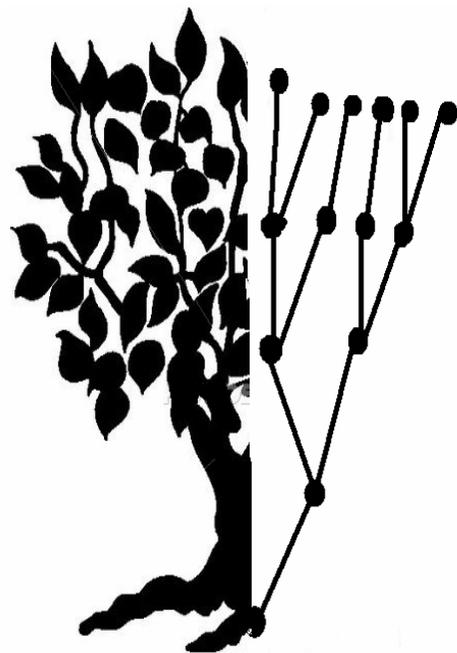


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Presentation on  
**Trees**

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Anika Mahmud  
University of British Columbia

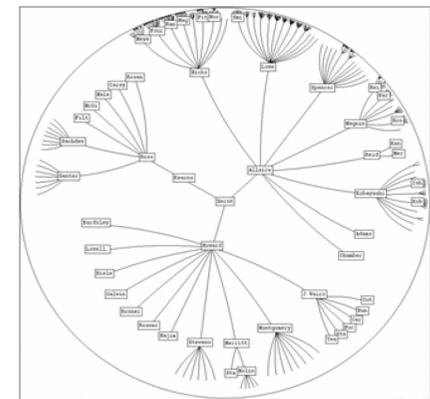
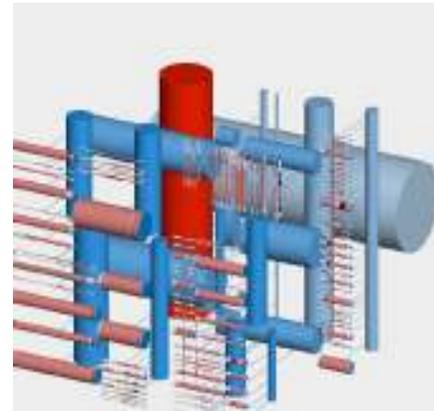
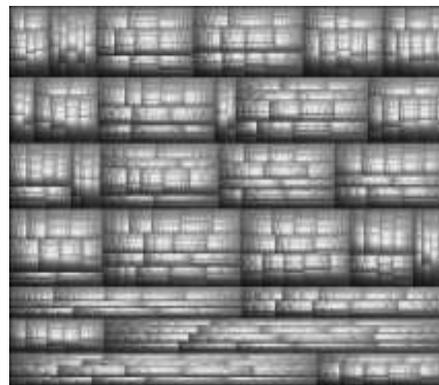
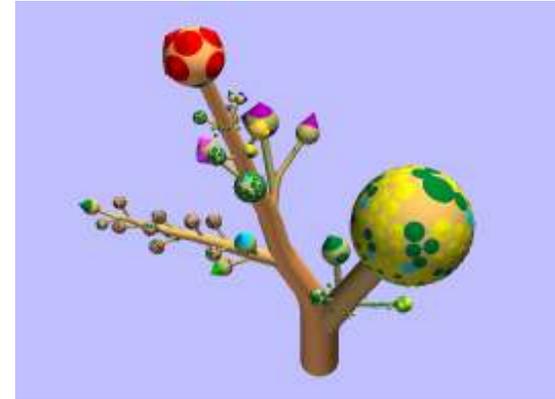
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# Papers Covered:

- J. J. van Wijk and H. van de Wetering, "Cushion Treemaps: Visualization of Hierarchical Information", IEEE Symposium on Information Visualization (INFOVIS'99), San Francisco, CA, 1999.
  - E. Kleiberg, H. van de Wetering, and J. J. van Wijk, "Botanical Visualization of Huge Hierarchies", InfoVis 2001: IEEE Symposium on Information Visualization, San Diego, CA, 2001, pp. 87-94.
  - Alfred Kobsa , " User Experiments with Tree Visualization Systems.", Proc InfoVis 2004, IEEE Symposium on Information Visualization, Austin, TX.
-

# Concentration:

- Treemap
- Cushion Treemap
- BeamTrees
- Hyperbolic browser/Star Tree
- Botanical Tree



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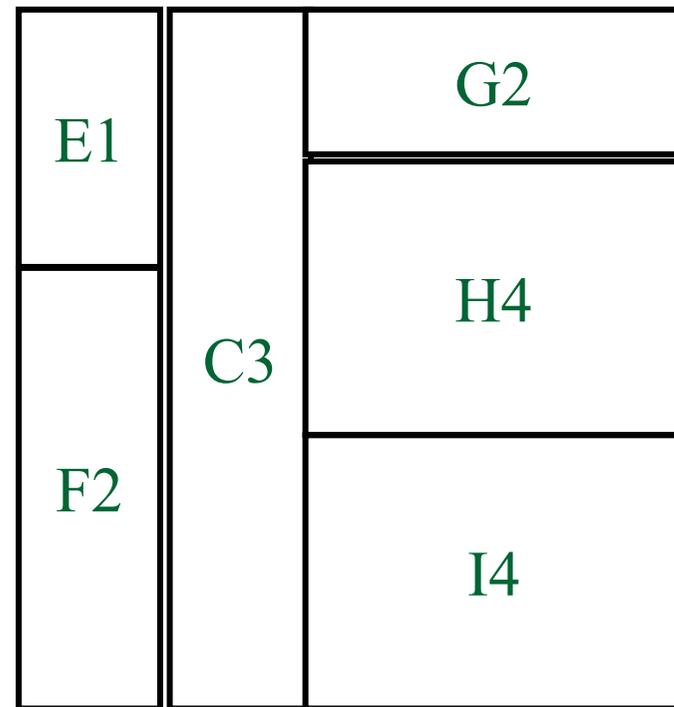
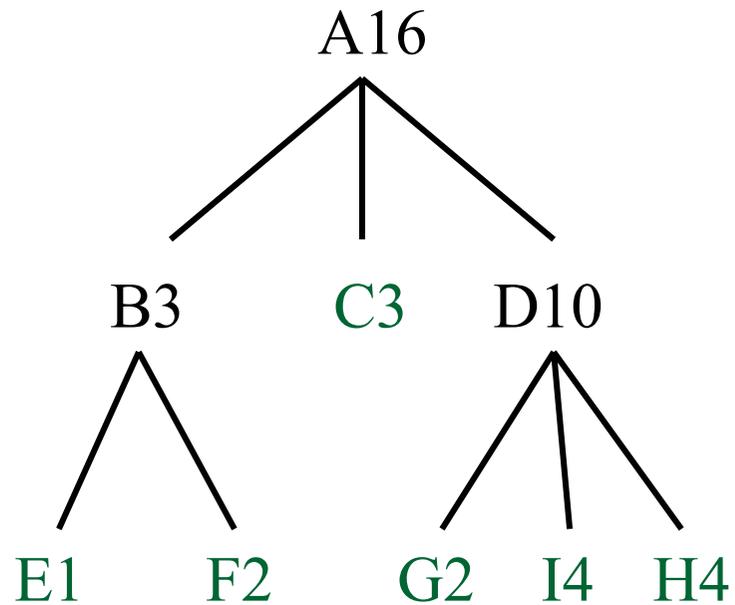
# Goal:

- Visualizing Hierarchical information using-  
Cushion treemap  
Botanical tree.
  - Performance measure for viewing hierarchical data of-  
Treemap,  
Cushion treemap,  
Beam tree,  
Hyperbolic tree and  
Botanical tree
-

