

Creating Interactive Data Visualizations for the Web with the JavaScript InfoVis Toolkit 2.0

Nicolas Garcia Belmonte - YOW! Conferences - Dec. 2010



<http://sencha.com/>

Data Visualization
JavaScript

Data is Everywhere on the Web

Data gets more Complex with Time

Description formats can get complicated...

$2x$ (Descartes)

$\lambda x. 2x$ (Church)

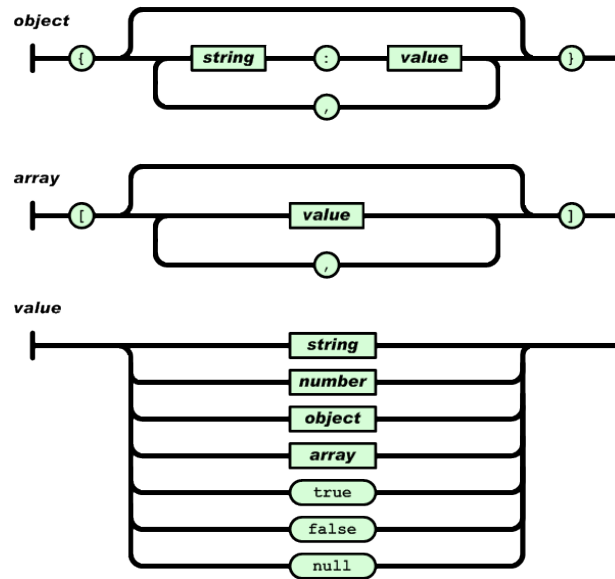
(LAMBDA (X) (* 2 X)) (McCarthy)

```
<?xml version="1.0"?>
<LAMBDA-TERM>
  <VAR-LIST>
    <VAR>X</VAR>
  </VAR-LIST>
  <EXPR>
    <APPLICATION>
      <EXPR><CONST>*</CONST></EXPR>
      <ARGUMENT-LIST>
        <EXPR><CONST>2</CONST></EXPR>
        <EXPR><VAR>X</VAR></EXPR>
      </ARGUMENT-LIST>
    </APPLICATION>
  </EXPR>
</LAMBDA-TERM>
```

(W3C)

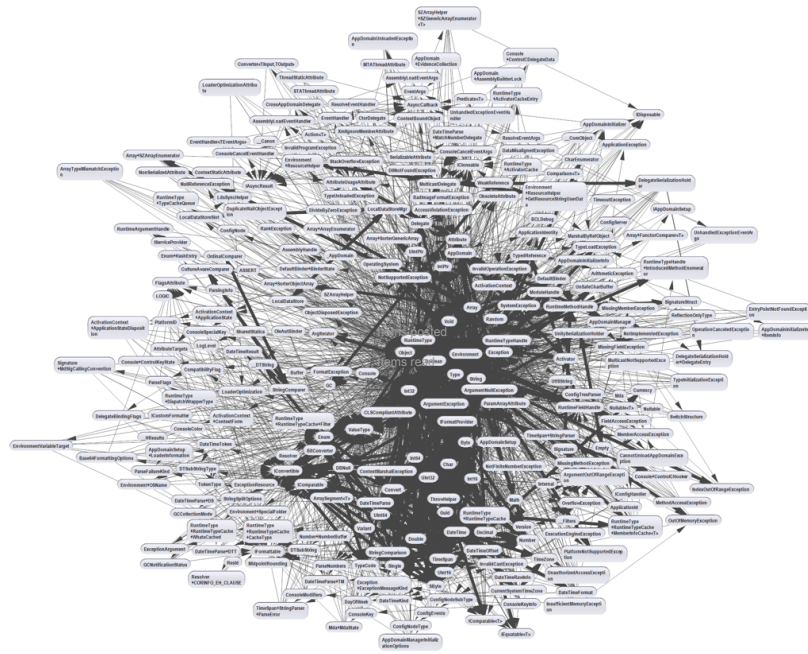
Source: <http://homepages.inf.ed.ac.uk/wadler/language.pdf>

...and even if formats can be simple...



