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

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**Different layout algorithms:**

- Cone Tree
- Hyperbolic Tree
- Radial Layout: Hierarchical/Generic Layout Algorithm
- H3 System: Generic Layout Algorithm

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**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
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- **Methods:**
  - **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

- **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:
      - Angular width of a node = \( \frac{\text{diameter of the node}}{\text{distance from the focus node}} \)
  - Choice of final angular width = \( \text{max (angular width of node, total angular width of child sub trees)} \)
  - Accommodate for addition/deletion of nodes with minimal layout restructuring
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- **Animation Techniques:**
  - **Aim:** To maintain 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

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- **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
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

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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
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Applications:

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

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