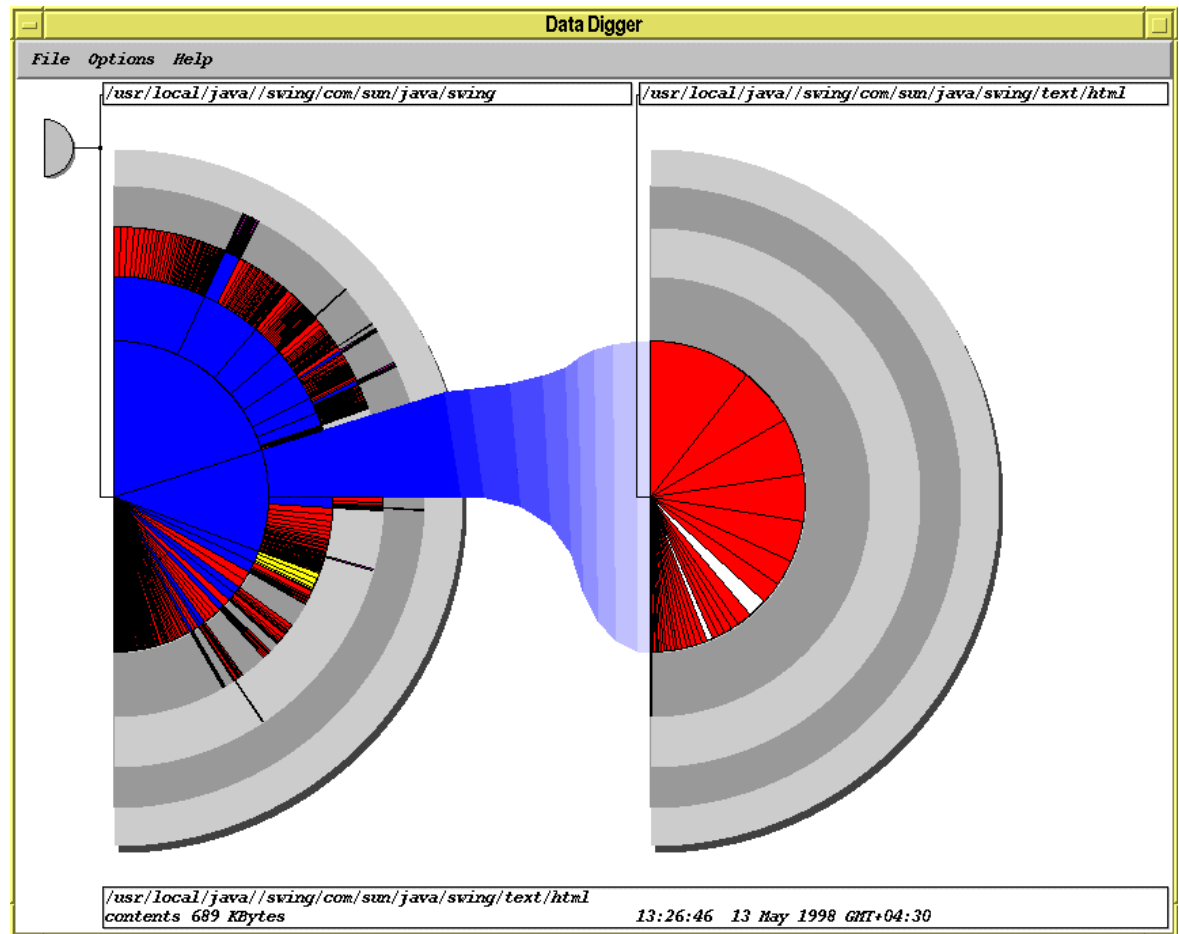
Radial Space-Filling



Chuah

Andrews &
Heidegger →

InfoVis '98



Empirical Study



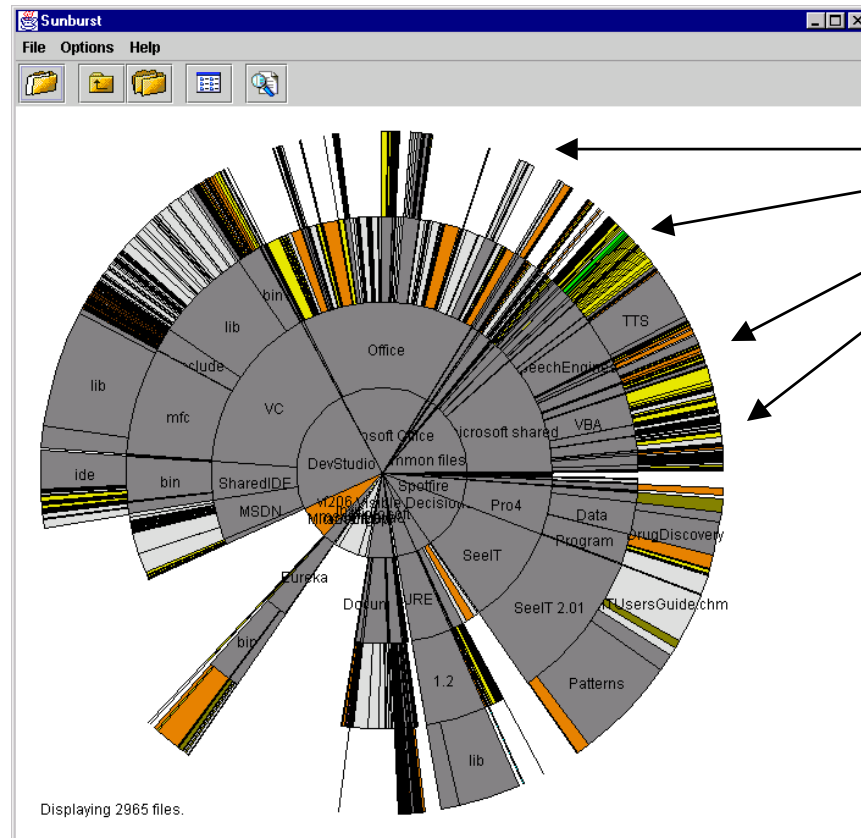
- ⌘ Compared SunBurst to Treemap (borderless) on a variety of file browsing tasks
 - ☑ SunBurst performed as well (or better) in task accuracy and time
 - ☑ Learning effect - Performance improved with Treemap on second session