Source: <http://json.org/>

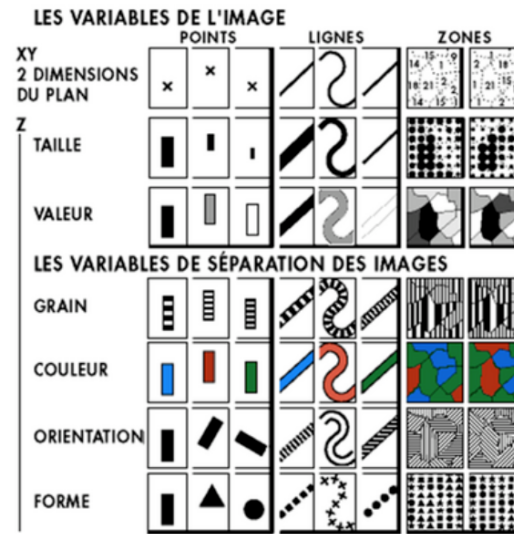
...the data they contain can still be Complex.



Source: <http://www.ndepend.com/>

InfoVis Theory

Semiology of Graphics



Source: Tamara Munzner. Chapter 27, p 675-707, of Fundamentals of Graphics, Third Edition, by Peter Shirley et al. AK Peters, 2009

Data Types

- Continuous (Quantitative)

10Kg, 13Kg, 15Kg, ...



- Ordered (Ordinal)

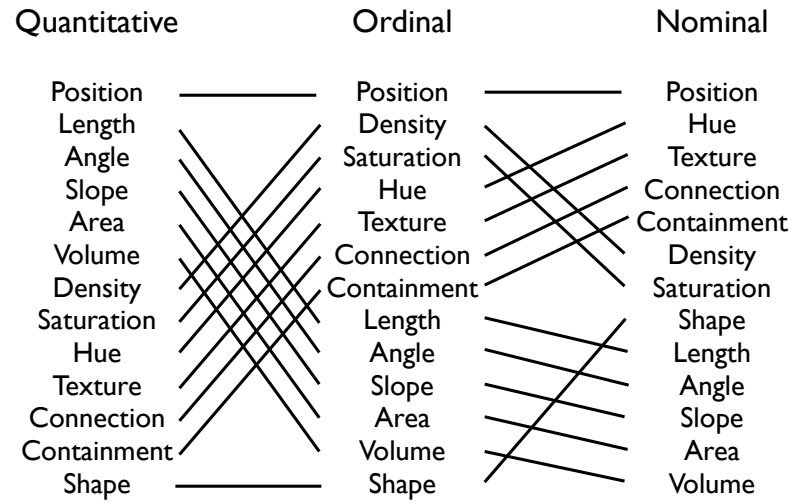
small, medium, big



- Categorical (Nominal)



Channel Ranking vs. Data Type



Source: Tamara Munzner. Chapter 27, p 675-707, of Fundamentals of Graphics, Third Edition, by Peter Shirley et al. AK Peters, 2009

JavaScript InfoVis Toolkit

- Web Based Interactive Data Visualizations
- Multiple Graph/Tree Layouts
- Modular, Extensible, Composable
- Web Standards Based