# Cushion Treemap:

## Visualization of Hierarchical Information

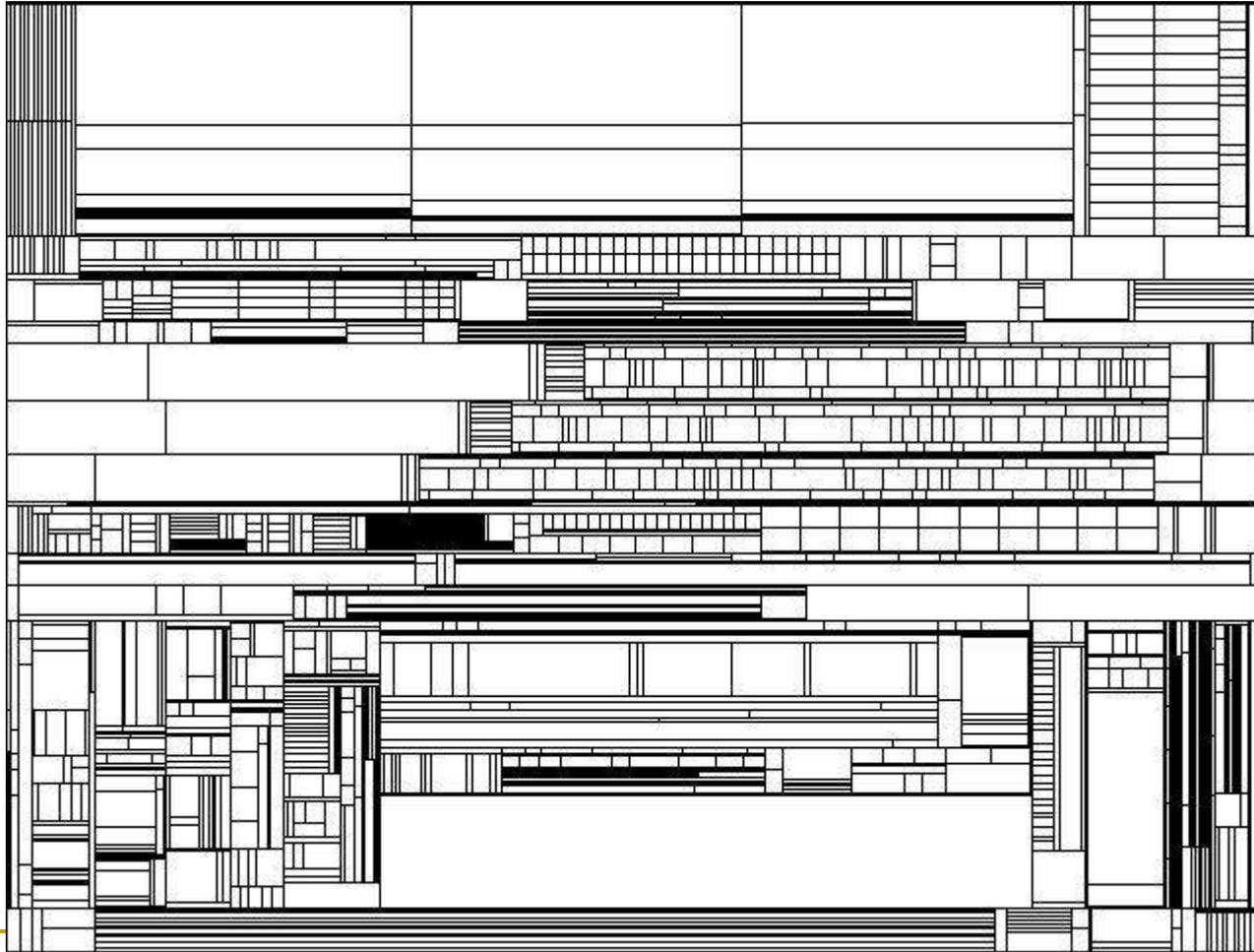
- Background- Space filling Treemap



Alternating directions, area represents size

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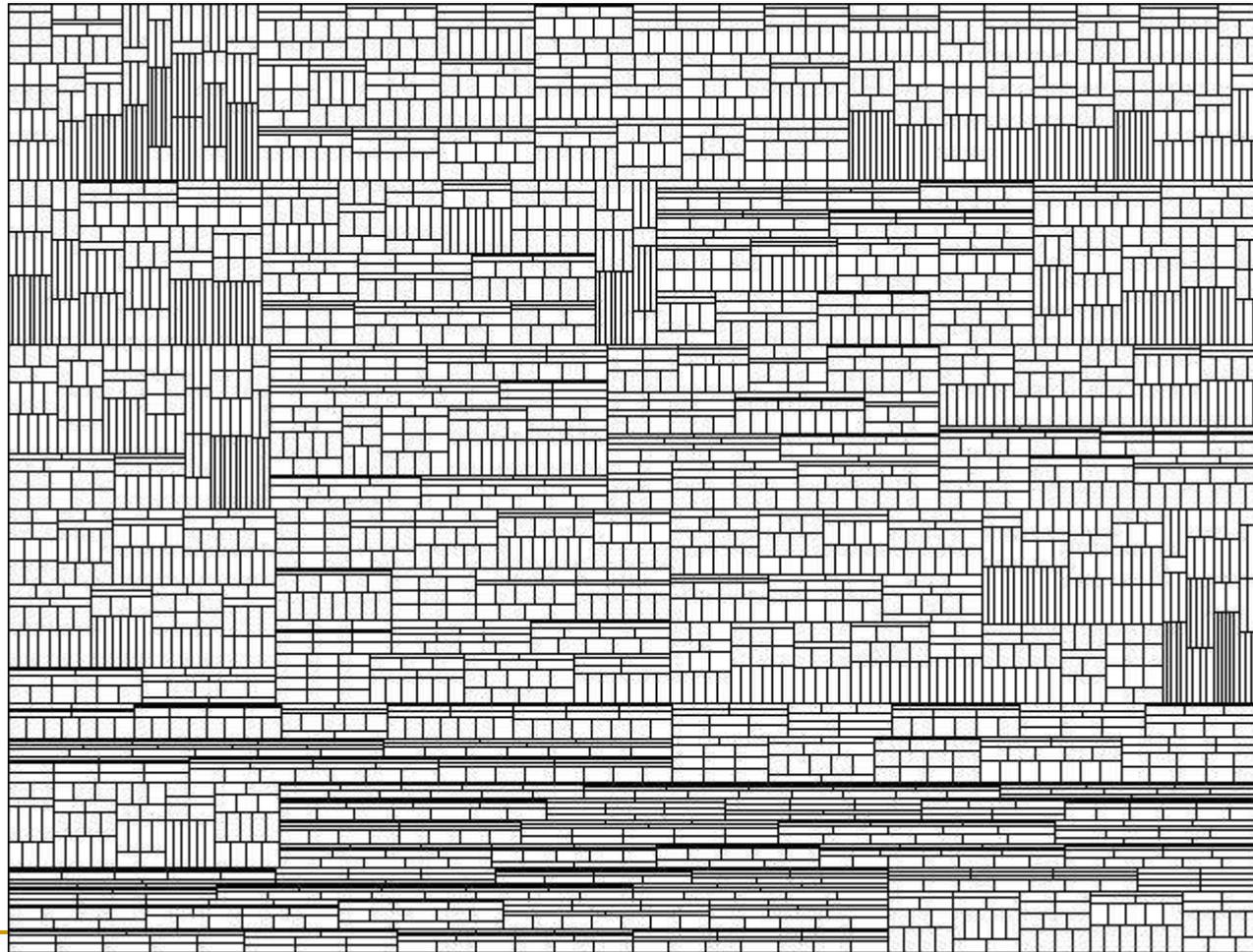
1400 files



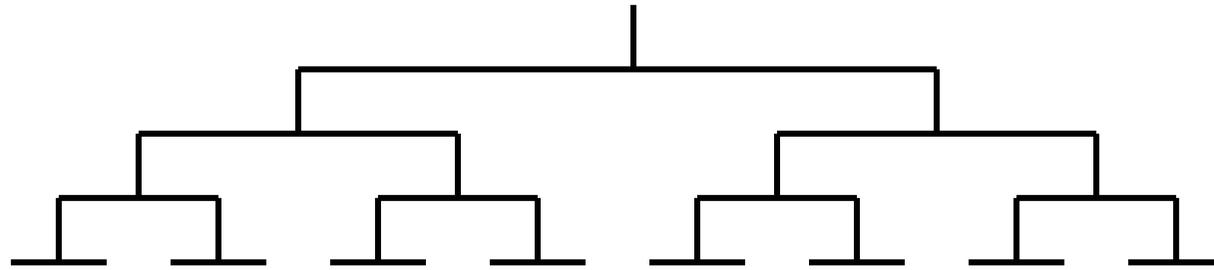
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3060 employees

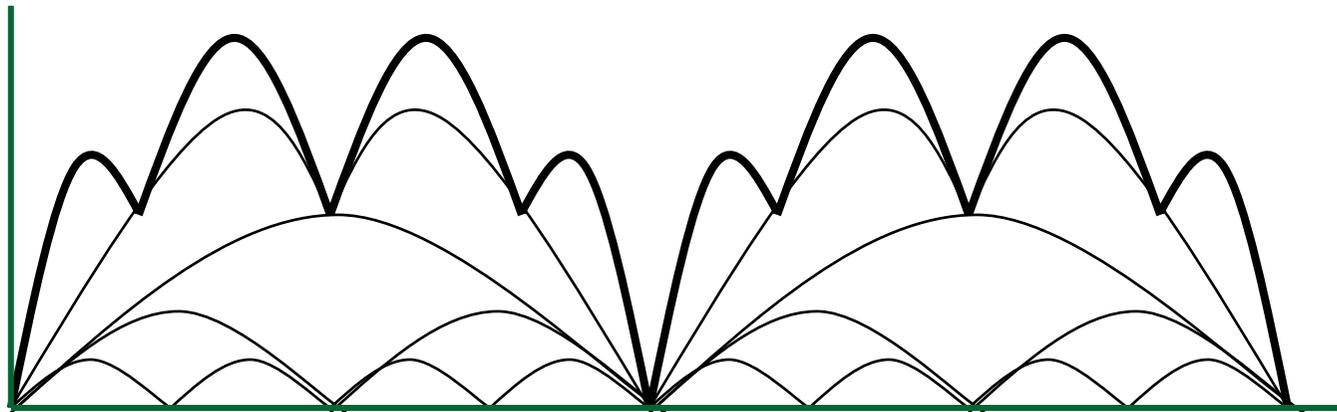
“Can You See The Structure?”



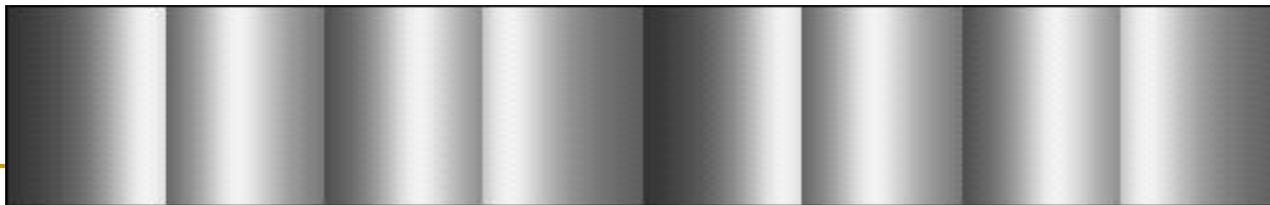
# Shading to the rescue:



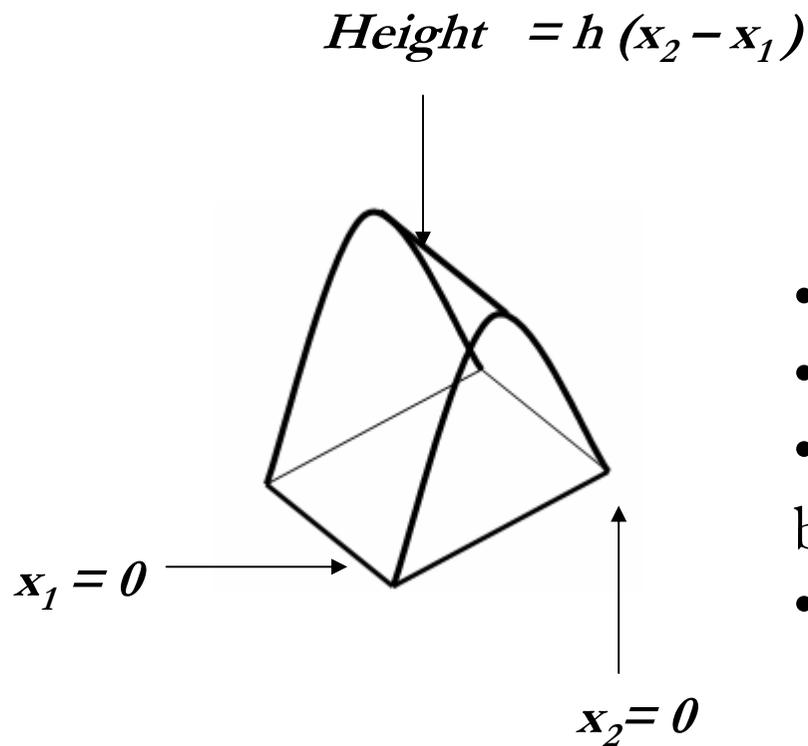
Binary tree



Ridges



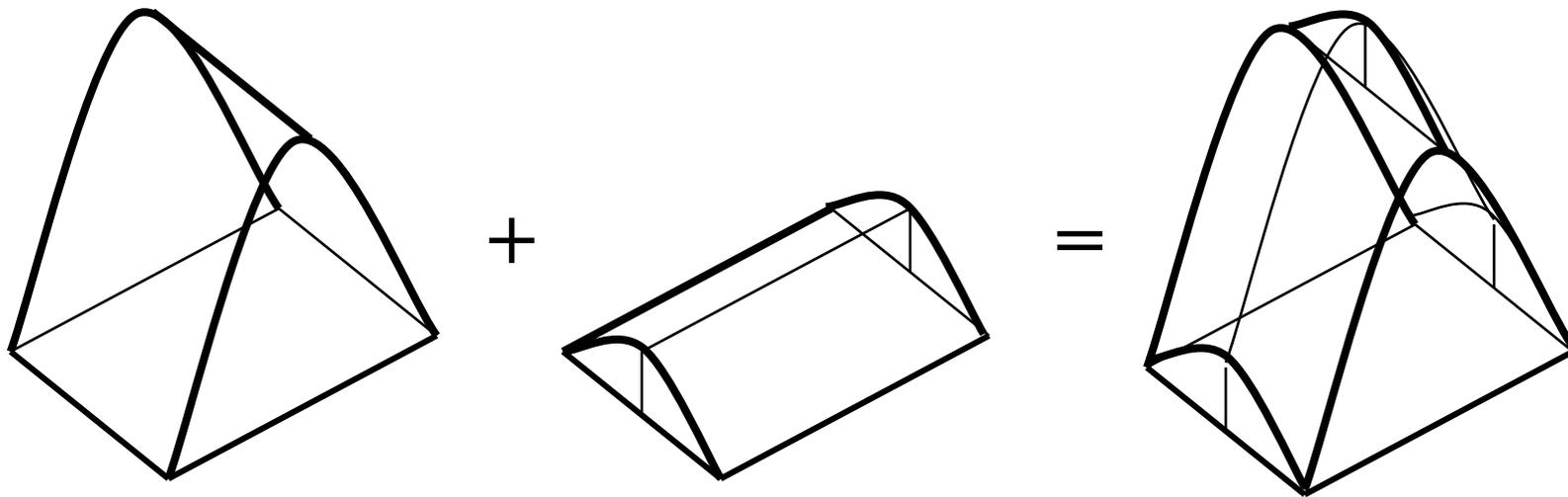
# Creating Bump:



- Parabola is used to create the bump
- Value of  $h$  is same for each level
- $h_i = f^i h$  ( $f$  is a scaling factor between 0 to 1.)
- Diffuse reflection

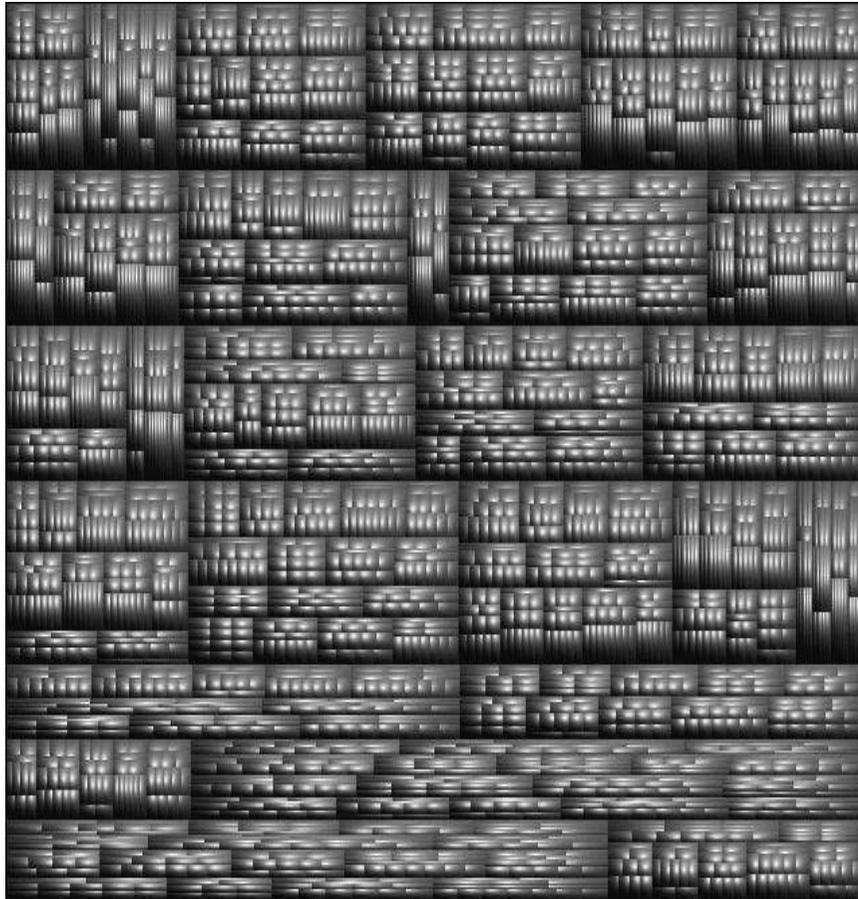
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Ridge + rotated ridge = cushion

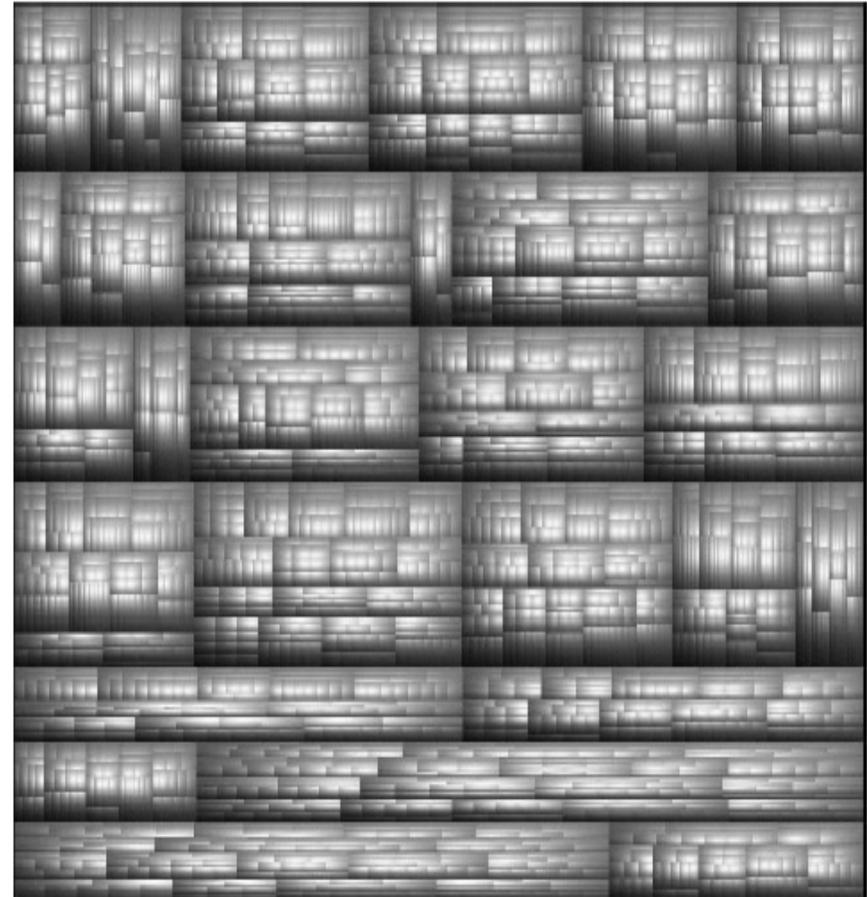


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# Result:



***$h = 0.5, f = 1$***



***$h = 0.5, f = .75$***

---

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# Interaction:

- Embedded in SEQUOIAVIEW
  - Color option for file type, level
  - Navigation
  - Filtering
-

---

# Critique:

- Good things
    - Simple Method
    - Fast Execution
    - Good for seeing overall structure
  - Bad things
    - Ambiguity in size perception
    - Not specific about interaction option
    - No user experiment
-

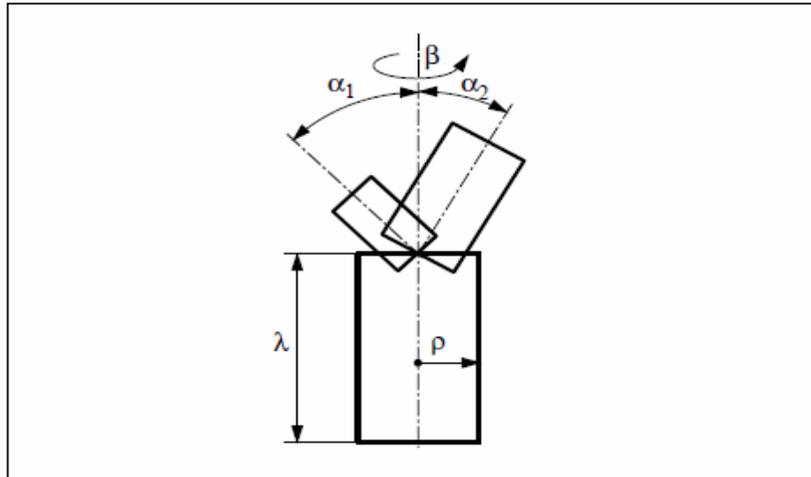
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# Botanical Visualization of Huge Hierarchies