 - ☑ Strong subjective preference (51-9) for SunBurst
 - ☑ Participants cited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



examples

Quick
demo

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



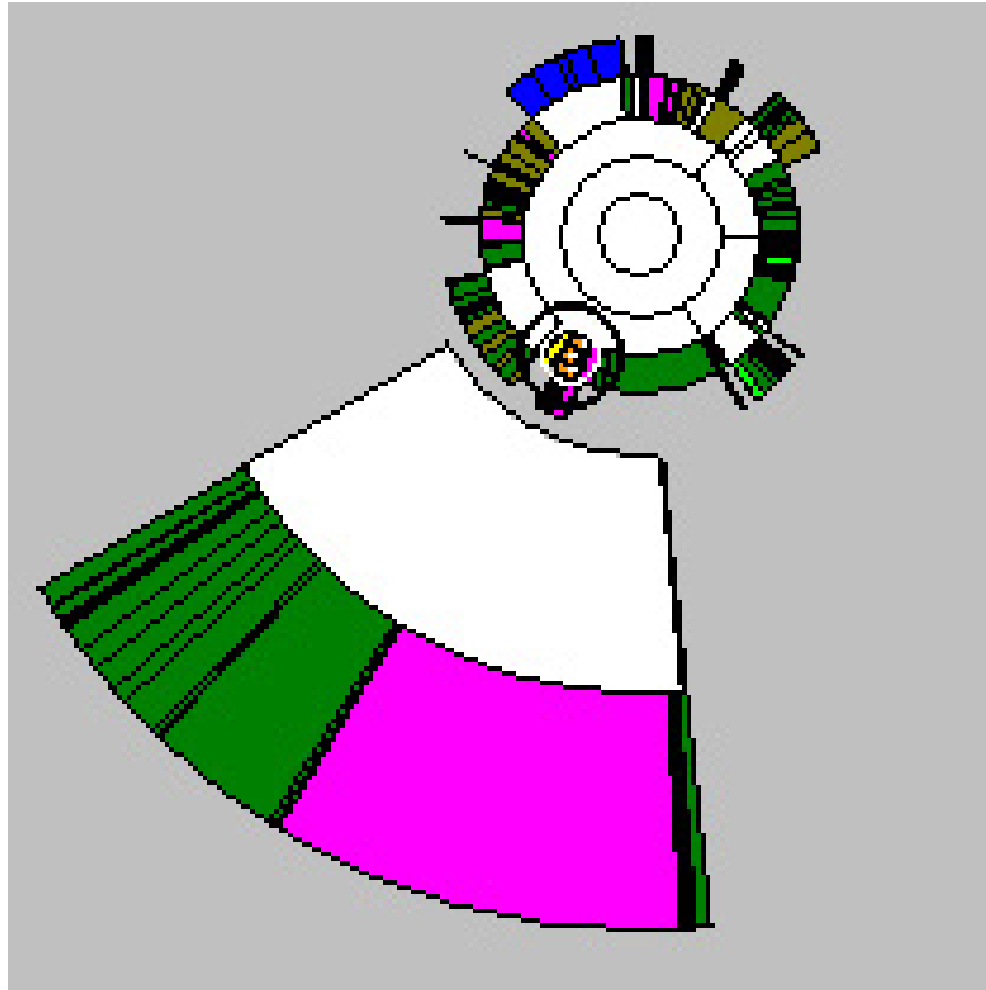
⌘ Three visualization+navigation techniques developed to help remedy the shortcoming