Modular

Grab only what you need

HyperTree

TreeMap

RGraph

SpaceTree

JavaScript InfoVis
Toolkit

SunBurst

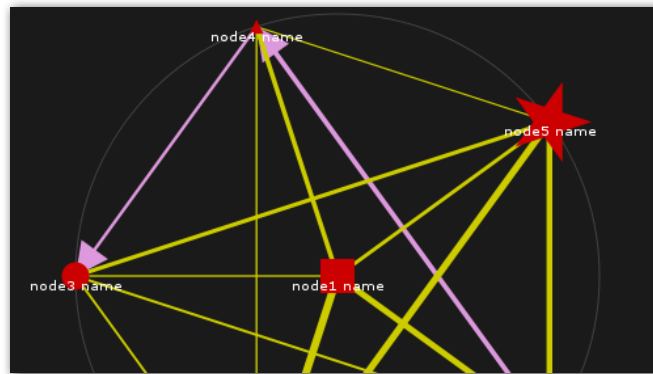
ForceDirected

Icicle

Stacked Charts

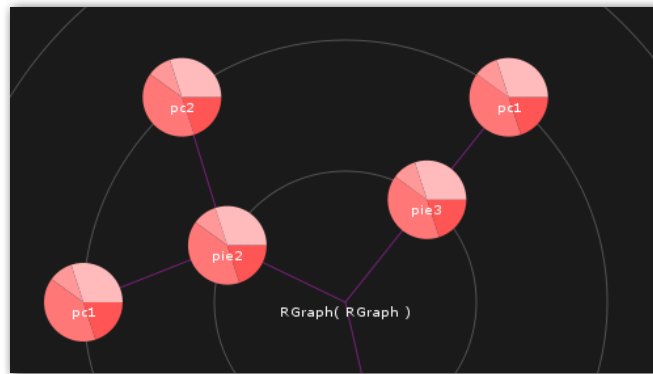
Extensible

Define custom Nodes and Edges



Composable

Add Visualizations as Node/Edge rendering functions to other visualizations



Web Standards Based

- Major Browsers Support
- Mobile Support (Touch Events, HTML/SVG fallbacks)
- Optional Support for advanced features (shadows, gradients, fillText, etc)
- Works well with fallbacks such as ExCanvas and FlashCanvas

