DATA VISUALIZATION AND VISUAL ANALYTICS

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HIERARCHY

- Oxford Dictionary:
  - a system in which members of an organization or society are ranked according to relative status or authority
  - an arrangement or classification of things according to relative importance or inclusiveness

- Hierarchical systems are ordered sets where elements are organized in a given relationship to one another
  - Parent-node relationship
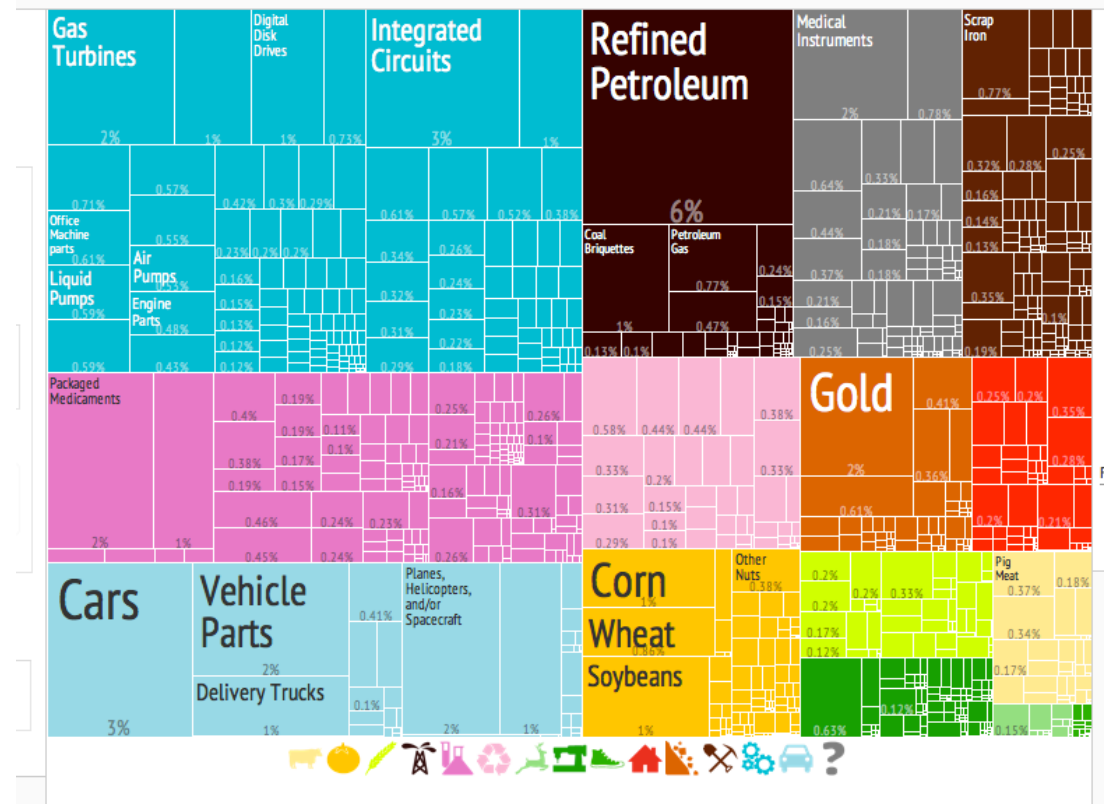 - Sibling relationship

HIERARCHY

- Complexity often takes form of hierarchy
- Hierarchy is one of the central structures to represents complexity

