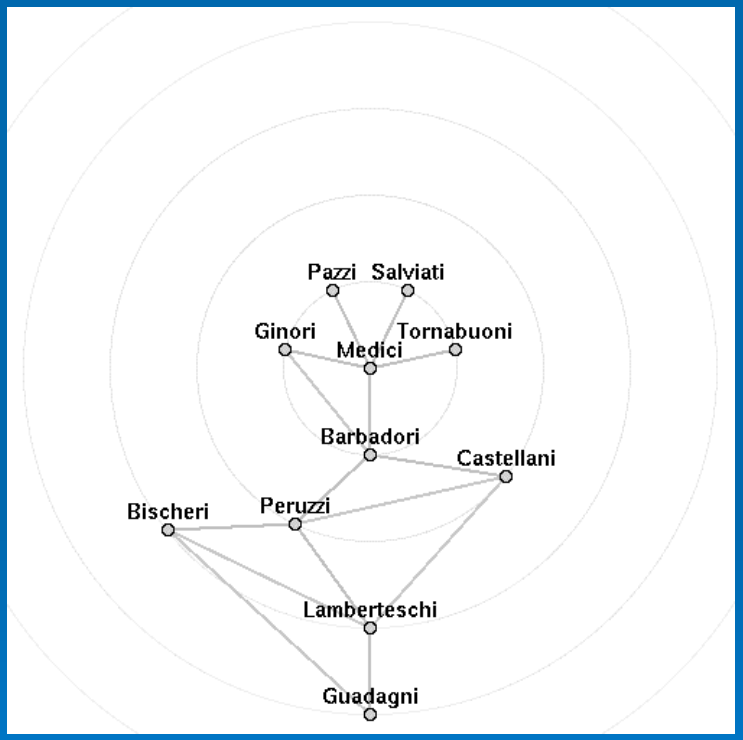
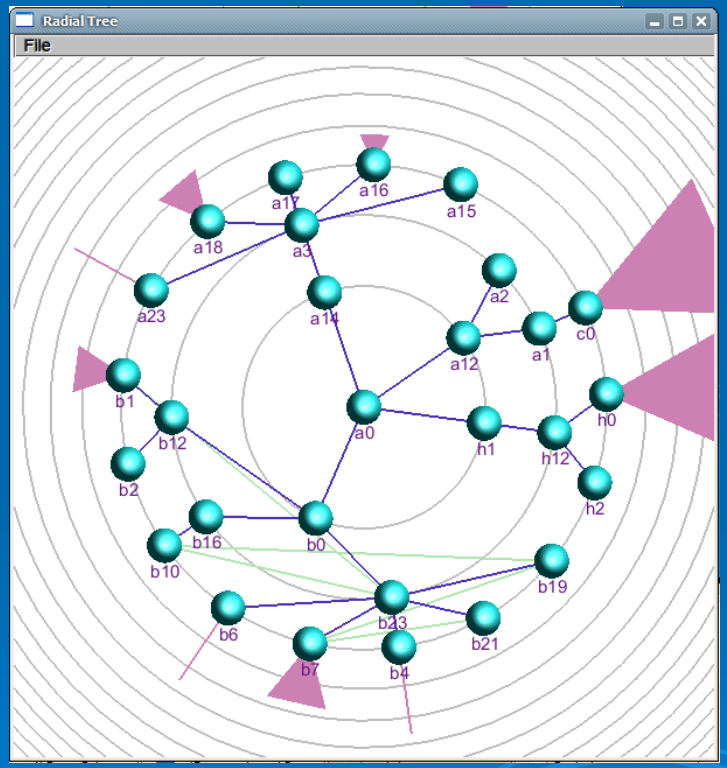
Pushing the Scale of Radial Graph Drawing