Featured Visualizations

Stacked Charts

AreaChart

BarChart

PieChart

Space Filling

SunBurst

TreeMap

Icicle

Node Link

RGraph

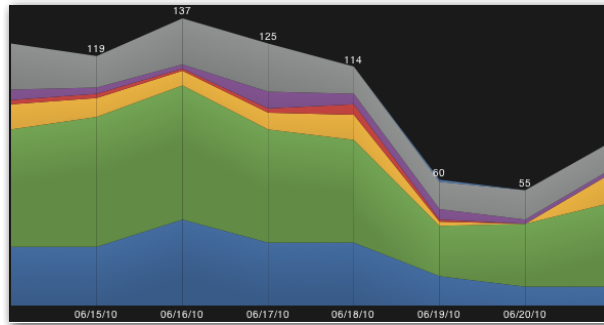
SpaceTree

HyperTree

Force-Directed

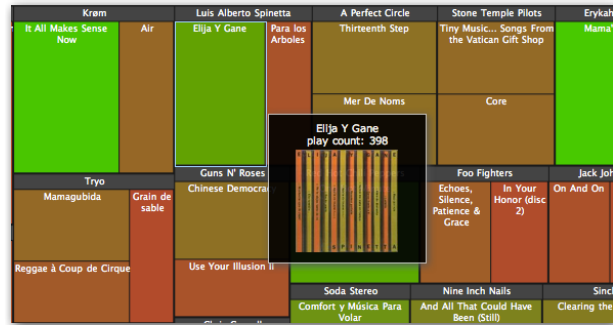
Stacked Charts

Stacked/Grouped BarCharts, PieCharts and AreaCharts

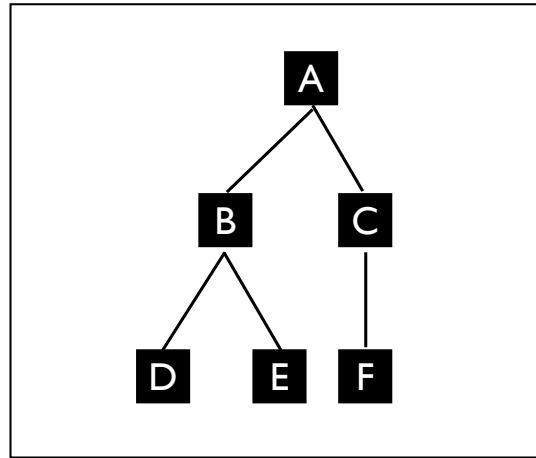


Space Filling Visualizations

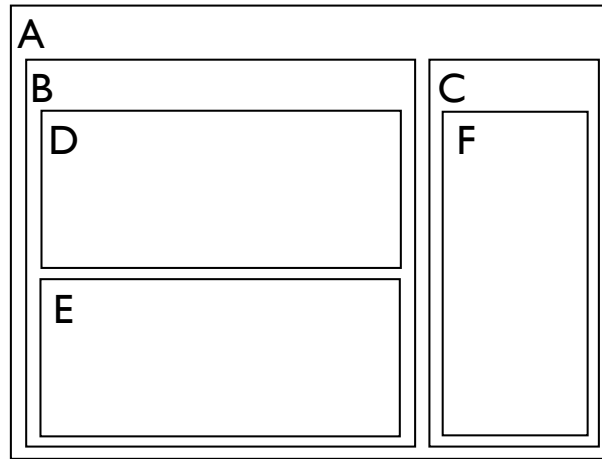
SunBurst, Icicle, TreeMap Layouts



Space Filling Visualizations

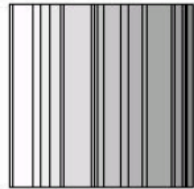


Space Filling Visualizations

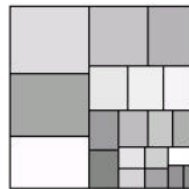


TreeMap

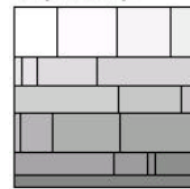
SliceAndDice



Squarified



Strip

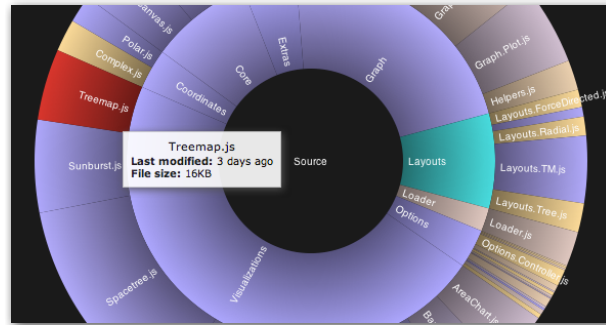


order	ordered	unordered	ordered
aspect ratios	very high	lowest	medium
stability	stable	medium	medium

Inspired by: Squarified TreeMaps - Jarke J. van Wijk, Mark Bruls, Kees Huizing
Inspired by: Ordered and Quantum TreeMaps - Benjamin B. Bederson, Ben Shneiderman, Martin Wattenberg

SunBurst

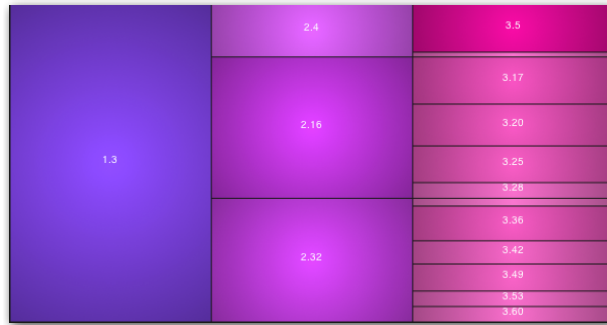
Radial Space-Filling Visualization



Inspired by: <http://www.cc.gatech.edu/gvu/ii/sunburst/>

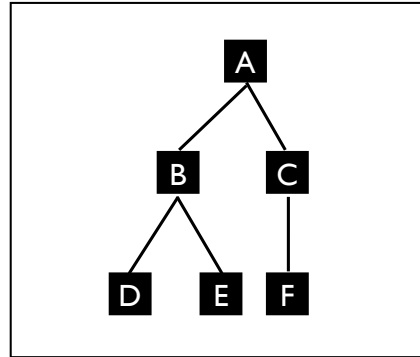
Icicle

Oriented Space-Filling Visualization

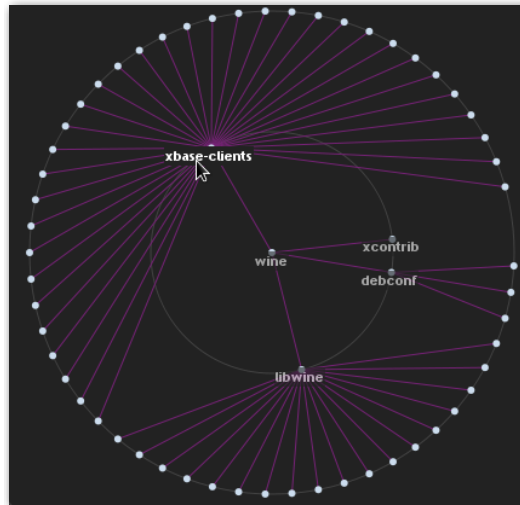


Node-Link Visualizations

RGraph, Force-Directed, SpaceTree, HyperTree



RGraph



Inspired by: [Animated Exploration of Dynamic Graphs with Radial Layout](#) - Ka-Ping Yee, Danyel Fisher, Rachna Dhamija, Marti Hearst