HIERACHICAL STRUCTURES
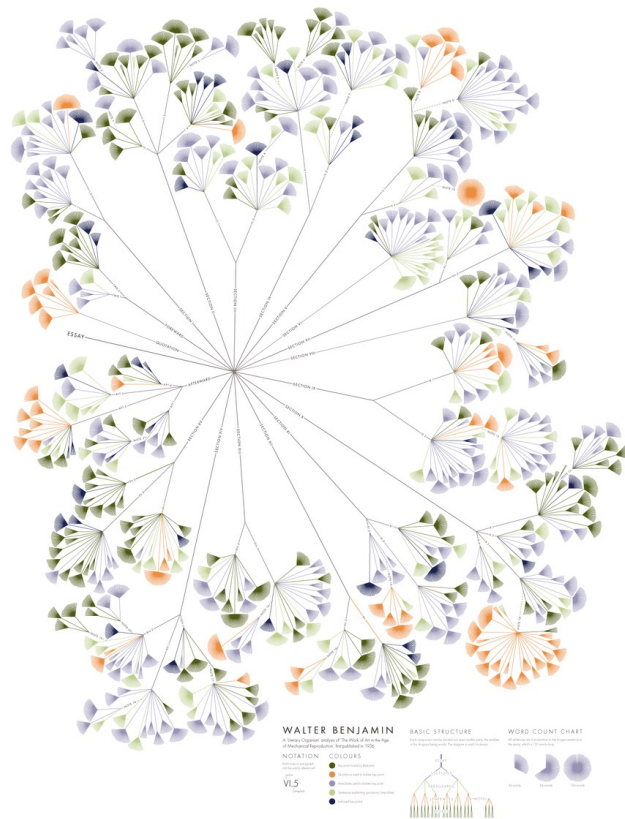
http://www.stefanieposavec.co.uk/entangled-word-bank/

http://atlas.media.mit.edu/

REPRESENTATION

- Two main visualization approaches
  - Stacked
    - Higher ranks are arranged in a directional relationship
      - Vertically, top to bottom
      - Horizontally, left to right, right to left
      - Centrally, center to periphery
    - Lines connect elements in the sets
      - One-dimensional visual elements
  - Nested

REPRESENTATION

- Two main visualization approaches
  - Stacked
  - Nested
    - Elements organized in containers
    - Higher ranking elements contains lower ranked ones
    - Container is a geometric object: two-dimensional plane, three dimensional solid
    - Container provides the grouping for all the descendant

VISUAL HIERARCHIES

Hierachical systems	→	Hierachical Visual Encoding
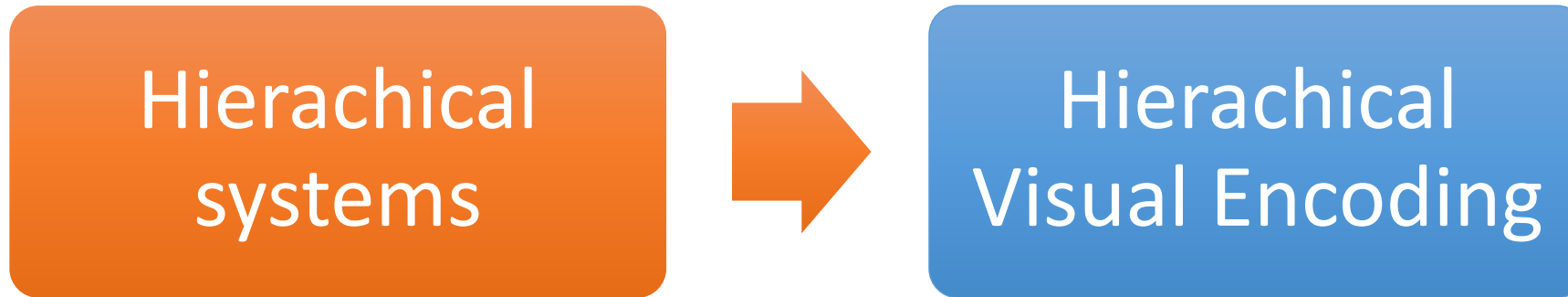
- Spatial encoding is crucial for visualization
- Two separate cognitive processes
  - Spatial properties (position and size)
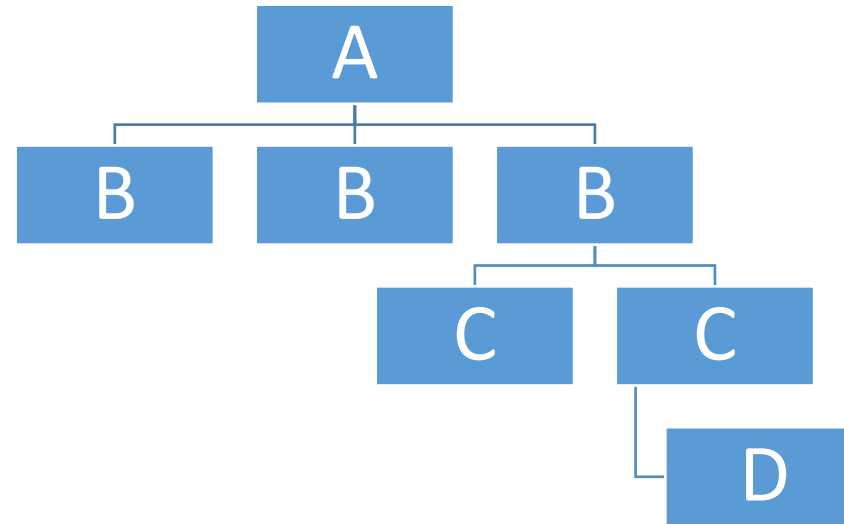 - Object properties (shape, color, texture,etc.)