☑ Angular detail

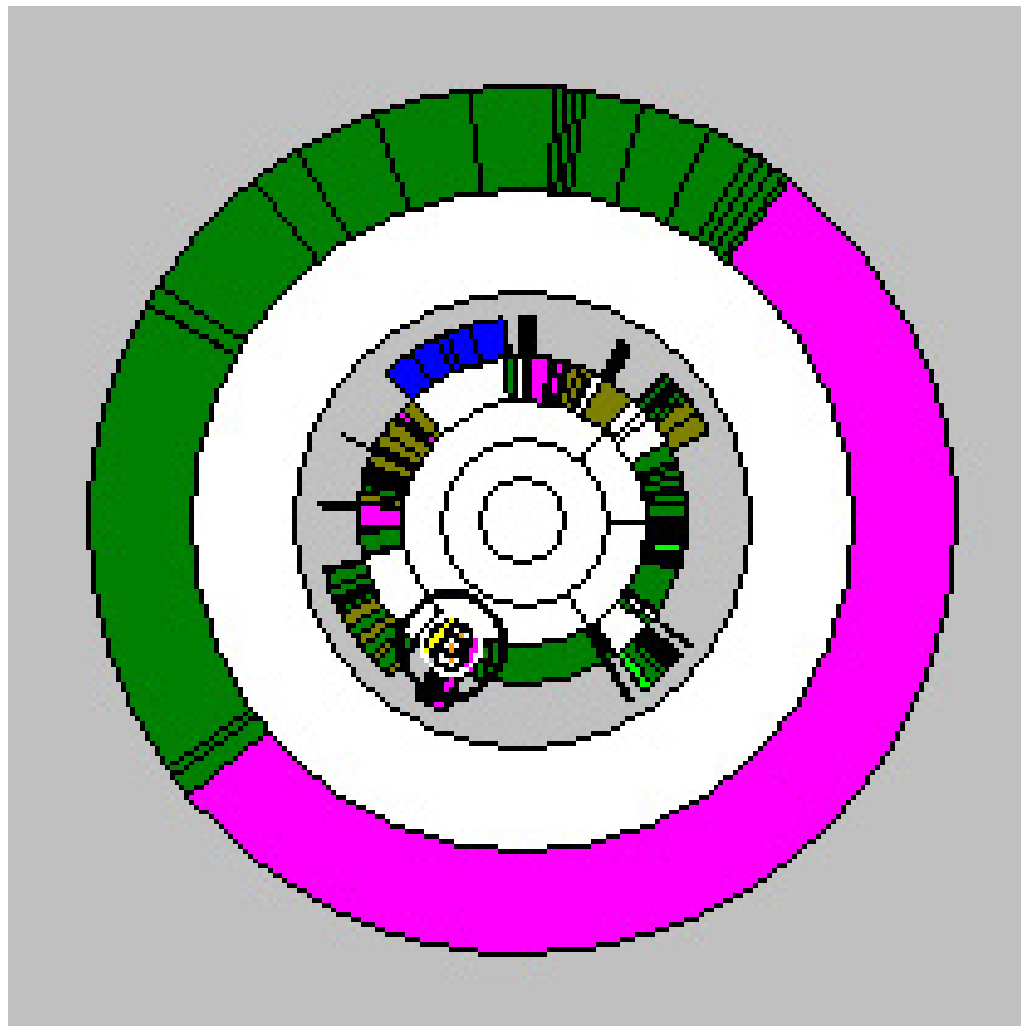
☑ Detail outside

☑ Detail inside

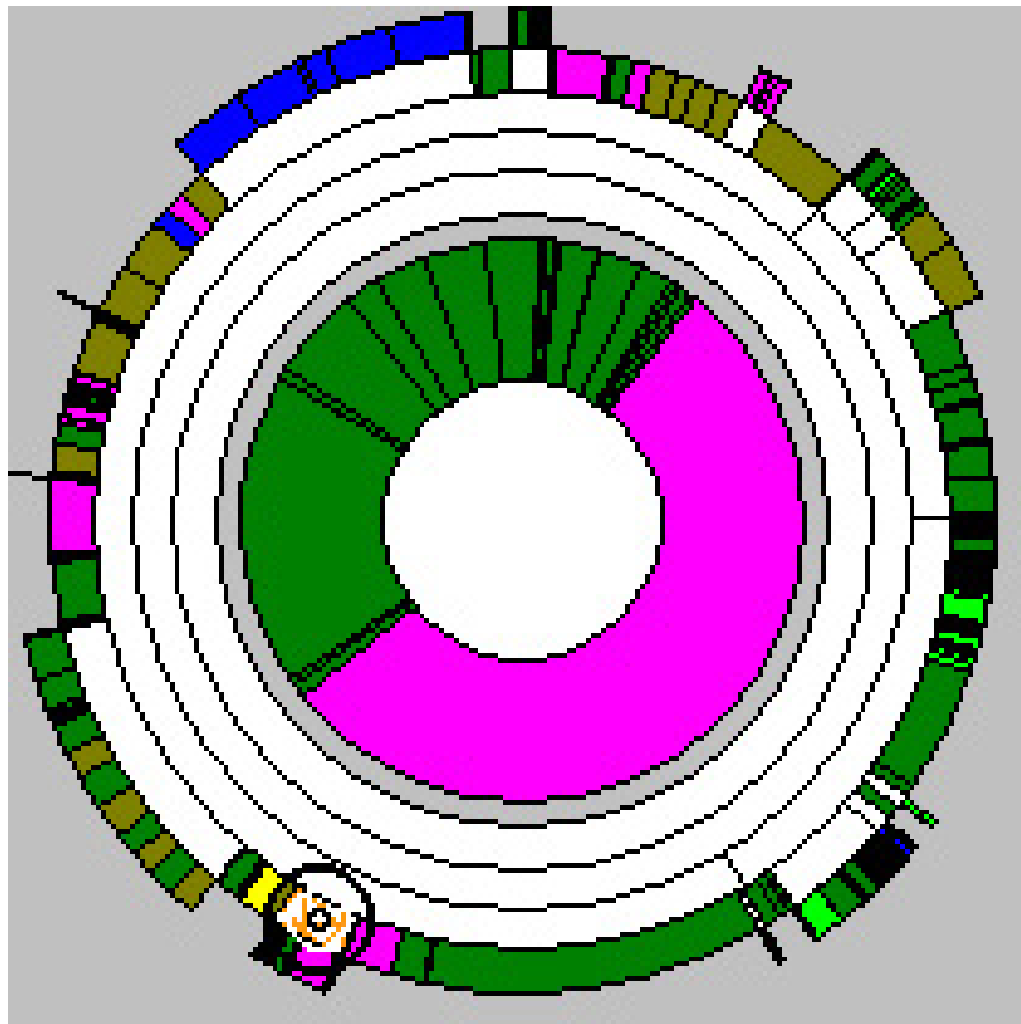
Design 1 - Angular Detail



Design 2 - Detail Outside