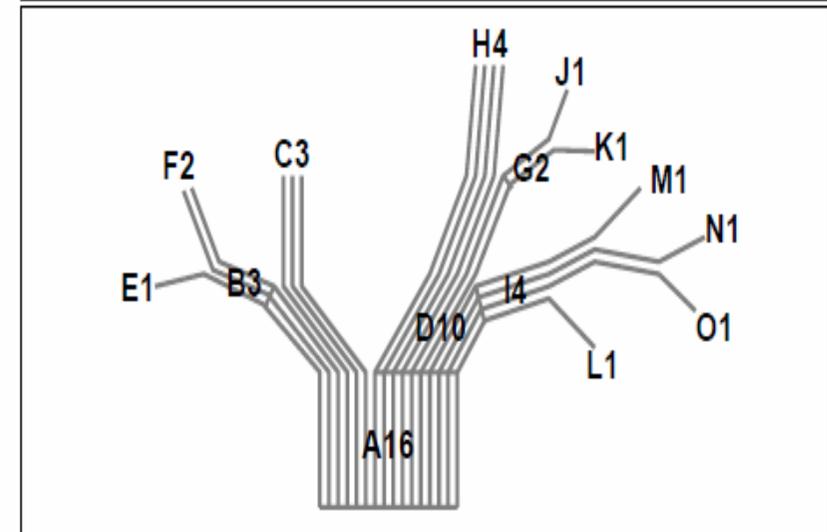
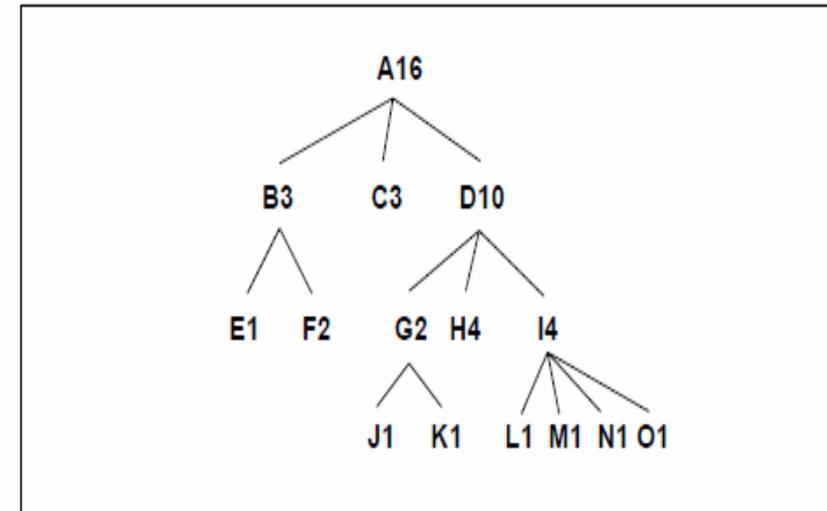
Background: Strand model (Holton, 1994)

- ❑ Mimics vascular system
  - ❑ Each leaf is connected to one strand
  - ❑ Branch = bundle of strands
-

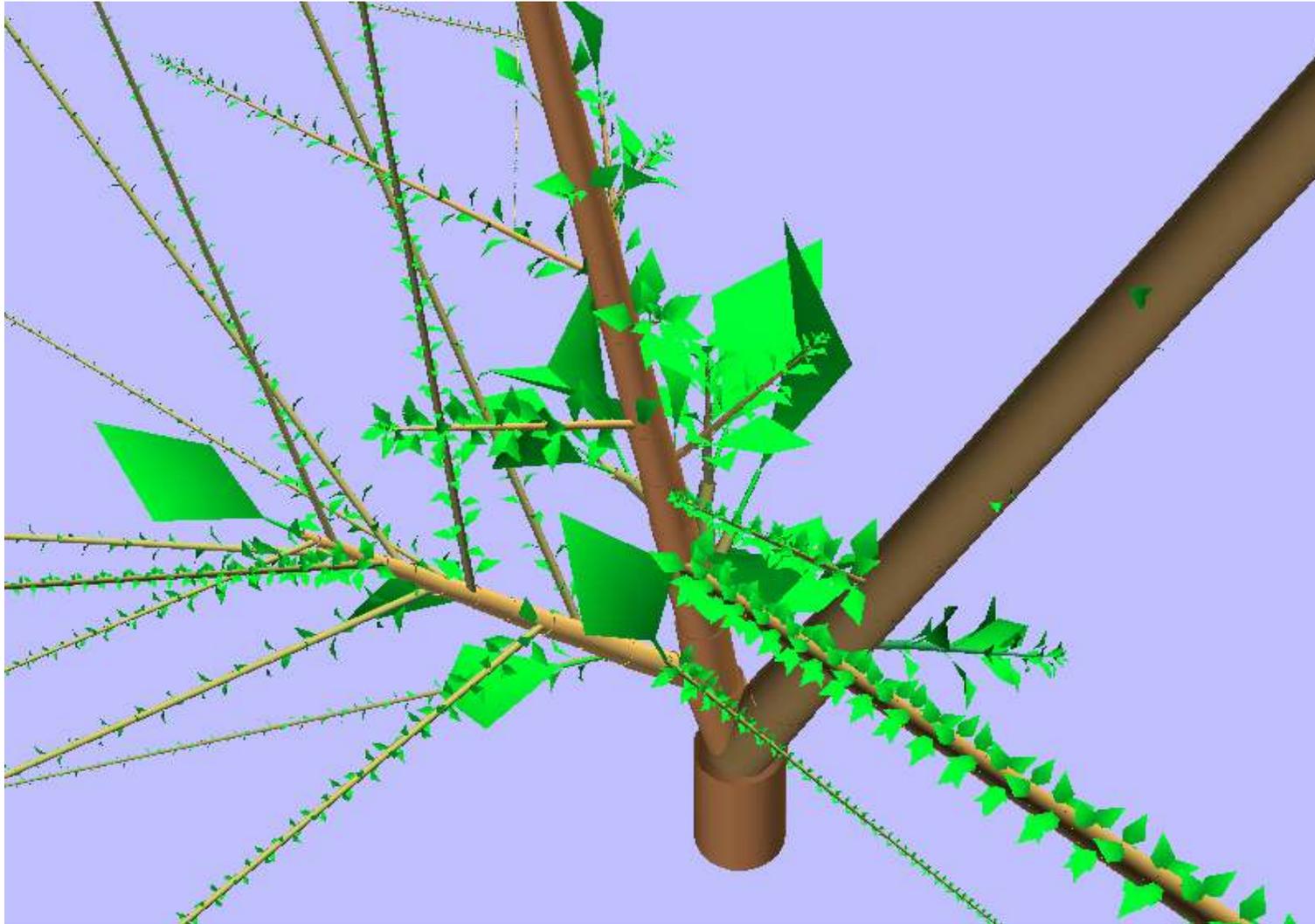
# Initial Attempt:



- Each directory is a branch
- Each file is a leaf



Result:



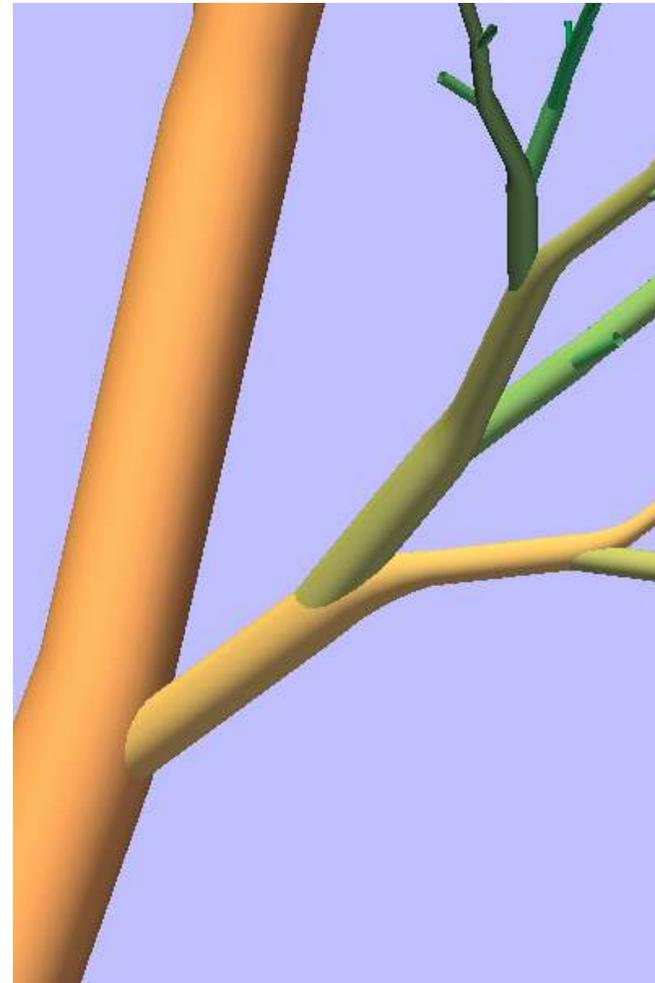
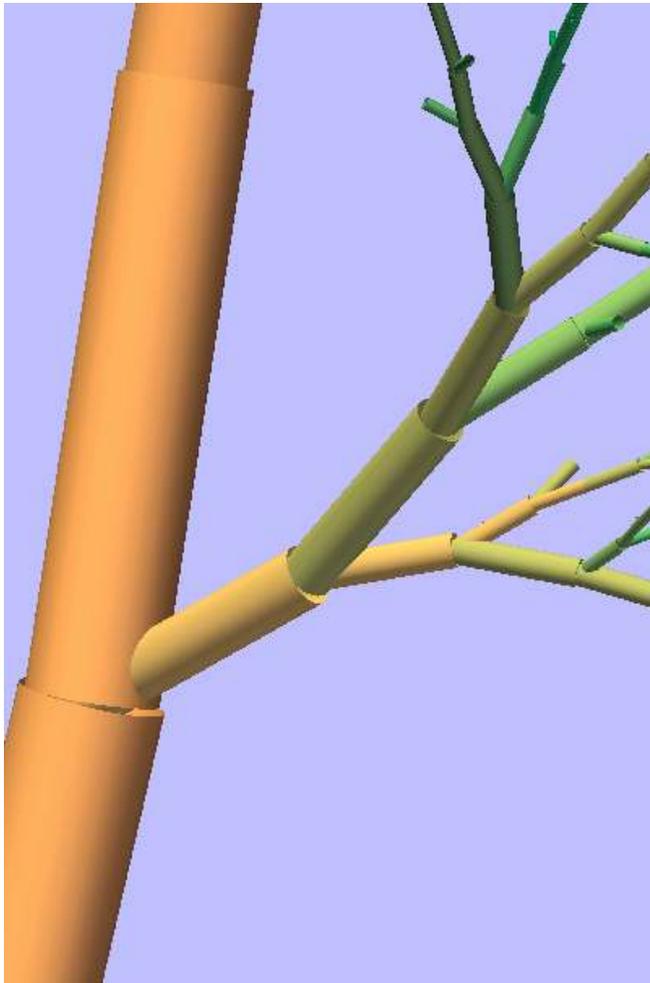
---