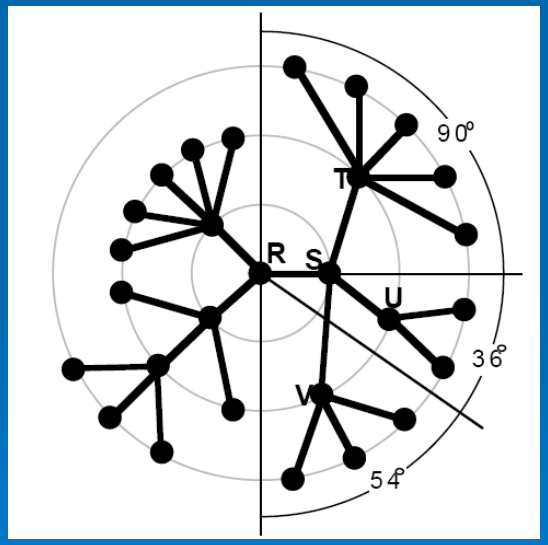


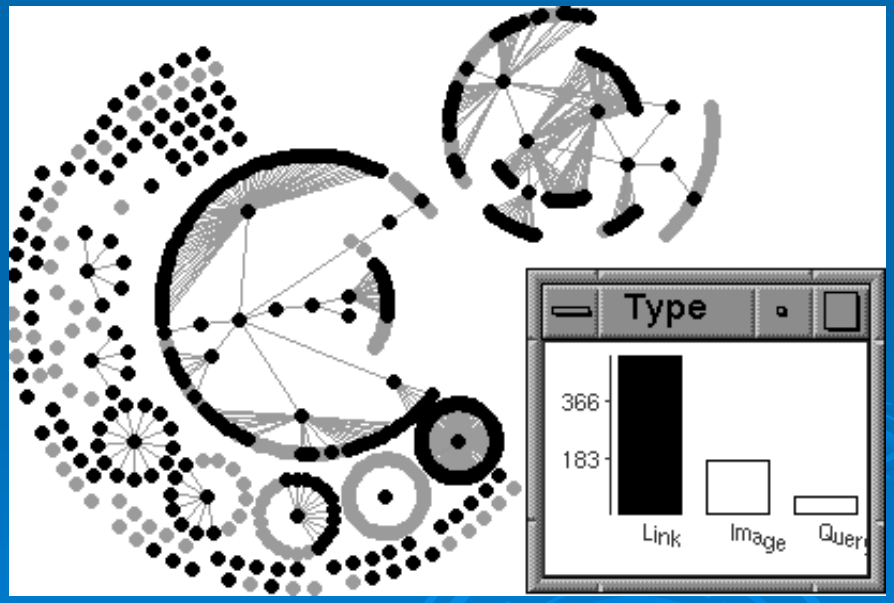


Presentation by Cody Robson

Radial Graph Drawing Recap

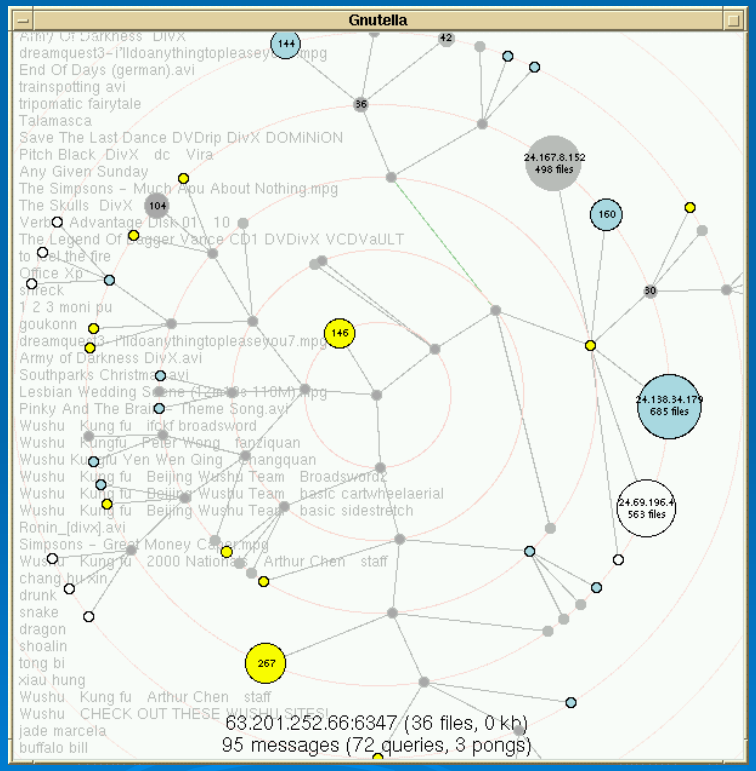
- Radial placement lays out graph as a tree
- Focused node treated as root
- Radians of circles divided amongst children





Wills, *NicheWorks – Interactive Visualization of Very Large Graphs*
Journal of Computational and Graphical Statistics, Vol 8 No 2, 190-212

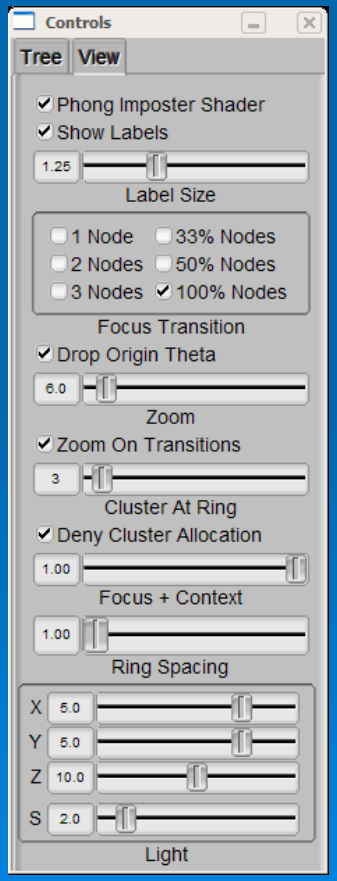
Animated Exploration of Dynamic Graphs with Radial Layout

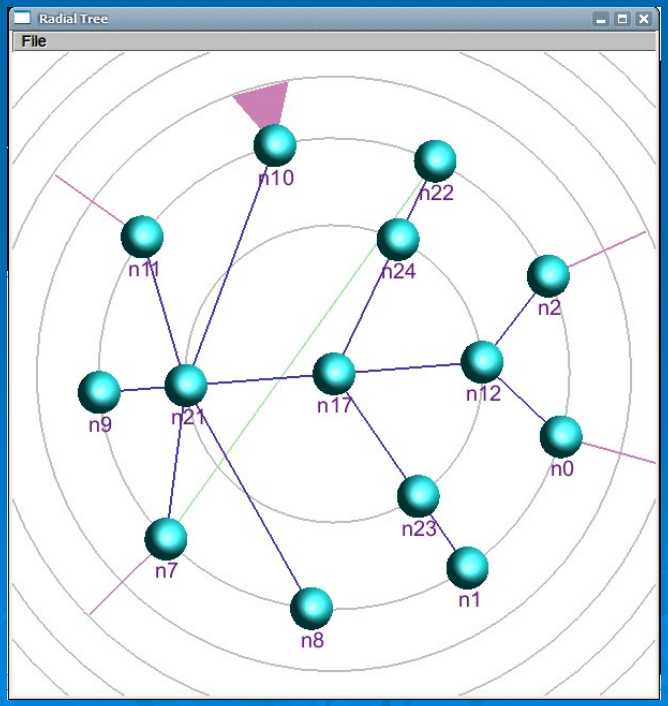


Yee et al. Proc Info Vis 2001

My Goals

- Technique-driven
- Start with Yee et al.’s feature set
- Add extensions to aid with scaling





Features of Yee et al.

Technique Features

- Animated focus transitions
- Interpolating Polar Coordinates
- Slow-in Slow-out
- Graph Orientation Constraint
- Constrained Neighbor Ordering

Data Features

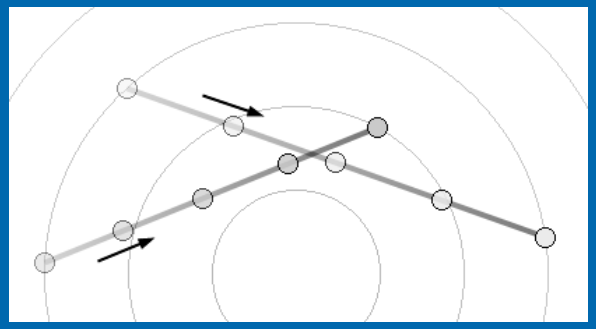
- Dynamic Node Addition/Subtraction
- Dynamic Node Sizes

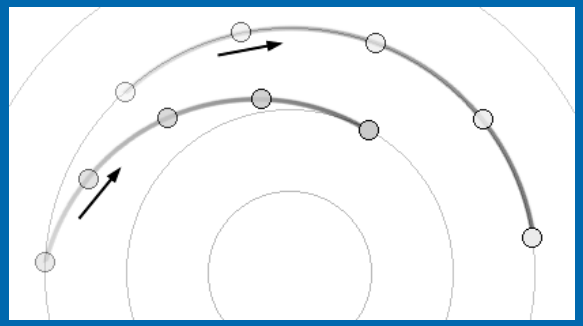
Scaling of Yee et al.