Design 3 - Detail Inside

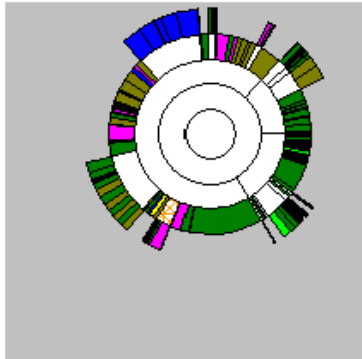


Video

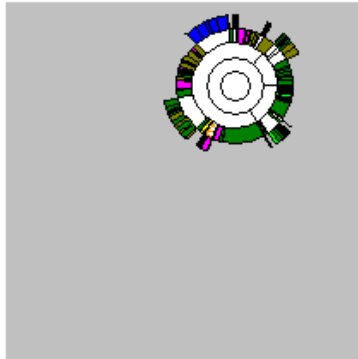


4 minutes
On conf tape

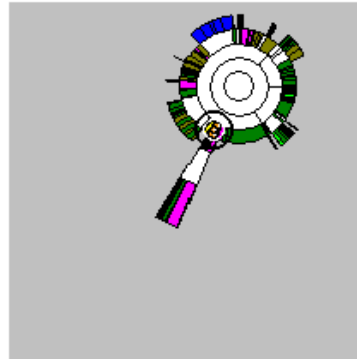
Angular Detail