PROXIMITY

Proximity describes the tendency to group visual elements that are near one another

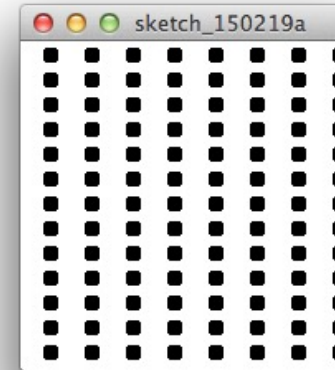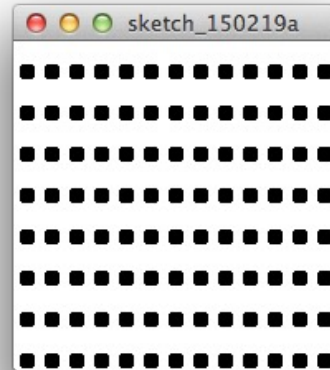Visual proximity (should) corresponds to real proximity
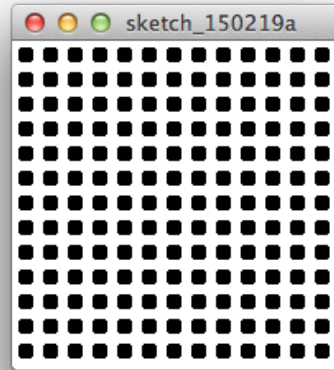
Physical Systems
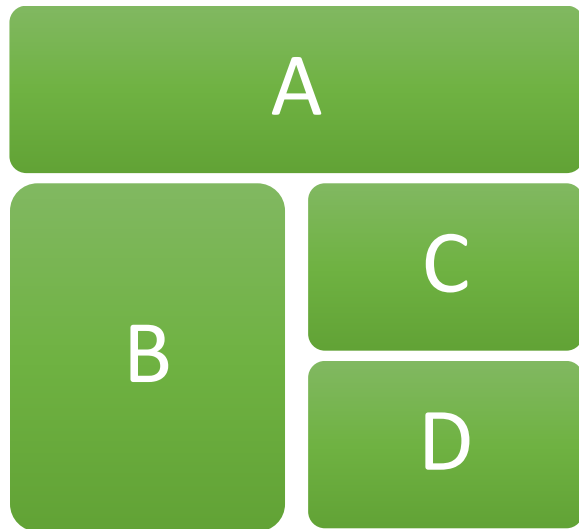
Abstract Systems