RGraph

- Polar vs. Rectangular Interpolation
- Node Constraints: Orientation and Ordering
- Linear Transitions vs. EaseIn/Out Transitions

RGraph

Polar vs. Rectangular Interpolation

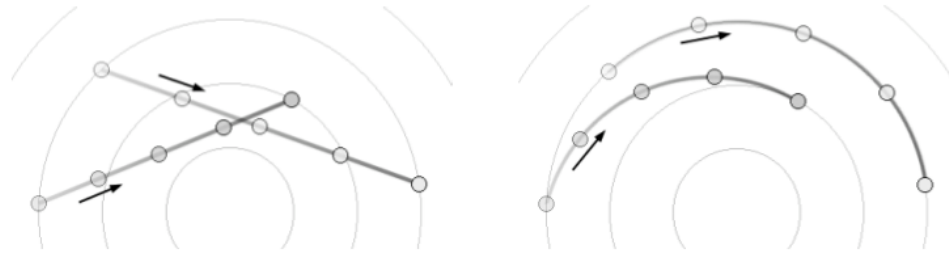


Figure 3. Interpolation in rectangular coordinates (left) can yield a confusing animation. Interpolation in polar coordinates (right) works better for radial layouts.

Source: Animated Exploration of Dynamic Graphs with Radial Layout - Ka-Ping Yee, Danyel Fisher, Rachna Dhamija, Marti Hearst

RGraph

Node Constraints:
Parent - Child angle

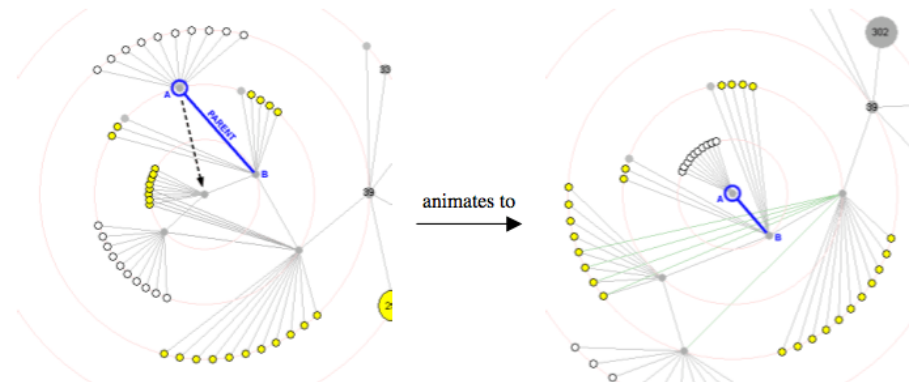


Figure 4. Node A is selected to become the new focus. The orientation of edge AB is maintained.

Source: Animated Exploration of Dynamic Graphs with Radial Layout - Ka-Ping Yee, Danyel Fisher, Rachna Dhamija, Marti Hearst

RGraph

Node Constraints:
Child Ordering

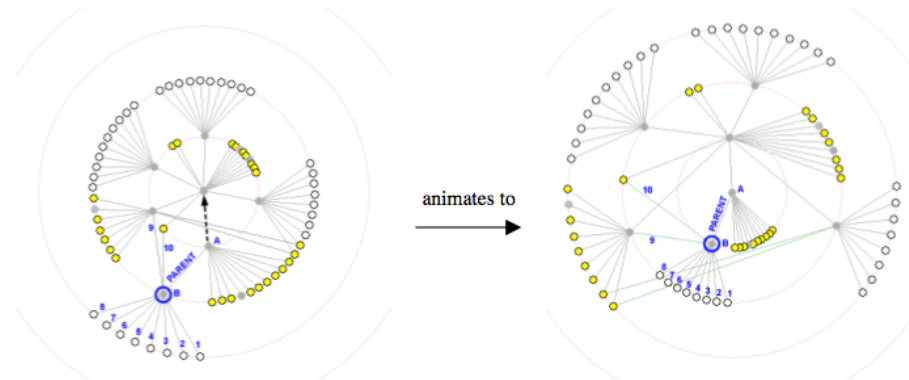


Figure 5. Node A becomes the new focus. The ordering of node B's neighbors is preserved.