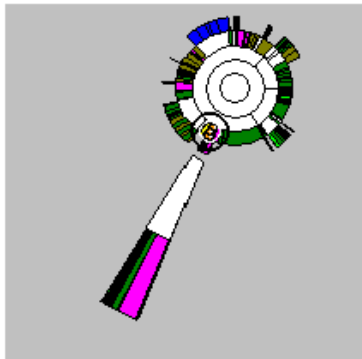
(a)



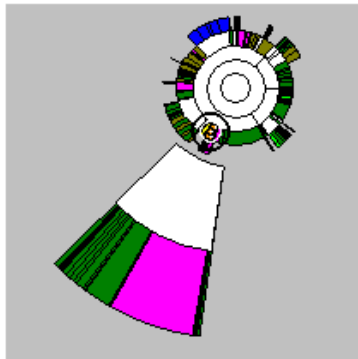
(b)



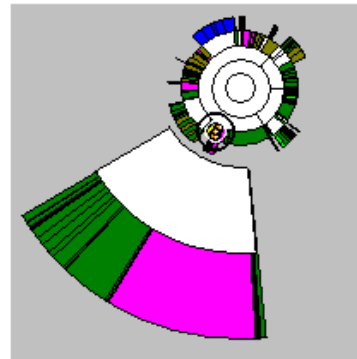
(c)



(d)



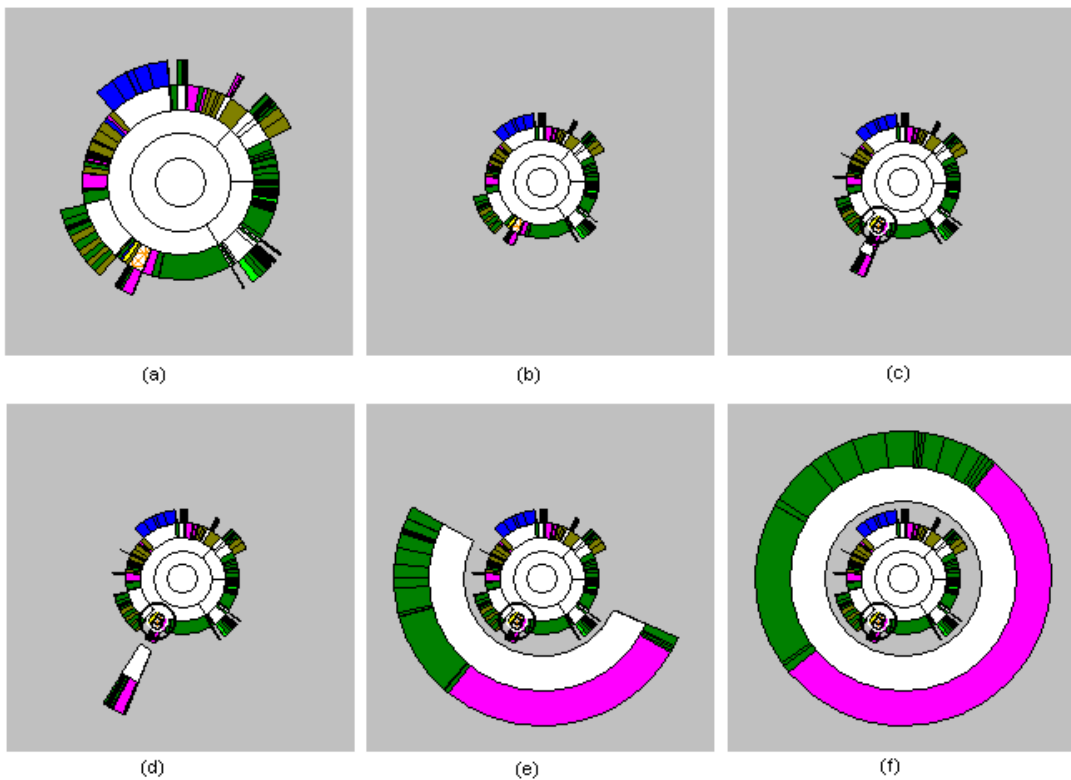
(e)