PROXIMITY, GROUPS, CLUSTERS

- Space between dots allows us to perceive groups as columns or rows

- Spatial proximity facilitate the detection of related data

- Conceptually related concepts should be represented spatially close

HIERARCHICAL ABSTRACT DOMAINS

- Abstract domains usually do not provide visual clues
- Assigning a visual representation to abstract data is crucial for a robust visualization
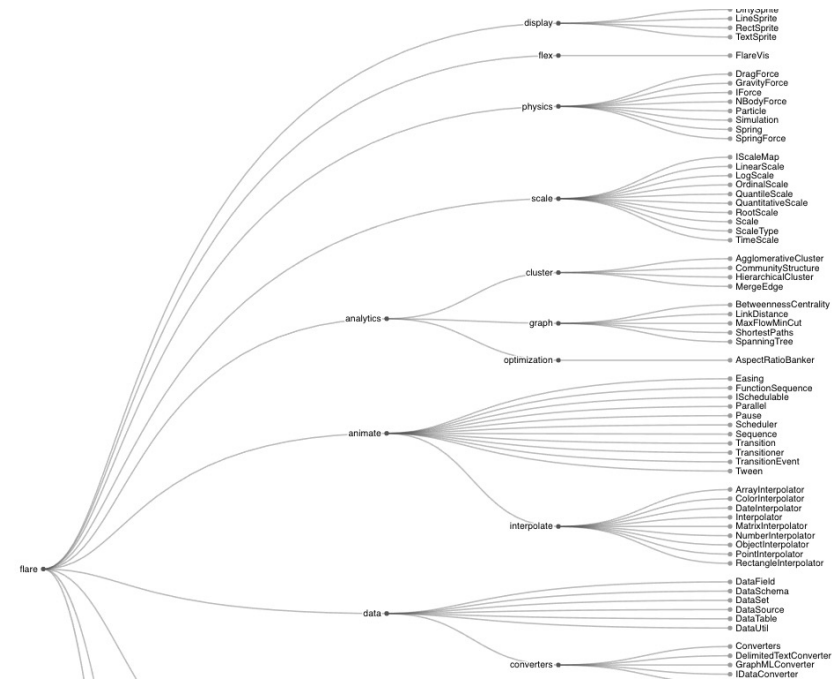
VISUAL TAXONOMY