Source: Animated Exploration of Dynamic Graphs with Radial Layout - Ka-Ping Yee, Danyel Fisher, Rachna Dhamija, Marti Hearst

RGraph

Slow-in, slow-out Transitions

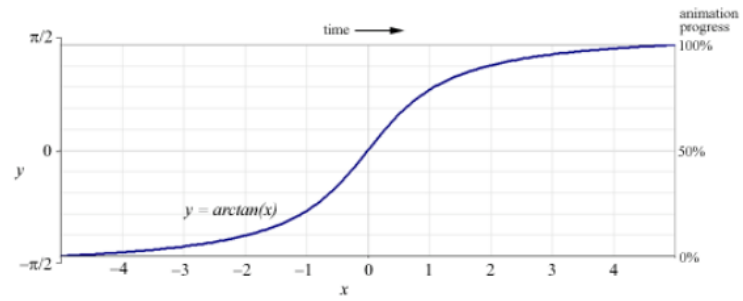
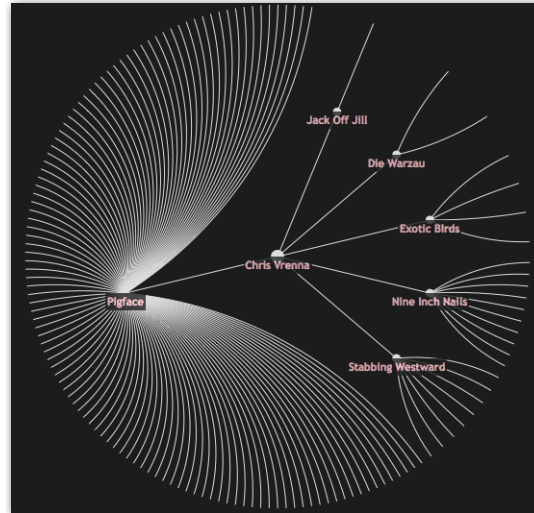


Figure 6. Slow-in, slow-out animation timing

Source: Animated Exploration of Dynamic Graphs with Radial Layout - Ka-Ping Yee, Danyel Fisher, Rachna Dhamija, Marti Hearst

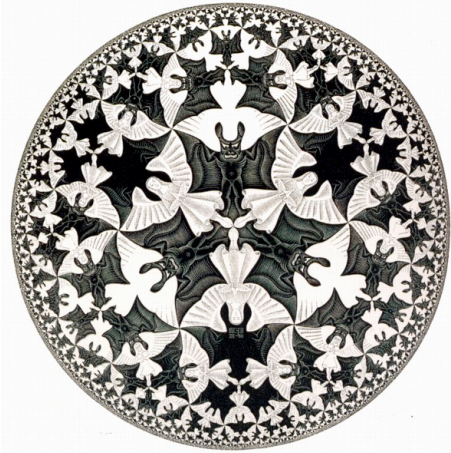
HyperTree



Inspired by: A focus+context technique based on Hyperbolic Geometry for Visualizing large Hierarchies - John Lamping, Ramana Rao, Peter Pirolli