(f)

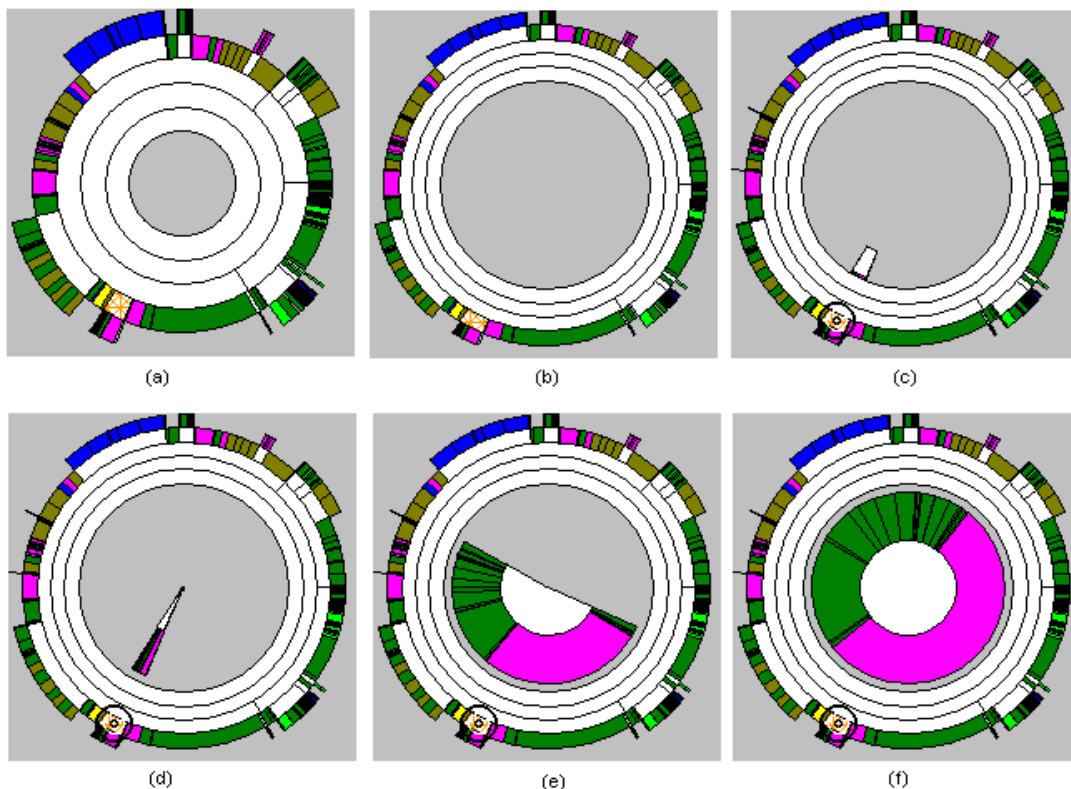
- Most “natural”
- Least space-efficient
- Most configurable by user

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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✂ www.cc.gatech.edu/gvu/ii