

Animated Exploration of Dynamic Graphs with Radial Layout

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Animated Radial Layout Viz.

- ❖ Introduction
- ❖ Methods
- ❖ Animation technique
- ❖ Application
- ❖ Conclusion

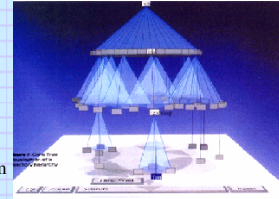


Animated Radial Layout Viz.:

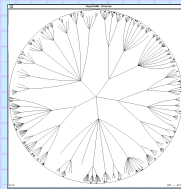
- ❖ Presence of interactive data visualization provides a new insight in the data exploration process

- ❖ Different layout algorithms:

- ❖ Cone Tree
 - ❖ Hyperbolic Tree
 - ❖ Radial Layout
 - ❖ H3 System
- } Hierarchical data format
- : Hierarchical/Generic Layout Algorithm
- : Generic Layout Algorithm



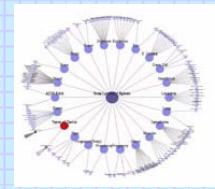
Cone Tree Layout



Radial Layout



H3 Layout (3D Hyperbolic)

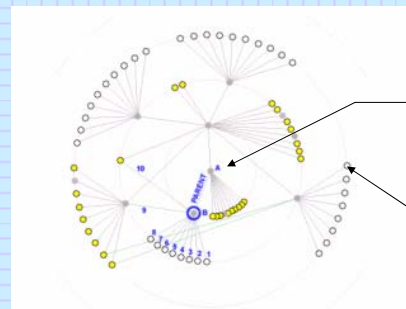


Hyperbolic Layout

Animated Radial Layout Viz.:

- ❖ Radial Layout:

- ❖ Layout of information on concentric circles
- ❖ The graphics get re-arranged around the focus node
- ❖ Papers' Approach : - to apply animation technique during the re-arrangement

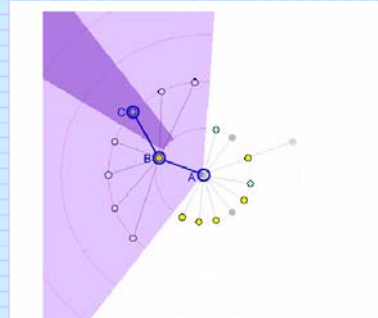


Focal Node

Node on the concentric circle

Animated Radial Layout Viz.:

- ❖ Methods:
{ data comprises of : parent-child relationship and non-tree neighbors }
- ❖ Radial Layout:
 - ❖ Selected node acts as a “focus node” and moves to the center of the layout
 - ❖ Breadth-first transversal performed to determine the parent-child relationships from the focus node
 - ❖ Same-level child nodes arranged in consecutive outer concentric circles from parent
 - ❖ Node angular position is a function of sector of the ring of the node
 - ❖ Child nodes of the parent nodes are arranged within this sector area



Animated Radial Layout Viz.:

- ❖ Methods:
 - ❖ Space Allocation:
 - ❖ Content quantity determine the size of the nodes
e.g.: - #transactions, #queries
 - ❖ Accounted for issues on node overlapping:
- by calculating the angular width :
$$\text{Angular width of a node} = \frac{\text{diameter of the node}}{\text{distance from the focus node}}$$
 - ❖ Choice of final angular width =
$$\max(\text{angular width of node, total angular width of child sub trees})$$
 - ❖ Accommodate for addition/deletion of nodes with minimal layout restructuring



Animated Radial Layout Viz.:

❖ Animation Techniques:

Aim: To maintaining consistency in layout and content for user during refocus

- ❖ By providing a smooth transition for relocating the selected node at the center
- ❖ Unique in maintaining the uniformity in layout – other nodes arranged in relation to other nodes
- ❖ Supports data with tree structures and associated cross-linking data (non-tree neighbors)

❖ Transition Paths:

- ❖ Use of rectangular co-ordinates for transition during layout, results in confusing animation and clustering of data points during rearrangement
- ❖ Exploited the polar co-ordinates for smooth animation
 - Arc motion
 - Movement on the existing circles periphery, if not changing the levels
 - Supports change in level by giving smooth spiral movement



Rectangular co-ordinates (left) v/s Polar co-ordinates (right) use in transition calculation

Animated Radial Layout Viz.:

❖ Animation Techniques:

Two constraints were applied to maintain consistency

- ❖ Reduction in rotational time during transition phase
 - accomplished by maintaining the same direction for the edge connecting the focal node and its parent node

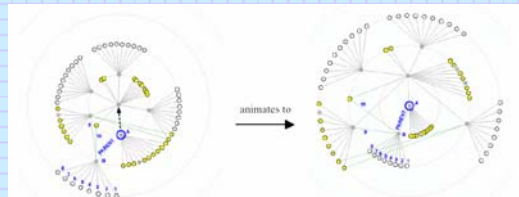
Fig (Right): Node A is selected to become the new focus. The orientation of edge AB is maintained



- ❖ Avoid edge cross-over condition among non-tree neighbor nodes

- tracking connected node edges to the parent node and laying out by proceeding in clockwise direction
- level integrity maintained

Fig (Right): Node A becomes the new focus. The ordering of node B's neighbors is preserved



Animated Radial Layout Viz.:

Animation Techniques:

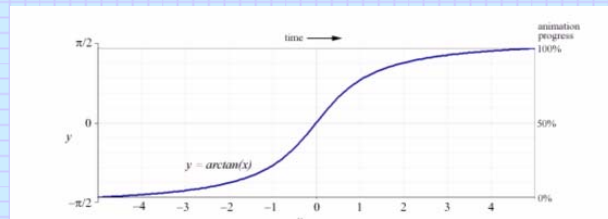
Animation Timing:

- use of arctangent function as compared to straight linear timing during transition

Features of Arctangent function (Graph) :

- Initial slow starts
- smooth acceleration in the center
- decelerate at the end

Smooth transition helps user to keep track of the nodes of interest



Arctangent function (Slow-in, slow-out animation timing)

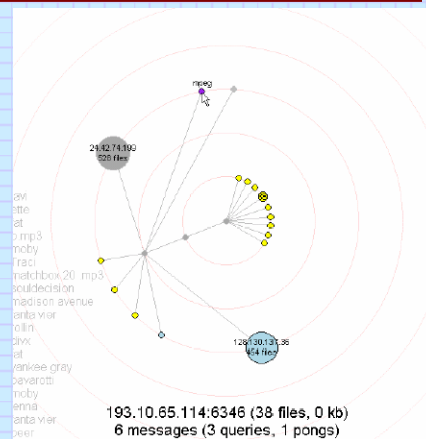
Animated Radial Layout Viz.:

Applications:

Gnutellavision: File-sharing Network

Previously visualization layout - static

- Dynamic animation features added:
- Status – through color feedback
- Operation capacity – through circle size
- Query – display of keyword above the circle
- Query origin and transition among network – through color-coding the receiving nodes and edges

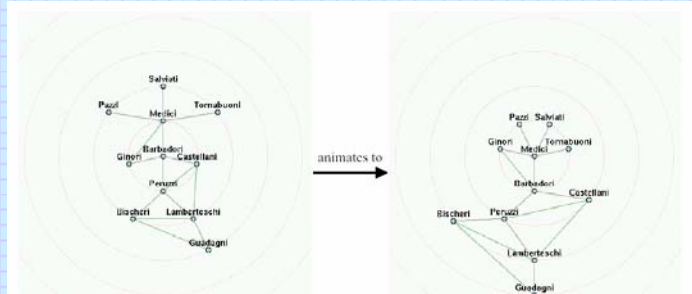


Animated Radial Layout Viz.:

Applications:

Social Network:

- Provides an overview of the relationships between different nodes
- Helpful in quick interpretation of the social structure at a glance



Animated Radial Layout Viz.:

AVI movie

Conclusion:

The animation applied provided a user-friendly techniques for interactively exploring graphs in a focus-plus-context style