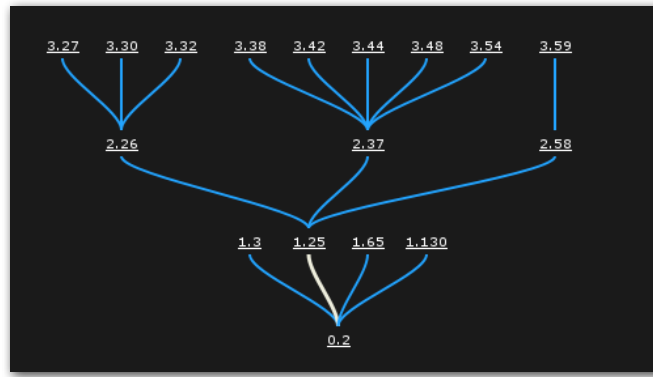
HyperTree

Poincare Disk Model of
Hyperbolic Geometry



Circle Limit IV - Escher

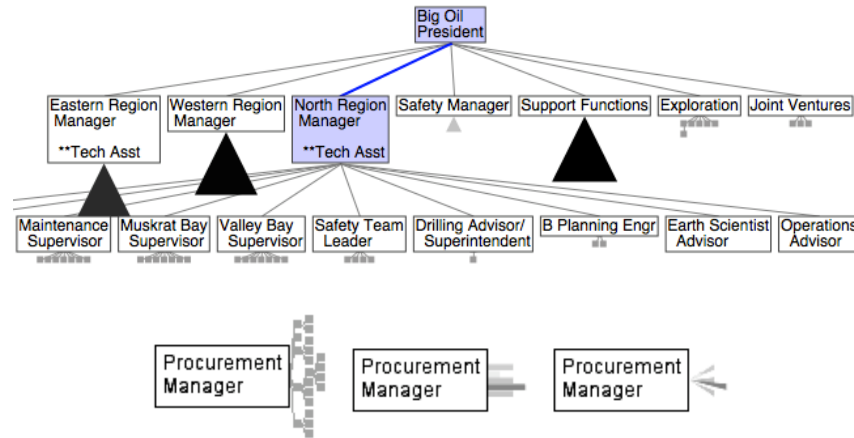
SpaceTree



Inspired by: SpaceTree: Supporting Exploration in Large Node Link Tree, Design Evolution and Empirical Evaluation - Catherine Plaisant, Jesse Grosjean, Benjamin B. Bederson

SpaceTree

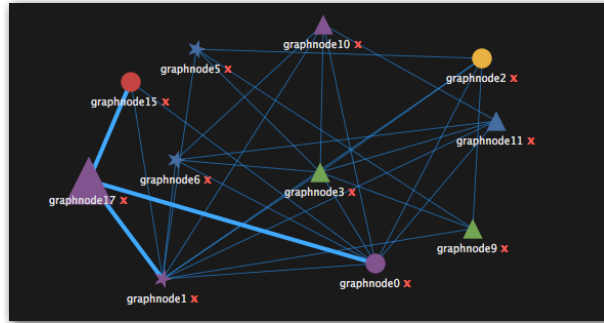
Only show Context-Related Nodes



Source: SpaceTree: Supporting Exploration in Large Node Link Tree, Design Evolution and Empirical Evaluation - Catherine Plaisant, Jesse Grosjean, Benjamin B. Bederson

Force-Directed

Physical System Simulation

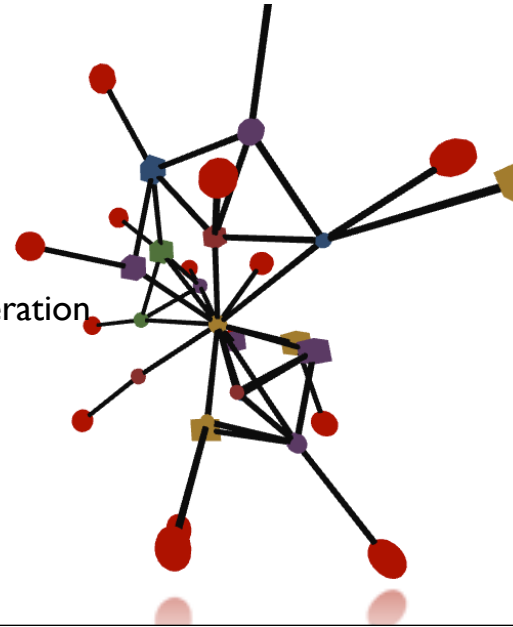


Some Examples

- [Inspecting Google Chrome](#)
- [Artist-Band Relationships Visualization](#)
- [Mozilla Firefox 4 beta UI Study](#)
- [Mozilla.org Community Visualization](#)
- [Google Wave Visualizer](#)
- [The Guardian's Embedded TreeMap](#)

What's Next

- WebGL
- Hardware Acceleration
- 3D Layouts



Questions?

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Project Page: <http://thejit.org>

Blog: <http://blog.thejit.org>

GitHub: <http://github.com/philogb>