- Nodes bunch up on wider rings
- Large Transitions are a mess
- Terrible at leaf nodes of trees

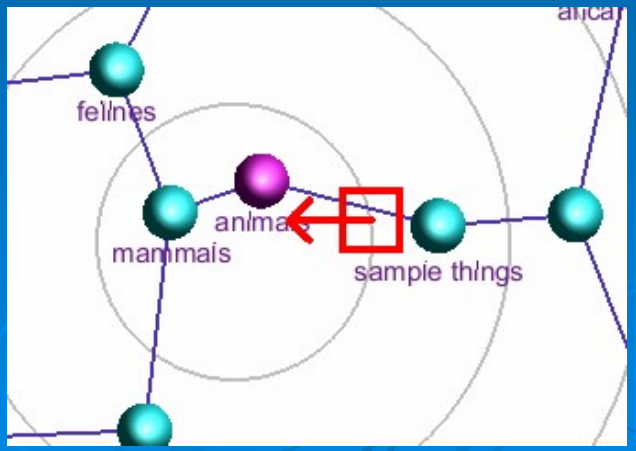
Polar Interpolation

Motivation: Avoid massive intersection



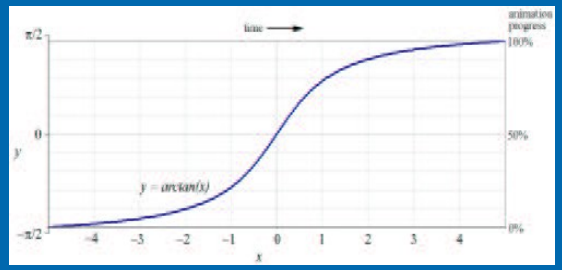


My extension: Dropping orientation at the origin

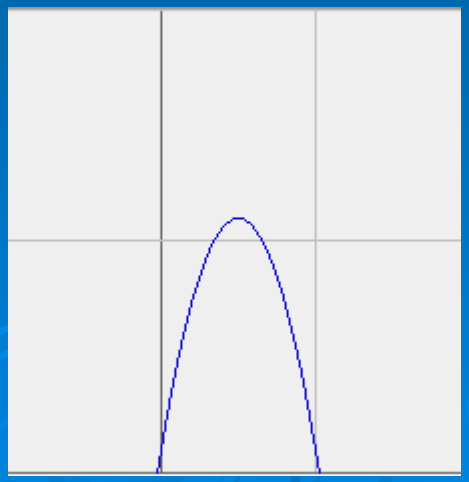


Slow in Slow out

Yee et al.: Arctangent position function

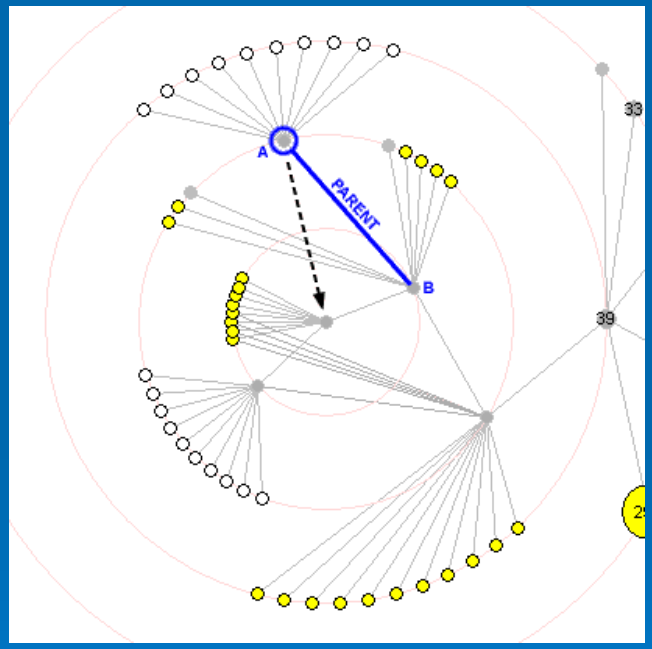


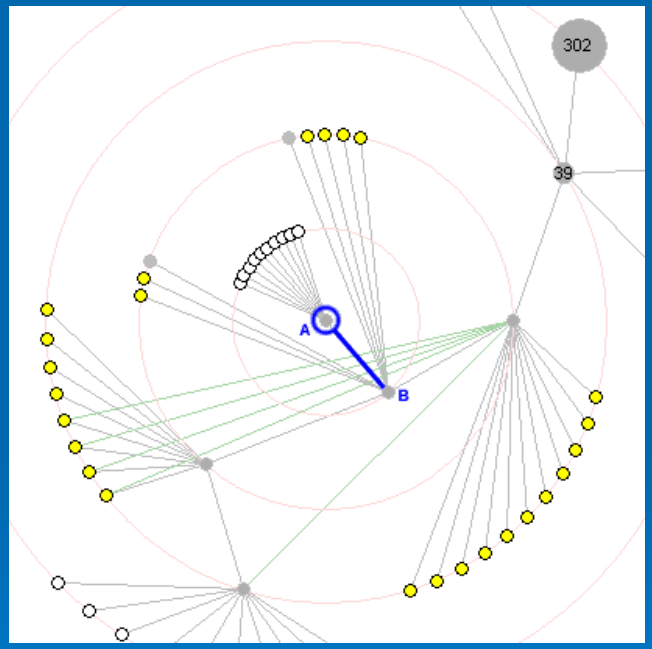
Me: Quadratic velocity function



Orientation Constraint

Motivation: Reduce rotational travel

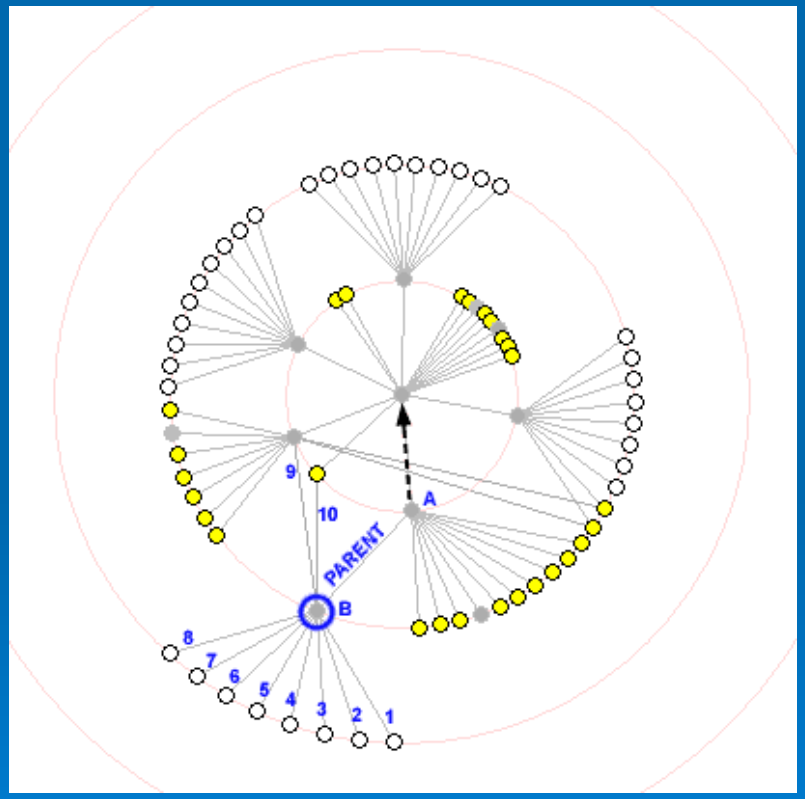