# Three problems

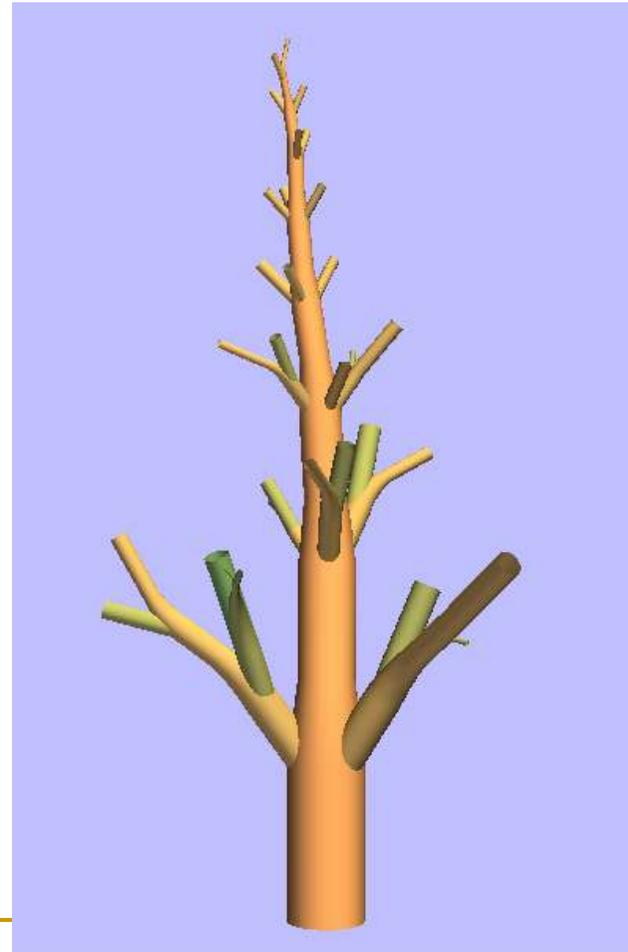
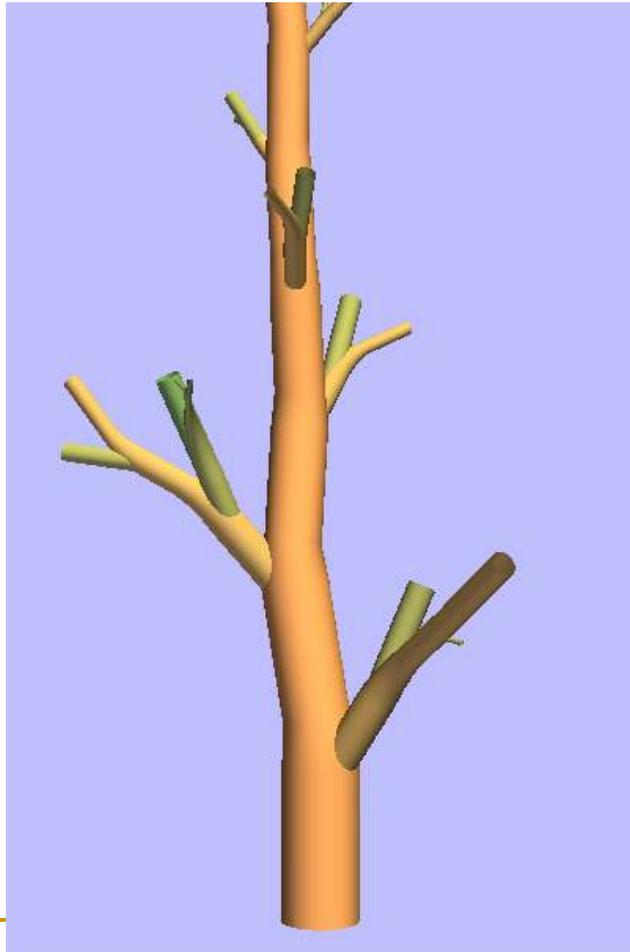
- Continuing branches are hard to see
  - Long, thin branches emerge
  - Leaves are messy
-

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# Smoothed continuing branches

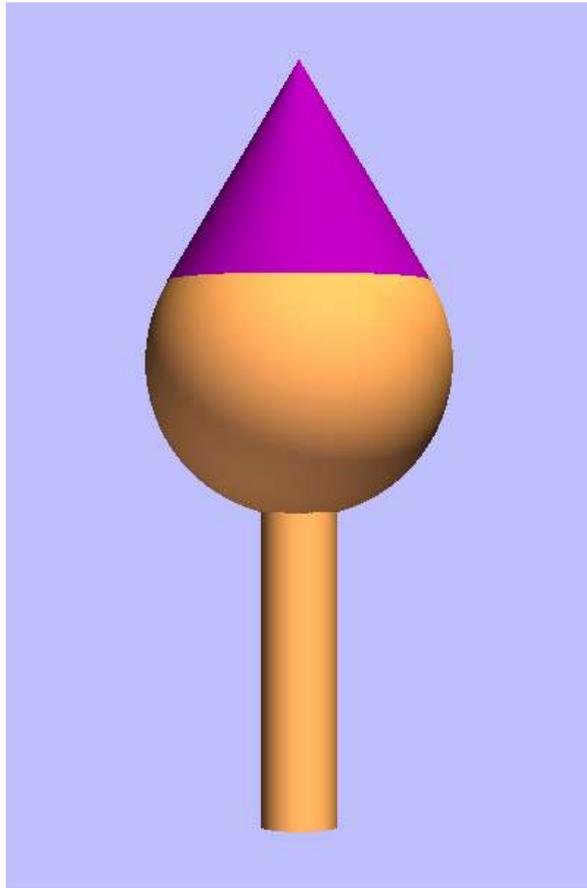


# Contract long branches

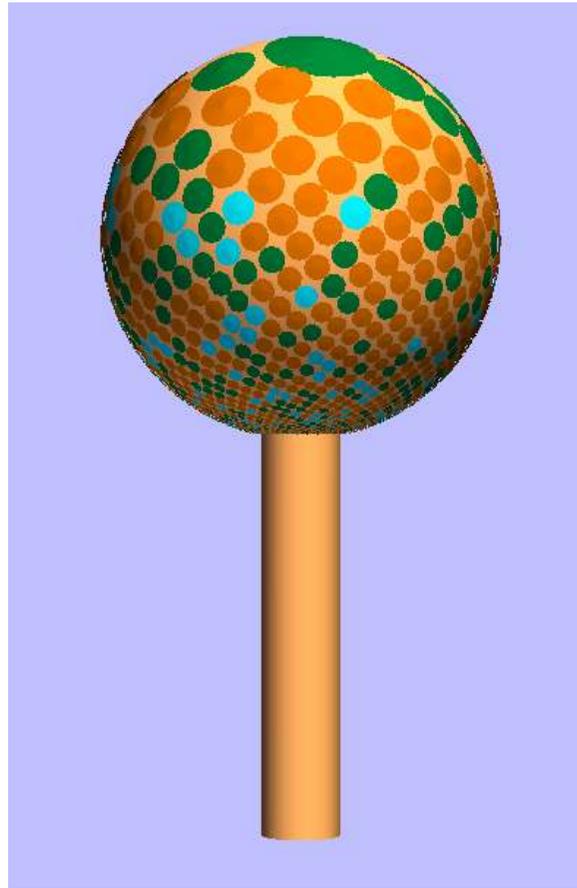


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Files: Phi-balls-Bigger surface bigger file

