Ch 14: Embed Focus+Context
Papers: TreeJuxtaposer

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CPSC 547, Information Visualization
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http://www.cs.ubc.ca/~tmm/courses/547-15
News

• reminder: proposals due by Mon 5pm
Embed: Focus+Context

• combine information within single view
• elide
  – selectively filter and aggregate
• superimpose layer
  – local lens
• distortion design choices
  – region shape: radial, rectilinear, complex
  – how many regions: one, many
  – region extent: local, global
  – interaction metaphor
Idiom: **DOITrees Revisited**

- elide
  - some items dynamically filtered out
  - some items dynamically aggregated together
  - some items shown in detail

Idiom: **Fisheye Lens**

- distort geometry
  - shape: radial
  - focus: single extent
  - extent: local
  - metaphor: draggable lens

http://tulip.labri.fr/TulipDrupal/?q=node/351
http://tulip.labri.fr/TulipDrupal/?q=node/371
Idiom: Stretch and Squish Navigation

- distort geometry
  - shape: rectilinear
  - foci: multiple
  - impact: global
  - metaphor: stretch and squish, borders fixed

System: TreeJuxtaposer

Distortion costs and benefits

• benefits
  – combine focus and context information in single view

• costs
  – length comparisons impaired
    • network/tree topology comparisons unaffected: connection, containment
  – effects of distortion unclear if original structure unfamiliar
  – object constancy/tracking maybe impaired

Further reading

  – Chap 14: Embed: Focus+Context


What and why: Data and task abstraction

- **data:** trees
  - phylogenetic tree reconstruction
    - siblings unordered, interior nodes inferred

- **task:** compare topological structure
  - larger query scopes require more explicit tool support
    - compare several is more difficult than identify/inspect one
      - even trickier: summarize all

- **derived data:** structural differences
  - best corresponding node in other tree
How: Idiom design decisions

• juxtapose linked views
  – show two tree layouts side by side
  – linked navigation

• encode with color: linked highlighting
  – structural differences
  – corresponding subtree (click select)
  – best corresponding node (hover select)
How: Idiom design decisions

- **embed focus+context in single view**
  - reduce with complex combination of filtering and aggregation
- **distort geometry**
  - metaphor: stretch and squish navigation
  - shape: rectilinear
  - foci: multiple
  - impact: global
Algorithm: Stretch and squish navigation

• guaranteed visibility of semantically important marks even when squished small
  – TJ: scalability to 500K nodes
    • all preprocessing subquadratic
    • all realtime rendering sublinear

• guaranteed visibility
  – marks always visible
  – easy with small datasets
Guaranteed visibility challenges

• hard with larger datasets

• reasons a mark could be invisible
  – outside the window
    • AD solution: constrained navigation
  – underneath other marks
    • AD solution: avoid 3D
  – smaller than a pixel
    • AD solution: smart culling
Guaranteed visibility: Small items

- naïve culling may not draw all marked items
Guaranteed visibility: Small items

- Naïve culling may not draw all marked items

Guaranteed visibility of marks

No guaranteed visibility
Structural comparison

- rayfinned fish
  - salamander
  - frog
  - mammal
    - bird
    - crocodile
    - lizard
    - snake
    - turtle
    - lungfish

- rayfinned fish
  - lungfish
  - salamander
    - frog
    - turtle
    - snake
    - crocodile
    - mammal
    - bird
Matching leaf nodes

- rayfinned fish
  - salamander
  - frog
  - mammal
    - bird
    - crocodile
    - lizard
    - snake
    - turtle
  - lungfish
Matching leaf nodes
Matching leaf nodes

diagram with leaf nodes:
- rayfinned fish
  - salamander
  - frog
  - mammal
  - bird
  - crocodile
  - lizard
  - snake
  - turtle
  - lungfish

diagram with leaf nodes:
- rayfinned fish
  - lungfish
  - salamander
  - frog
  - turtle
  - snake
  - crocodile
  - mammal
  - bird
Matching interior nodes

- rayfinned fish
  - salamander
  - frog
  - mammal
    - bird
    - crocodile
    - lizard
    - snake
    - turtle
  - lungfish
- rayfinned fish
  - lungfish
  - salamander
  - frog
  - mammal
    - turtle
    - snake
    - crocodile
    - mammal
    - bird
Matching interior nodes

- rayfinned fish
  - salamander
    - frog
  - mammal
    - bird
      - crocodile
        - lizard
          - snake
        - turtle
      - lungfish
Matching interior nodes

- rayfinned fish
- salamander
- frog
- mammal
- bird
- crocodile
- lizard
- snake
- turtle
- lungfish
Matching interior nodes

- rayfinned fish
  - salamander
  - frog
  - mammal
    - bird
    - crocodile
    - lizard
    - snake
    - turtle
  - lungfish
- rayfinned fish
  - lungfish
  - salamander
  - frog
  - turtle
  - snake
  - crocodile
  - mammal
    - bird
Similarity score: \( S(m,n) \)

\[
S(m,n) = \frac{|L(m) \cap L(n)|}{|L(m) \cup L(n)|} = \frac{\{E,F\}}{\{D,E,F\}} = \frac{2}{3}
\]
Best Corresponding Node

BCN(m) = \arg\max_{v \in T_2} (S(m, v))

- computable in $O(n \log^2 n)$
- linked highlighting
Marking structural differences

Nodes for which $S(v, \text{BCN}(v)) \neq 1$

- matches intuition
Next Time

• proposals: by 5pm Mon

• Thu Nov 5, to read
  – VAD Ch. 15: Analysis Case Studies