Outline

- Introduction
- SpaceTree and TaxonTree
- Emerging design guidelines
- Related work
- Controlled experiment and results
- Conclusion
Introduction

- Goal: to browse hierarchies and trees
  - **Space-filling techniques**
    - Best used when topology is not interesting
  - **Node link diagrams**
    - Typically make inefficient use of screen space
  - **Other Approaches**
SpaceTree Demo
SpaceTree

Key Features

- A zoomable interface with optimized camera movement
- Dynamic scaling of branches to fit the screen space
- Preview icons summarize topology
- Searchable
TaxonTree

- Derivative of SpaceTree
- Intended to display a phylogenetic tree
  - Shows evolutionary interrelationships between species with a common ancestor
  - Branch lengths sometimes represent evolutionary time
- Currently in use by the LepTree project
  - [http://leptree.net/](http://leptree.net/)
TaxonTree Demo
Emerging Design Guidelines

- Semantic zooming better than geometric scaling
  - Readability issue
Emerging Design Guidelines

- Open as many levels as possible
Emerging Design Guidelines

- Animation - trim, center, grow
Emerging Design Guidelines

- Maintain landmarks
  - path to root
Emerging Design Guidelines

- Data-aware zooming
  - Random zooming - bad!
Related Work

- Space-filling techniques
  - Ex. Treemaps (leaves, not topology is interesting)
- Node link techniques
  - Ex. SpaceTree (interactive)
  - Ex. Hyperbolic trees (circular layout)
- Expand and contract visualization
  - Ex. MS Explorer
- More recent
  - Elastic hierarchies: combining treemaps and node link (InfoVis’05)
MS Explorer
Hyperbolic Trees

- Inxight StarTree
- LexisNexis browser
Controlled Experiment

- 3 tree-browsing interfaces
  - MS Explorer
  - Hyperbolic tree browser
  - SpaceTree

- Goal: find out what features supported best certain tasks
  - Node search - new and visited
  - Topology-related tasks
Controlled Experiment

- 18 subjects - CS students
  - 3 interfaces (2 minutes training with each)
  - 7 tasks
  - 40-minute sessions

- Dependent variables
  - Time to complete task
  - Presence of errors
  - Subjective ratings
Results: Node search

- First-time node finding
  - Hypothesis: hyperbolic and SpaceTree show more levels at a time => should be better

<table>
<thead>
<tr>
<th></th>
<th>Explorer</th>
<th>Hyperbolic</th>
<th>SpaceTree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task 1 (seconds)</td>
<td>10.5</td>
<td>13.2</td>
<td>11.1</td>
</tr>
<tr>
<td>Task 2 (seconds)</td>
<td>11.3</td>
<td>5.6</td>
<td>4.7</td>
</tr>
</tbody>
</table>

- Task 3 - similar
Results: Node Search

- Returning to visited nodes
  - Hypothesis: SpaceTree has more consistent layout than Hyperbolic => faster
  - Explorer is fastest because it allows multiple branches to remain open

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<tbody>
<tr>
<td></td>
<td>6.5</td>
<td>22.7</td>
<td>15</td>
</tr>
</tbody>
</table>
Results: Topology

- Listing all the ancestors of a node
  - SpaceTree was fastest (clear path)

- Local topology
  - Ex. Find 3 nodes with more than 10 descendants
  - Hyperbolic was fastest, Explorer was close

- Topology overview
  - Ex. Which one of 3 branches contains most nodes
  - Least errors with SpaceTree
Results

- User preferences
  - SpaceTree and Hyperbolic are “cooler”
  - The three are equally likely for future use
Conclusion

- SpaceTree is attractive!
- Interactive node link visualization
  - can be improved
- Preview icons
  - help estimate topology
- Consistent layout
  - helps for regularly used trees
References