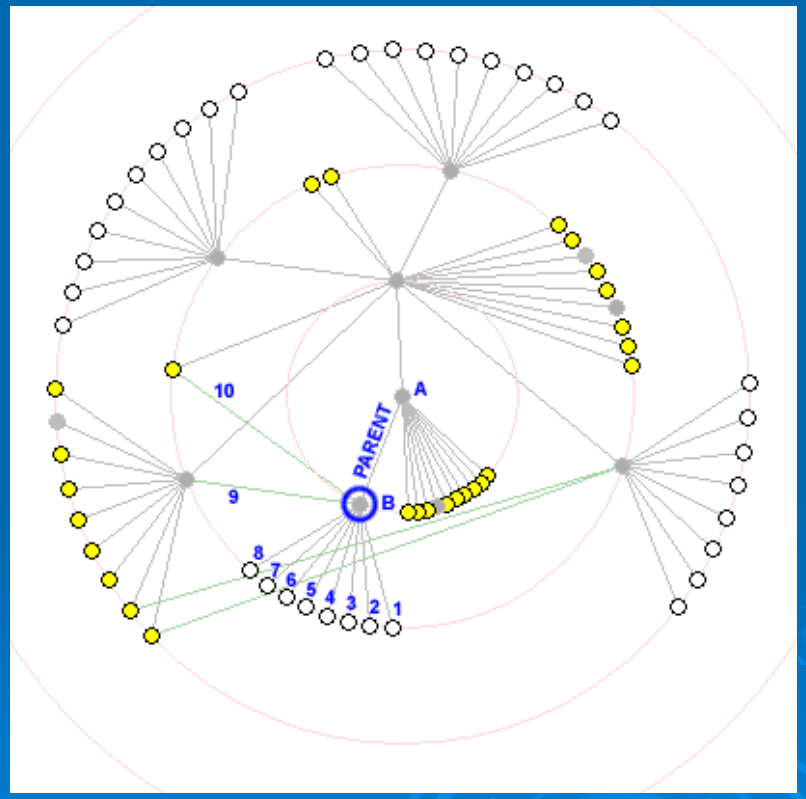


Maintain direction of edge between new focus and parent

Consistent Neighbor Ordering

Easy: Node's old tree children remain ordered



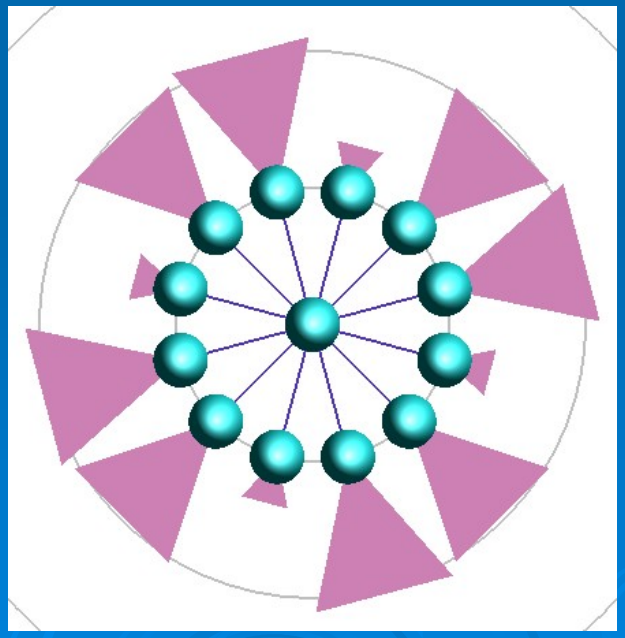


Harder: Node's *new* tree children remain ordered

Extensions of Yee et al.

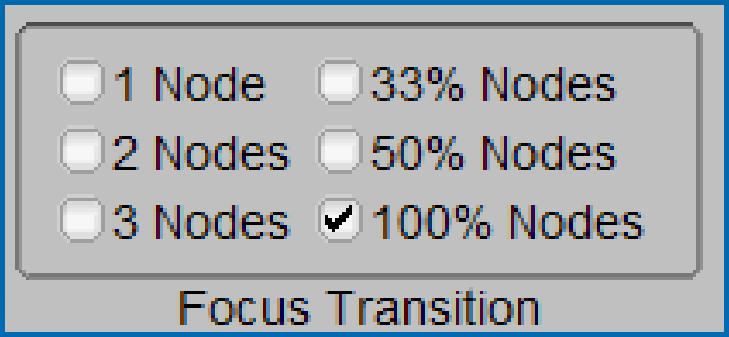
Two proposed extensions:

- Intermediate focus transitions
- Node aggregation



Transition Series

Focus walks along shortest path



- One / two / *n* node jump
- 33% / 50% node jump

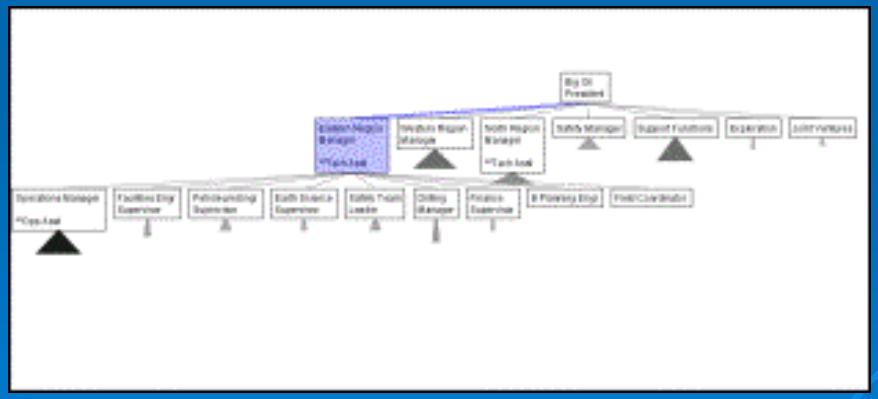
Slow-in Slow-out for each transition!