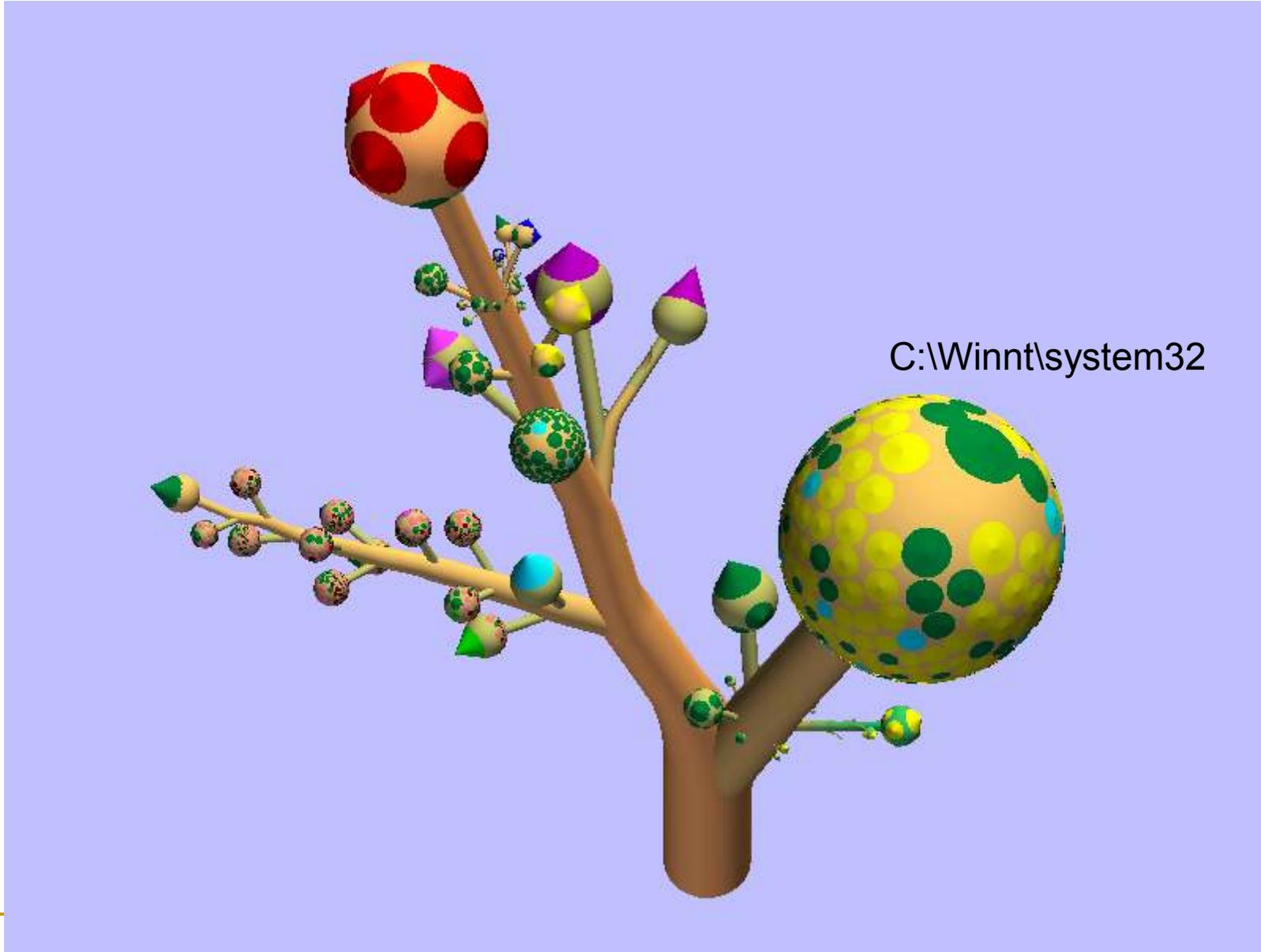


One big file

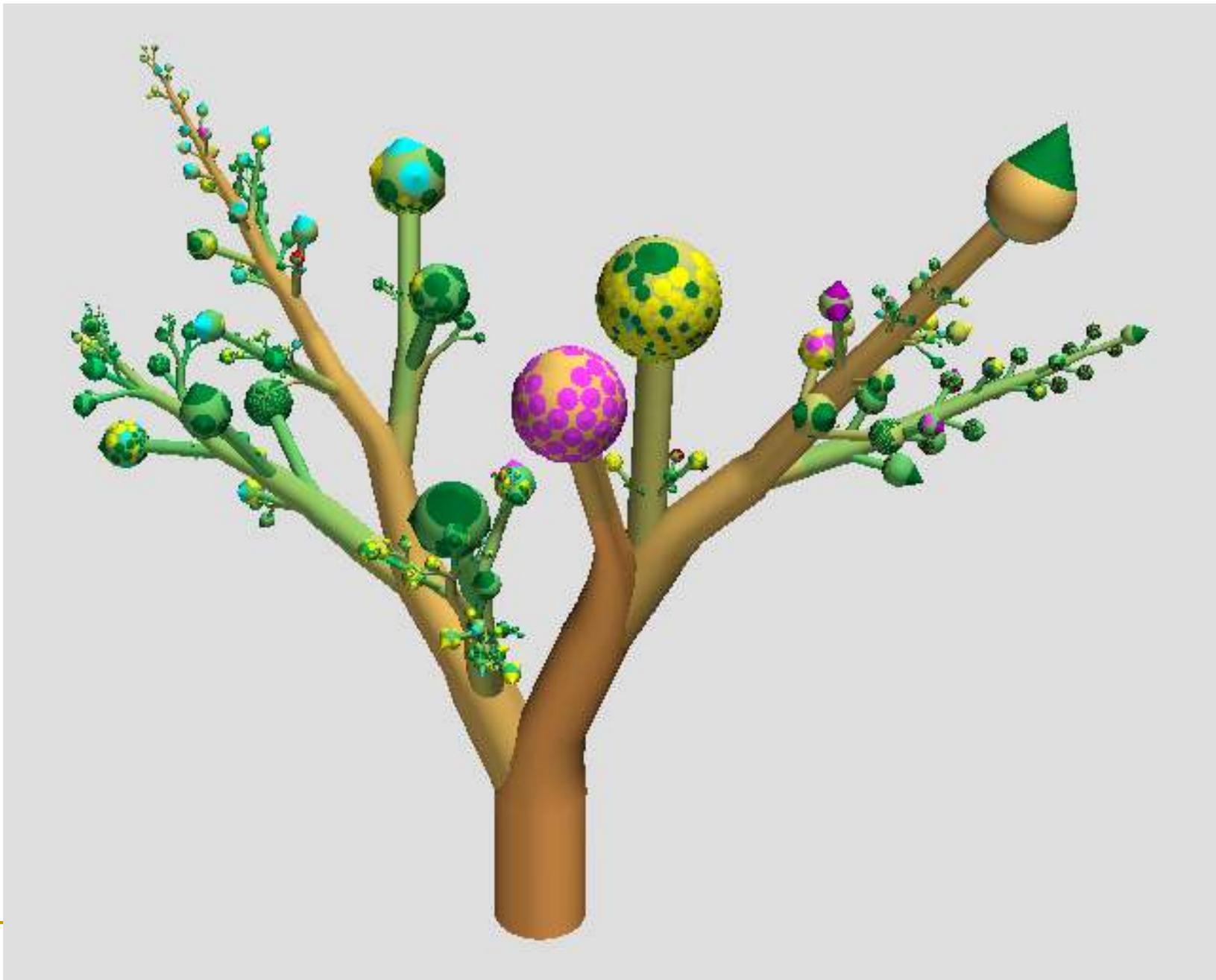


Many small files

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C:\Winnt\system32



---

# Interaction??

- They say you can interact with the system
-

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## Critique:

- Innovative idea, as they say “*natura artis magistra*”
  - Not says enough to understand the navigation
  - Hard to get the level
  - Hard to compare the size of file
  - The sphere fruit makes occlusion of the files in the same directory
  - No specific user experiment
-

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# User Experiments with Tree Visualization Systems

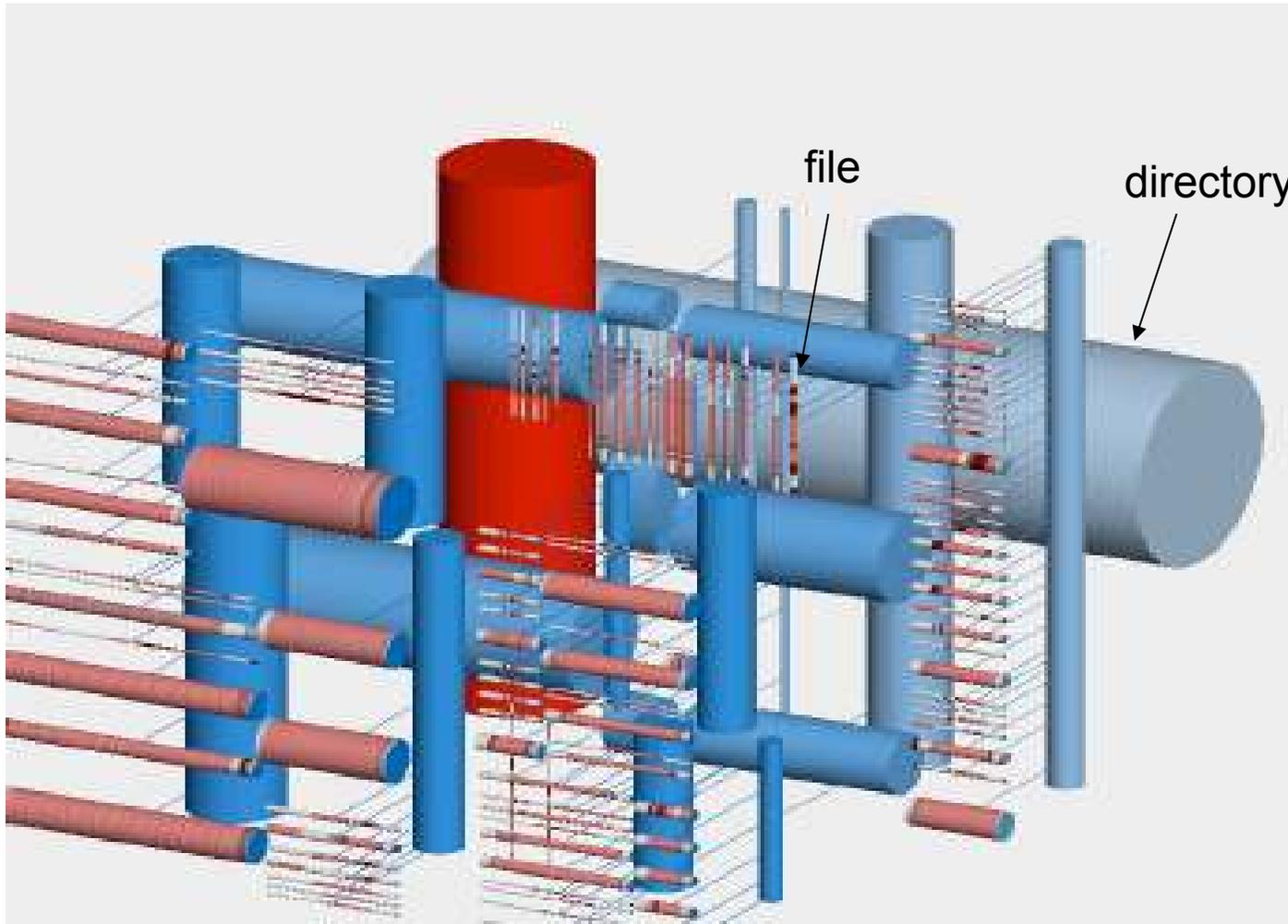
- Windows Explorer as the baseline
  - Compare five tree visualization system
    - ✓ Treemap 3.2
    - ✓ Sequoia View 1.3 (Cushion Treemap)
    - ✓ Hyperbolic browser/Star Tree Studio 3
    - ✓ Botanical Tree/Tree viewer
    - ☹ BeemTrees
-

