Hierarchies, Graphs, and Networks (oh my) part one

C. Andrews

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Hierarchies



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Hierarchies



Chart reflects PAS officials and those reporting directly to the Secretary and Deputy Secretary of Defense

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Hierarchies

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What are we trying to discover?

It is all about structure and relationships





Node-link graph







Trees

Node-link graph

Challenges

We need to display both structure **and** data

Structure consume space

The amount of data grows exponentially with the depth

Conventional tree visualization



http://www.informatik.uni-koeln.de/ls_juenger/research/vbctool/

Radial layout



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SpaceTree



Grosjean, et al. "SpaceTree: Supporting Exploration in Large Node Link Tree, Design Evolution and Empirical Evaluation"





Cone Trees



Robertson et al., "Cone Trees: Animated 3D Visualizations of Hierarchical Information"

Hyperbolic browser

The tree is laid out in hyperbolic space and mapped back to the unit circle.

> Can show 10x the number of nodes of a standard 2D approach (1000 vs. 100)



Lamping et al. "A Focus + Context Technique Based on Hyperbolic Geometry for Visualizing large Hierarchies"

3D Hyperbolic Tree



Force-directed radial layout



Degree-of-Interest (DOI) Trees







Card and Nation, "Degree-of-Interest Trees: A Component of an Attention-Reactive User Interface"

Degree-of-Interest Trees



Card and Nation, "Degree-of-Interest Trees: A Component of an Attention-Reactive User Interface"

Space filling trees





Connections

Containment

Icicle Plot



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TreeViz

Aside: Sankey Diagram



http://www.cs.umd.edu/hcil/VisuMillion/



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Building a treemap

makeTreeMap(node, orientation) for each child of node if orientation is vertical create rectangle with width scaled as proper percentage of node if child has children makeTreeMap(child, horizontal) else create rectangle with height scaled as proper percentage of node if child has children makeTreeMap(child, vertical)

Example: Sales figures (\$M)

North America

United States (\$200) Canada (\$200)

Europe

Germany (\$150) Austria (\$100) Russia (\$150) Sweden (\$100)

Asia

S. Korea (\$50) China (\$50)



Example: Sales figures (\$M)

North America (\$400)

- United States (\$200) Canada (\$200) **Europe (\$500)**
- Germany (\$150) Austria (\$100) Russia (\$150) Sweden (\$100) **Asia (\$100)**
 - S. Korea (\$50) China (\$50)



borrowed from M. Porath

Example: Sales figures (\$M)



Example: Sales figures (\$M)

North America (\$400)

- United States (\$200) Canada (\$200) **Europe (\$500)**
- Germany (\$150) Austria (\$100) Russia (\$150) Sweden (\$100) **Asia (\$100)**
 - S. Korea (\$50) China (\$50)



Nested treemap



http://www.cs.umd.edu/hcil/treemap-history/

Cushion treemaps



Sequoia View

Not a cushion treemap



Grand Perspective

The aspect ratio problem...



Sequoia View

The aspect ratio problem...



Squarified treemaps



Even more approaches...



Slice-and-dice

Cluster

Squarified



Pivot-by-middle

Pivot-by-size

Strip

Example: Presidential election 2012

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Example: Movie budgets

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http://www.treemap.com/

Example: News stories

Liverpool Edges Manchester

City and Edges Toward

Premier League Title

Spieth, 20, joins Watson atop Masters leaderboard

NASCAR: Harvick wins Sprint Cup race at Darlington in overtime

http://newsmap.jp

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Jordan Spieth joins Bubba Watson on top at Masters			Ryan Zimmerman Out 4-6 Weeks			right-hander Alex Cobb on DL		style as Oilers beat 5-2 Anatomy of a 9-2 record: Why the Brewers have baseball's best record		t Canucks Malone busted for t cocaine possession Cornet claims Katowice Open title from play		usted for DUI, possession Knicks officially eliminated from playoffs
			Premier League: Swansea boss Garry Monk unhappy after Chico Flores' red card		Gray Stymies Seattle in Oakland's 3-1 Win Zir thu for		Five Cuts: Nats lose Zimmerman to broken thumb, divergent fortunes in the NL		Dale Eamha Jr. doesn't v to hear how almost won	rdt Barden vant Poliek he	nada Preview: her 111-104 Ducks at Kings mg.larabatesteptyres.	
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Circular partition treemaps





Onak and Sidiropoulos, "Circular Partitions with Applications to Visualization and Embeddings"

Voronoi treemaps



Balzer et al. "Voronoi Treemaps for the Visualization of Software Metrics"

Voronoi Treemaps



Circular treemaps



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Radial Space-filling



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<u>SunBurst</u>

Demo: DaisyDisk