Node Aggregation

Cluster nodes or sub trees?

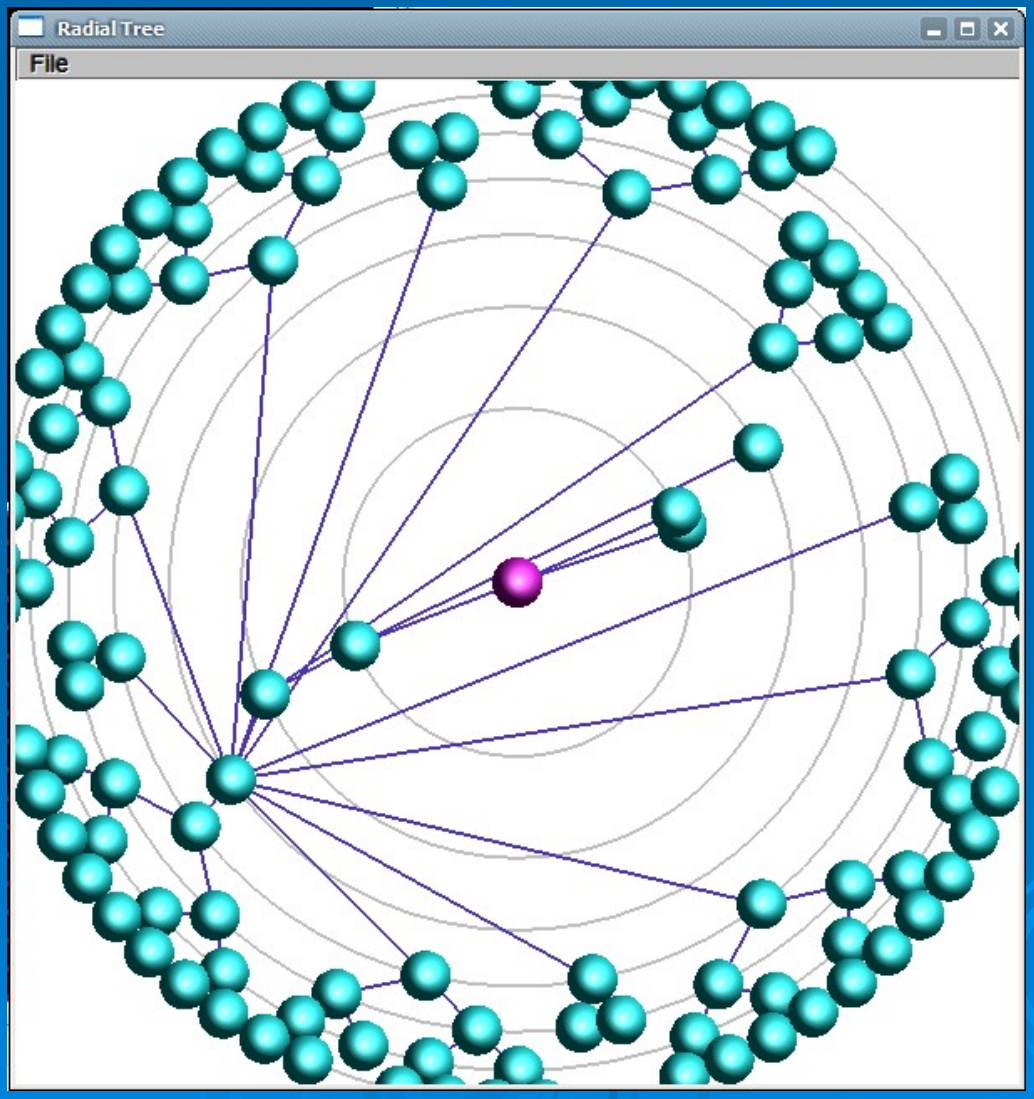
SpaceTree's *Triangular Preview*

- Should scale logarithmically
- Straight Lines for single-width paths

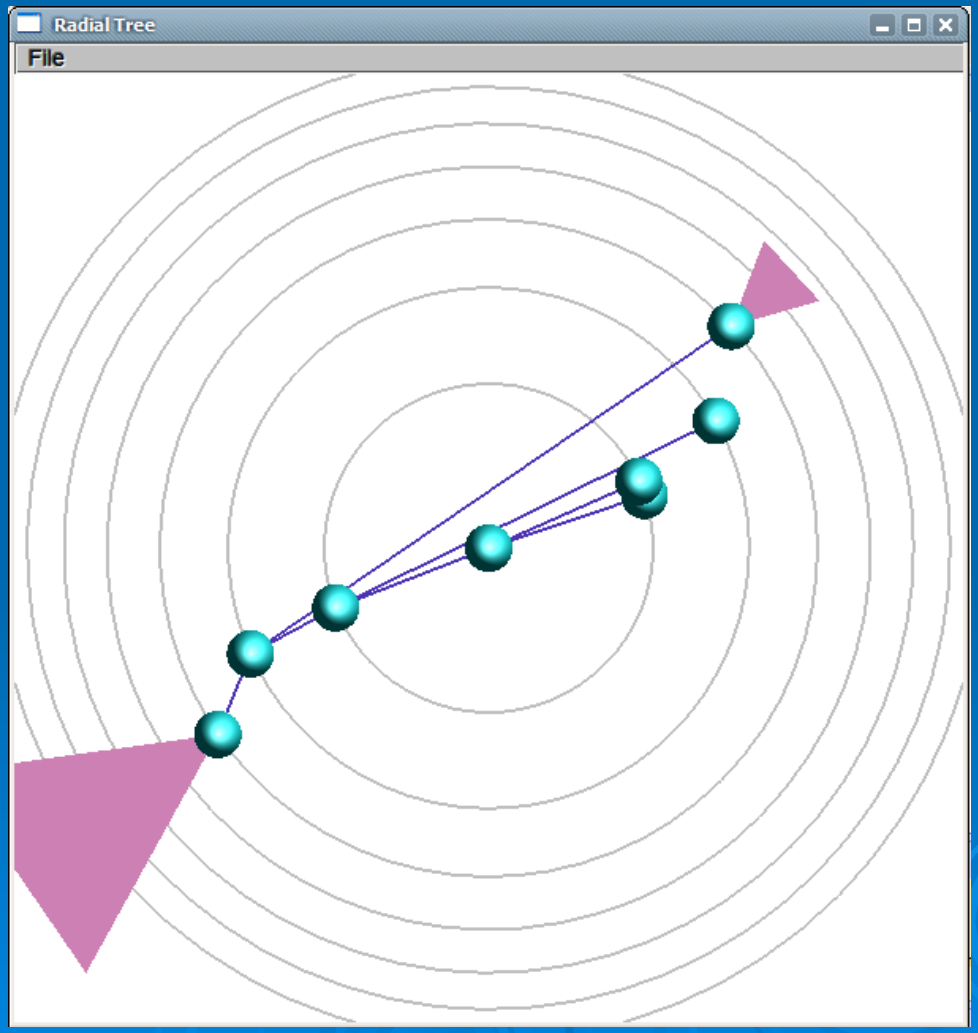


Consider effects on radial layout!