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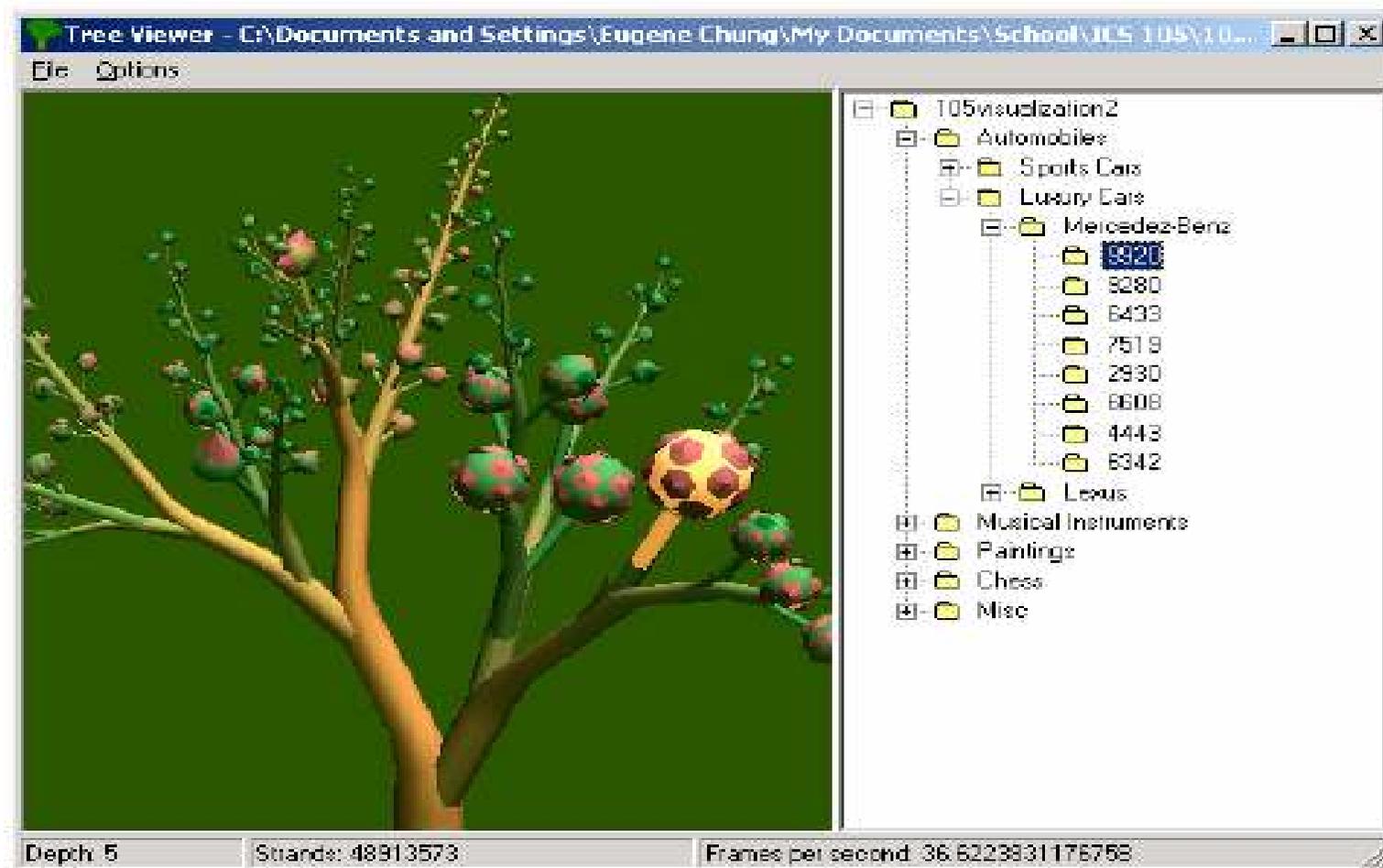
# Goals:

- Quantitative analysis
    - task completion time
    - accuracy
    - user satisfaction
  - Qualitative analysis
-

# BeamTrees



# Surprise!!

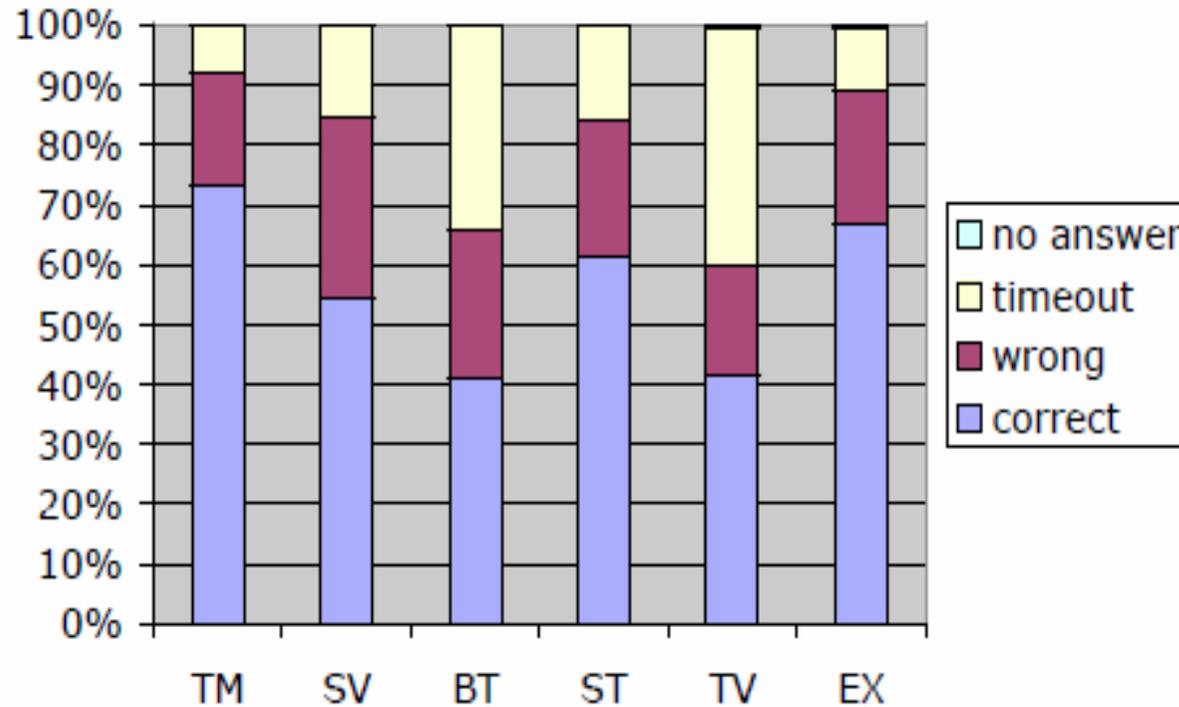


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# Tasks:

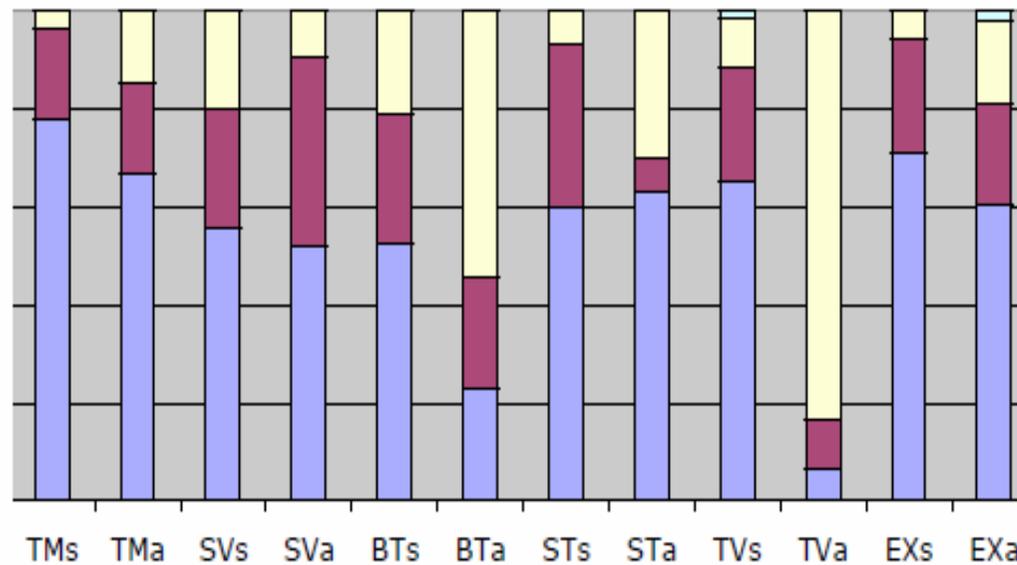
- Subset of a taxonomy of items on e-bay
  - Contained 5 levels and 5799 nodes
  - Relationship of the nodes required no domain specific knowledge
  - 15 tasks
  - Questions were both structure and attribute related
  - Subjects answers were recorded
  - Subjects interaction was recorded by screen capture software
  - User satisfaction data were taken
  - The video analysis was performed
-