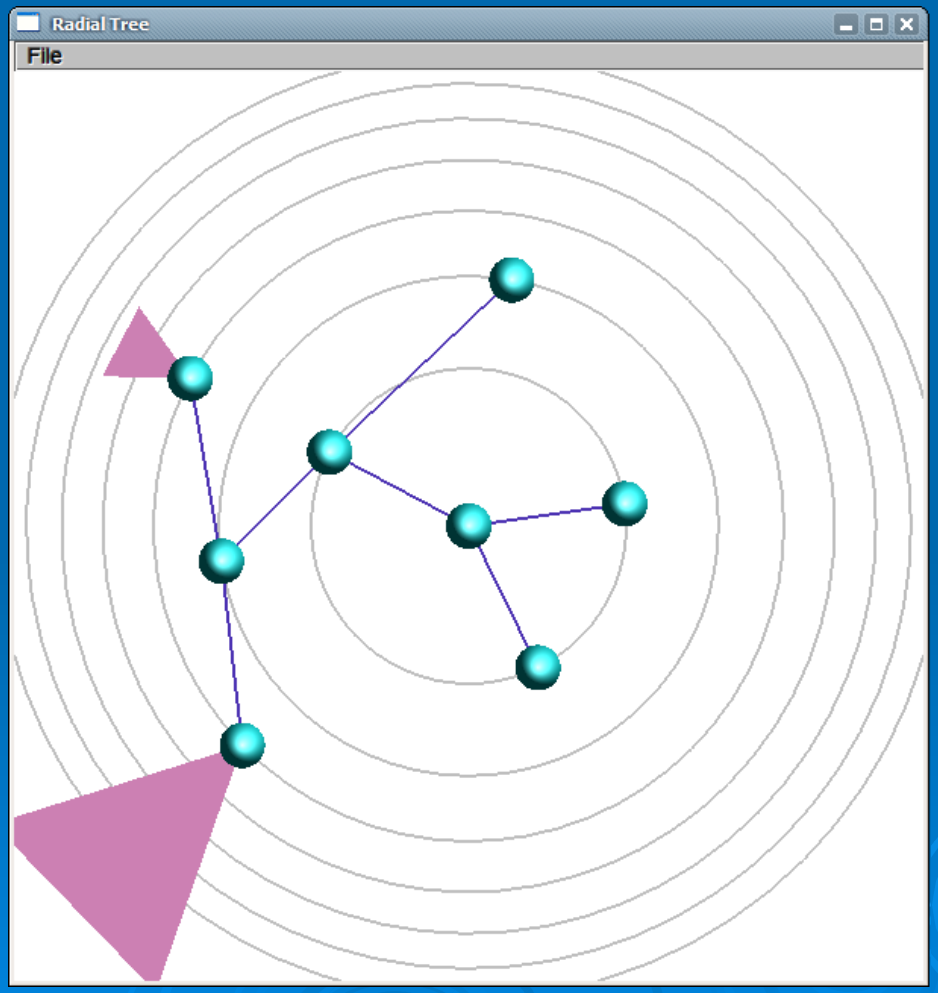
Radial Layout of Trees



Radial Layout of Trees

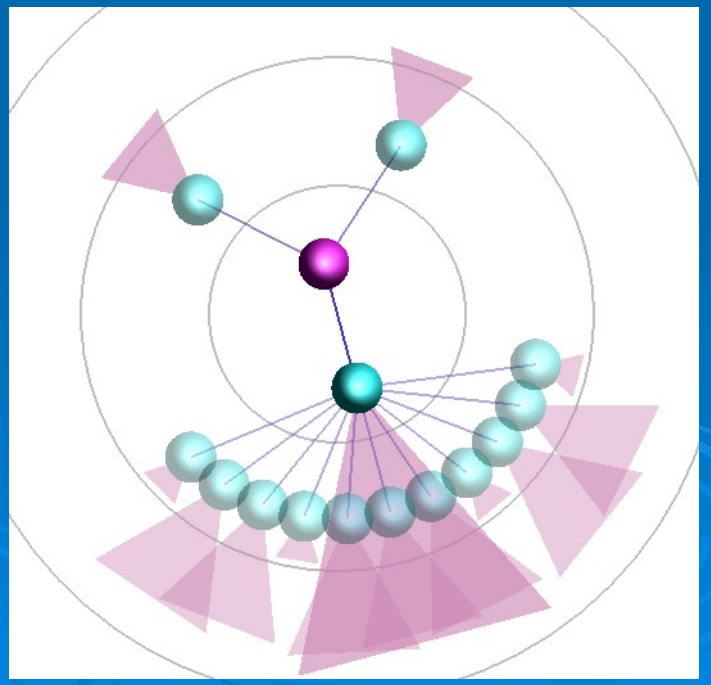


Radial Layout of Trees

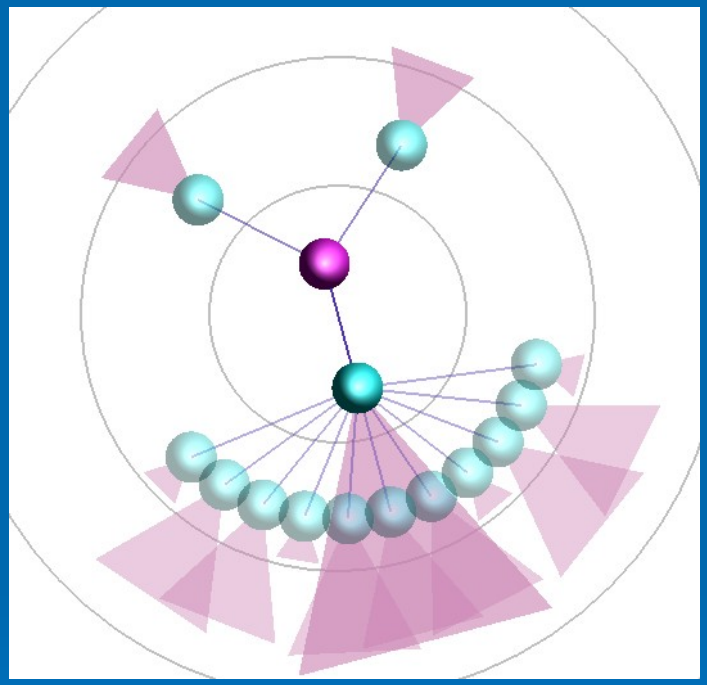


My Extensions

- Fade-in / fade-out animation
- Focus + Context
- Pan and Zoom
- Aesthetics



Fade-in Fade-out