# Result: Correctness of answer



BT << TM, SV, ST, EX  
TV << TM, ST, EX  
TV < SV

# Result: Correctness of answer con....



## Structure-related tasks

BT << TM

< EX

SV << TM < EX < BT

ST < TM

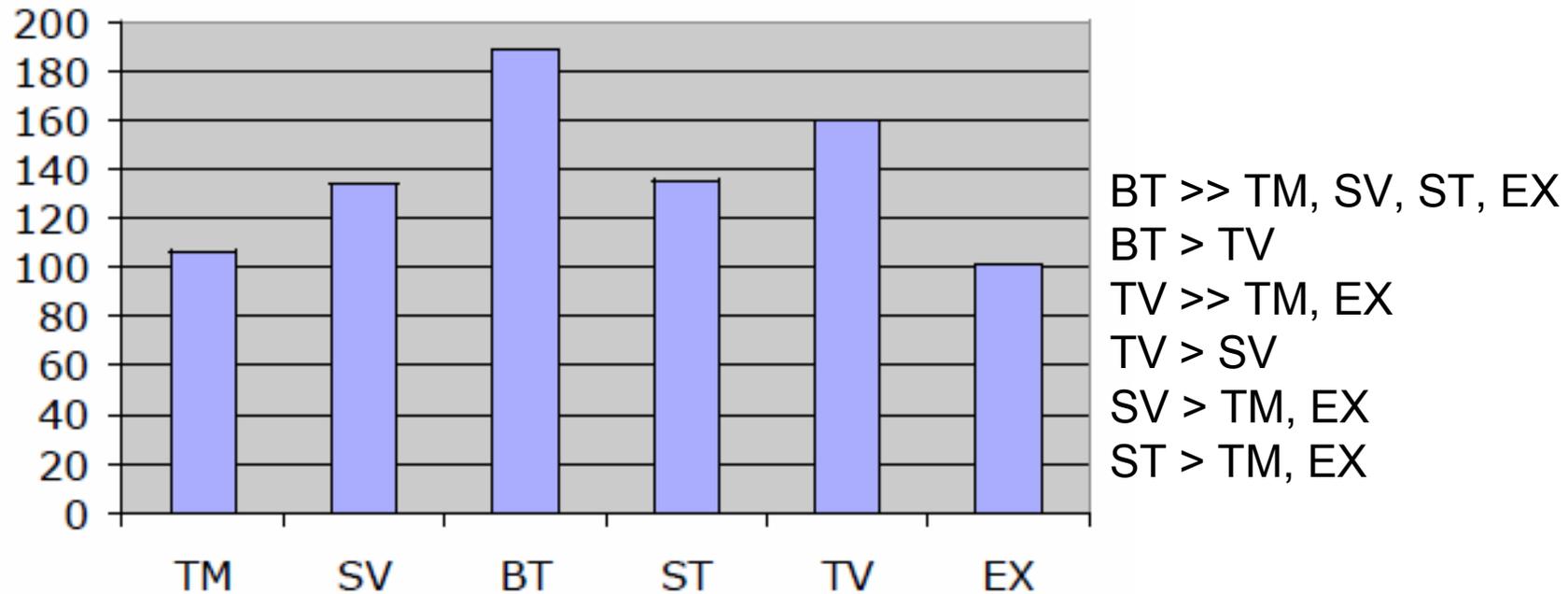
## Attribute-related tasks

BT << TM, SV, ST, EX

TV << TM, SV, ST, EX

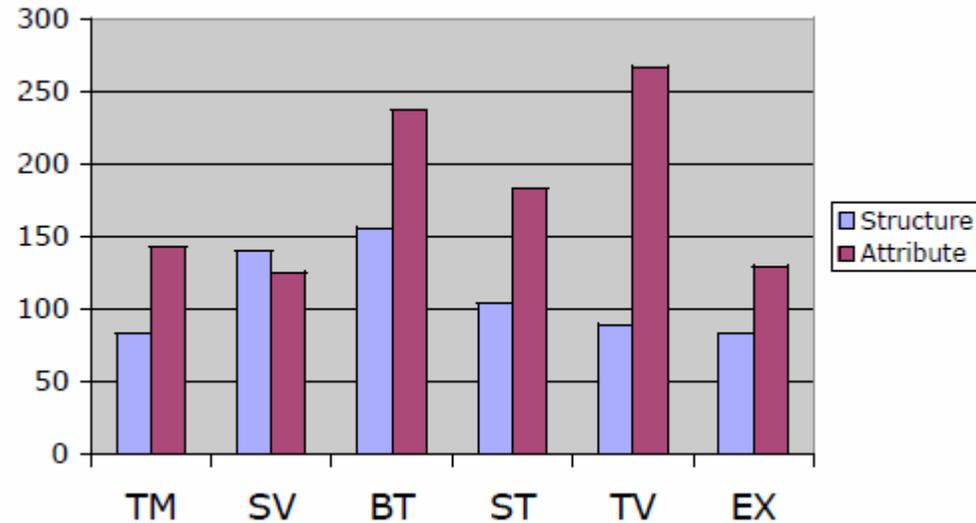
---

# Result: Average task completion time (in seconds)



---

# Result: Average task completion time (in seconds) con..



## Structure-related tasks

BT >> TM, TV, EX

BT > ST

SV >> TM, TV, EX

SV > ST

ST > EX

## Attribute-related tasks

BT >> TM, SV, EX

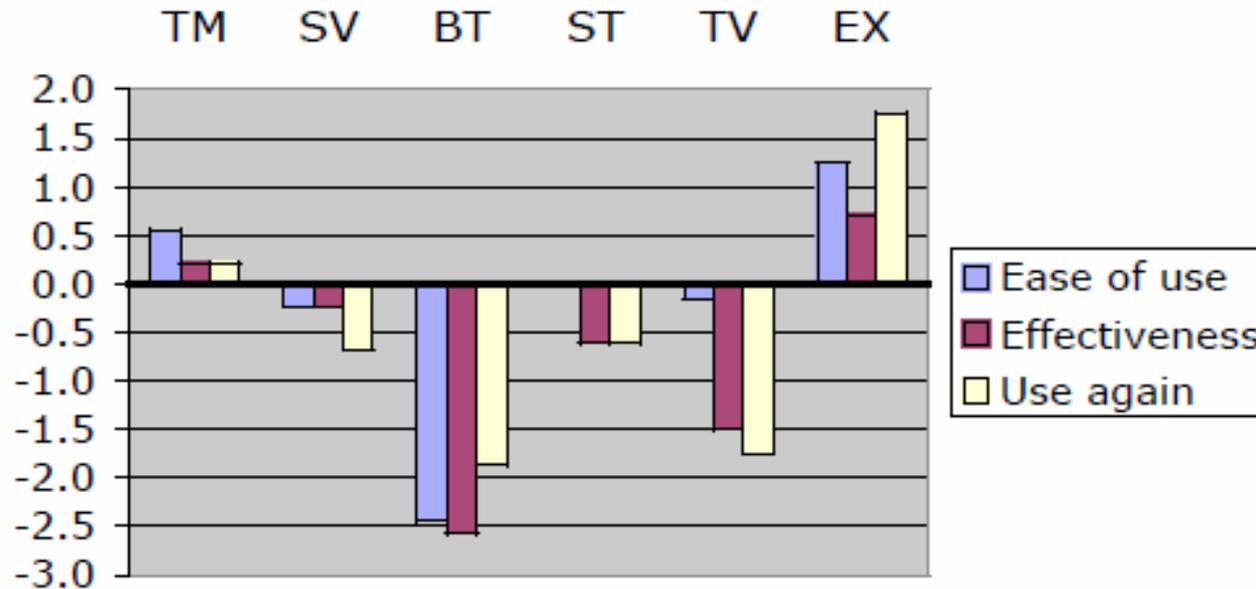
BT > ST

TV >> TM, SV, ST, EX

ST >> SV

---

# Result: User satisfaction



## Ease of use

BT << TM, SV, ST, TV, EX

BT < ST

EX > SV, TV

## Effectiveness

BT << TM, SV, EX

TV << TM, EX

## Use system again?

BT << EX

BT < TM

EX >> SV, TV

EX > ST

TM > TV

---

# Qualitative Analysis from Video:

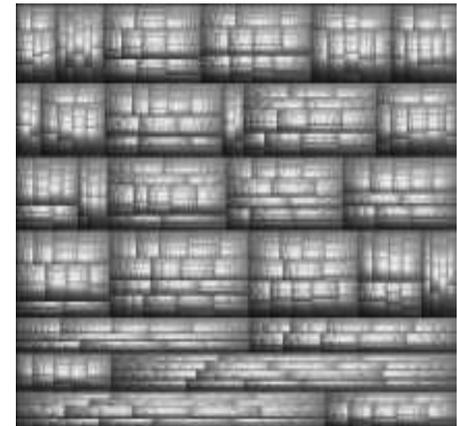
- Treemap: Better than other four visualization
  - Pros
    - Better user satisfaction
    - Color coding and filtering helped
  - Cons
    - Unable to solve time related question
    - Hard to solve global structure task
  - Suggestion
    - Search option can be increased



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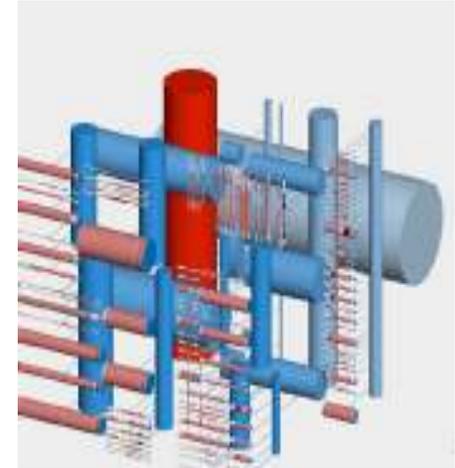
# Qualitative Analysis from Video: con..

- Sequoia View: Average performance
  - Cons
    - Hard to solve both attribute and structure related task
    - Users cant track level
    - Color options are less visited



# Qualitative Analysis from Video: con..

- Beam Trees: Worst performance
  - Pros
    - Better for local data visualization
  - Cons
    - Does not show relationship within same level
    - Length and size of beam bear little relationship
  - Suggestion
    - Needs functionality beyond visualization

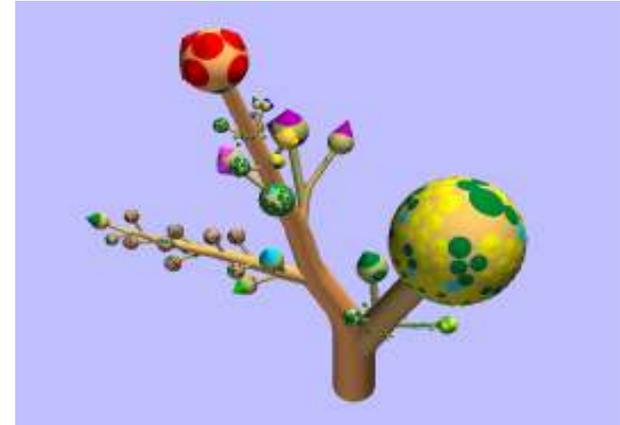




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# Qualitative Analysis from Video: con..

- Star Tree: Better than the worst
  - Cons
    - Lacks basic search options
    - Lacks file attributes
    - Hard to follow directory from the branch
    - Subjects found to depend on explorer like panel
  - Suggestion
    - Needs functionality beyond visualization



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# Qualitative Analysis from Video: con..

- Windows Explorer: Very good overall performance
    - Cons
      - Hard to solve file specific data
      - Hard to compare depth
-

---

## Critique:

- Good overall analysis
  - Analyzed the user activity
  - Separated structural and attribute task
  - Both good and bad parts were analyzed
  - More specific suggestion required
-

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## Concluding Remark:

- All have their good things and bad things
  - We look forward to find which works better for us
  - Works well when complementing each other
-

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Questions?

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