Clustering hides:
- Nodes
- Edges

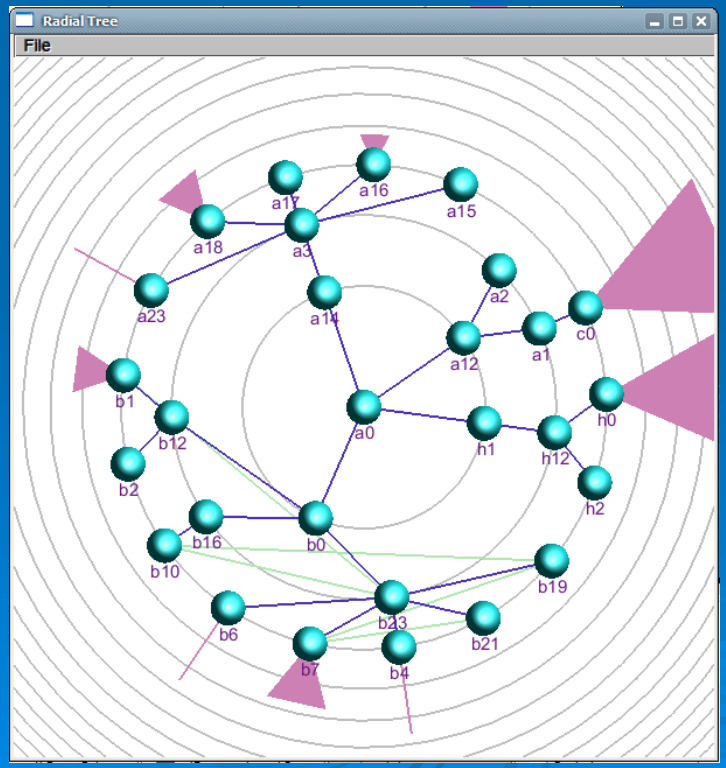
Clustering creates:
- Triangular Previews

Slow-in Slow-out?

Focus + Context

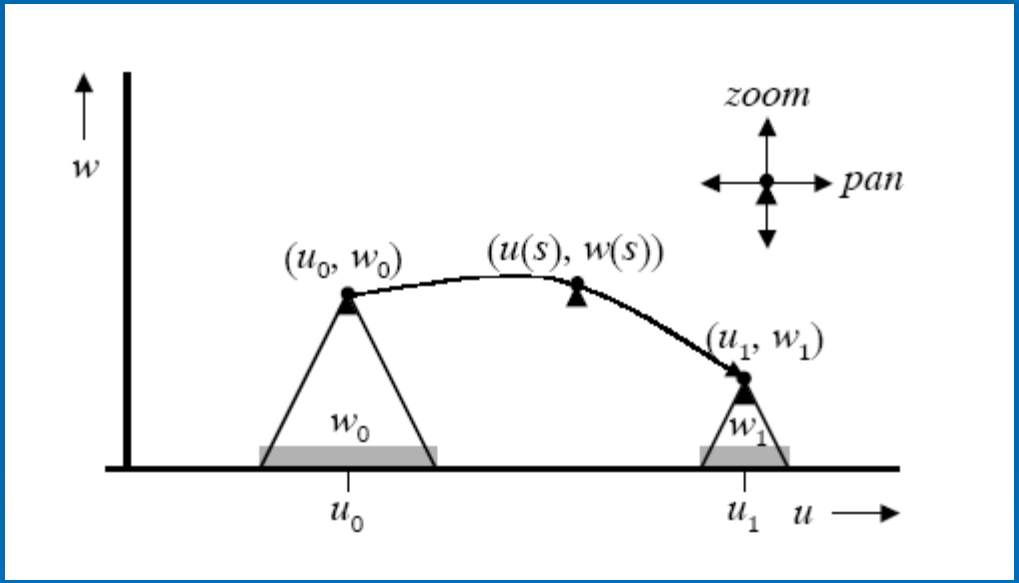
Rings' radius scale with log function

Eventually clustering takes over anyway



Pan and Zoom

Transition ~= pan?

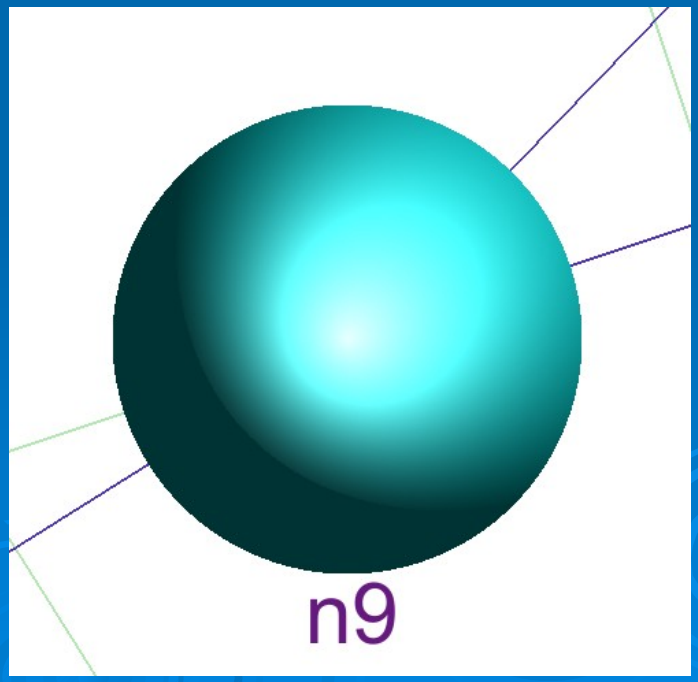


van Wijk et al. *Smooth and Efficient Zooming and Panning*
Proc from InfoVis 2003 pages 21-30

Aesthetics

- Modern hardware: no excuse for quality compromises

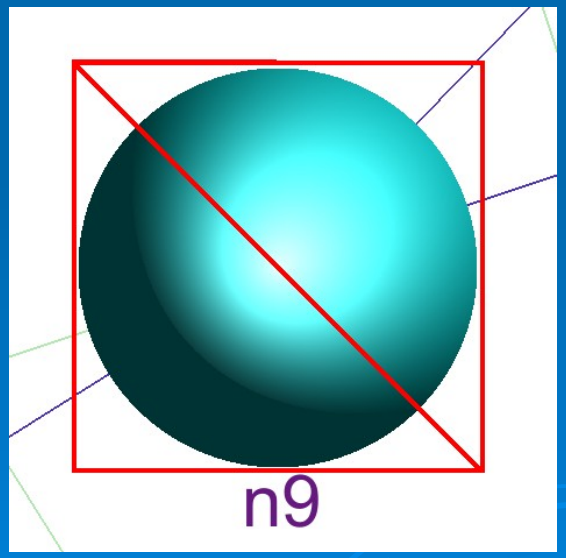
- Rendering at all scales should be considered



Node Drawing

Imposter Rendering:

- Replace geometry with billboards
- Calculate normals exactly
- Use “real” lighting



Tarini et al. *QuteMol* IEEE Vis 2006

Label Rendering

Lots of OpenGL font libraries…

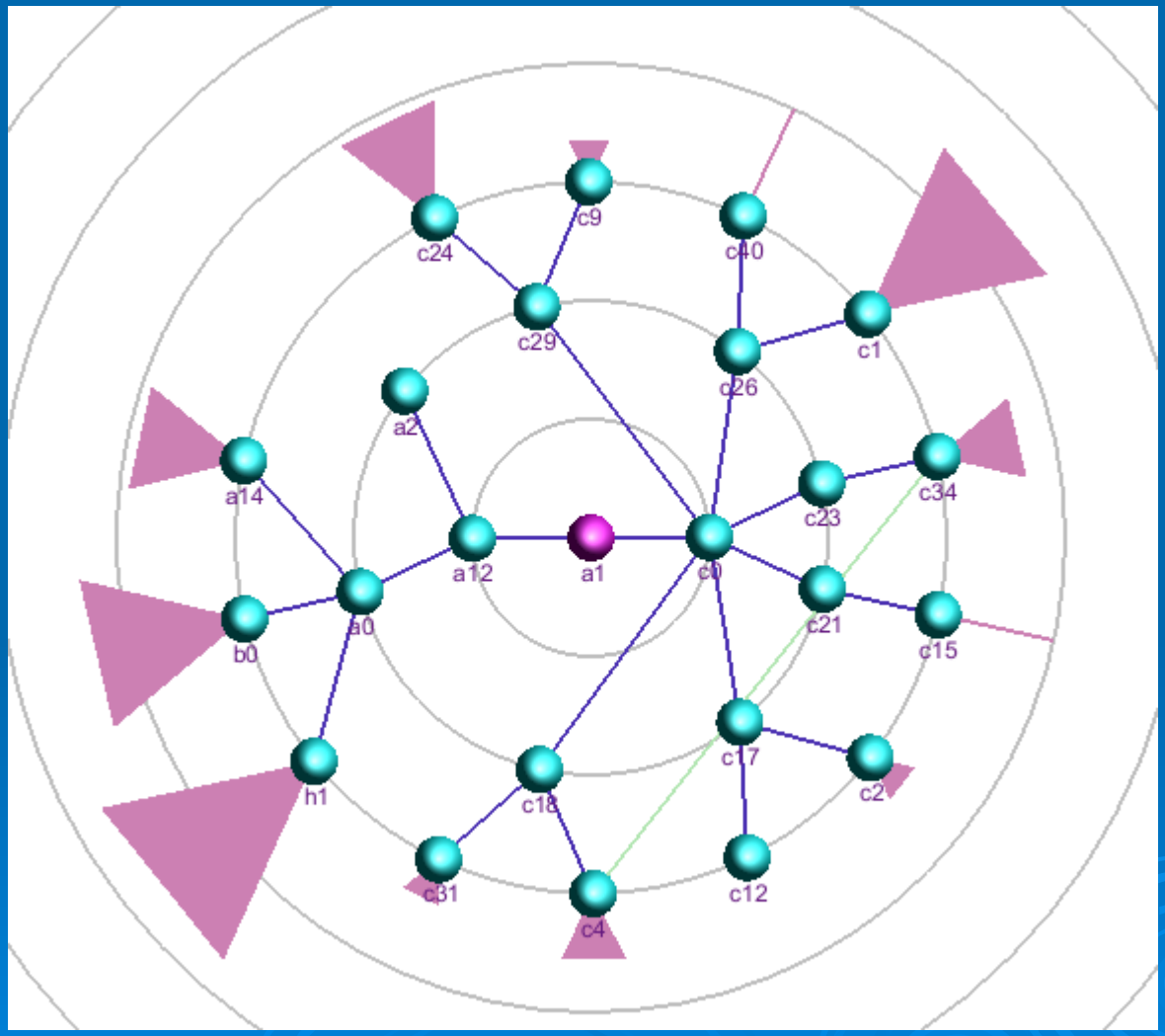
FTGL

Pixmaps (AntiAliased):

- Look great at all scales
- Expensive

Henry Maddock, ftgl.wiki.sourceforge.net

Results


c24
c9
c40
c29
c1
c26
a2
a14
c23
c34
a12
a1
c0
b0
a0
c21
c15
c17
h1
c18
c2
c31
c12
c4