TAXONOMY OF VISUAL REPRESENTATIONS
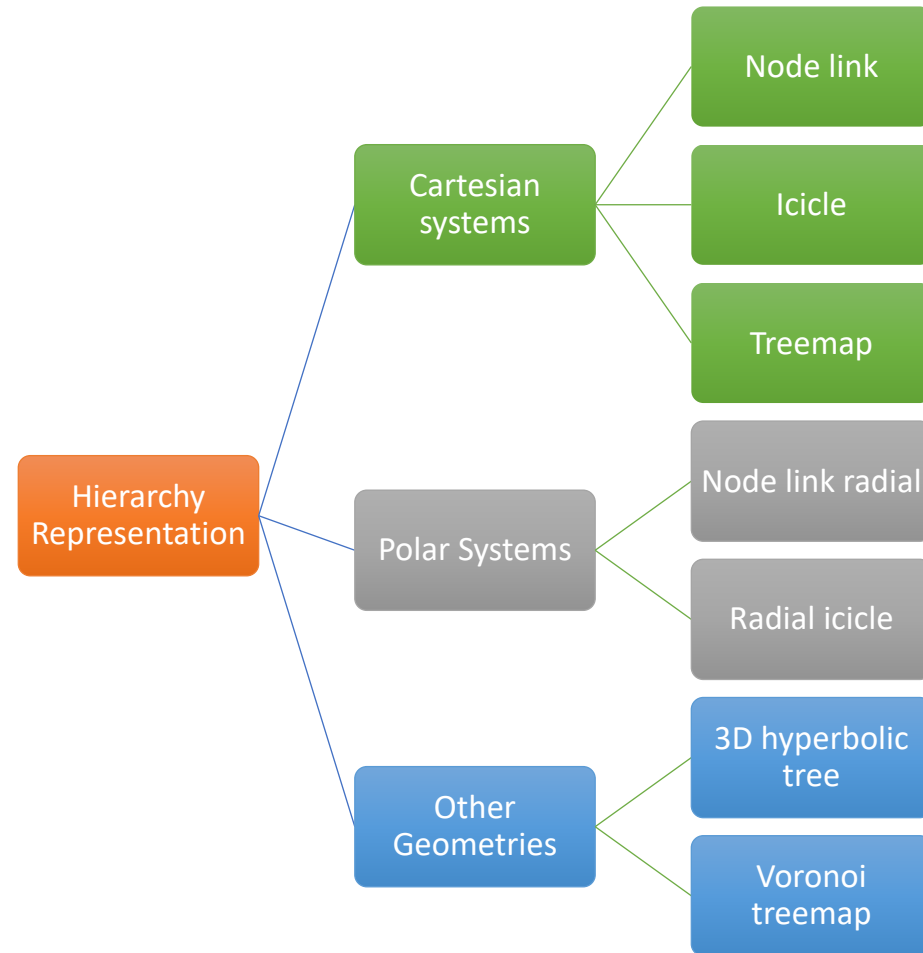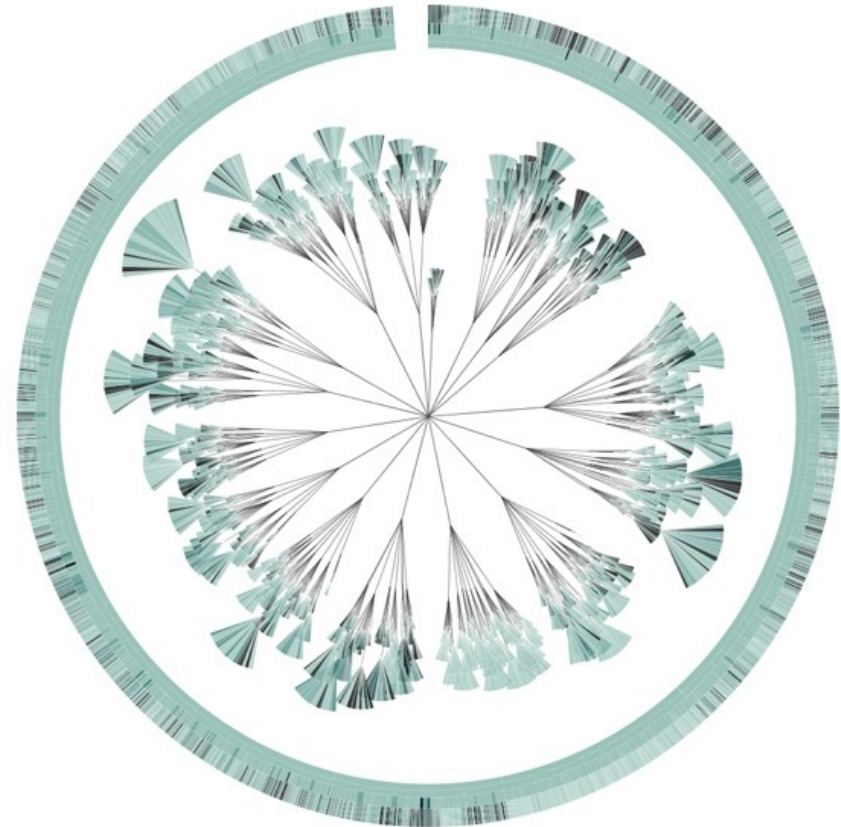
NODE LINK LAYOUT

- Stacked scheme

- Node link

- Direction for arrangement
  - Vertically
  - Horizontally
  - Centrally

- Sometimes lines encode properties of the relationship

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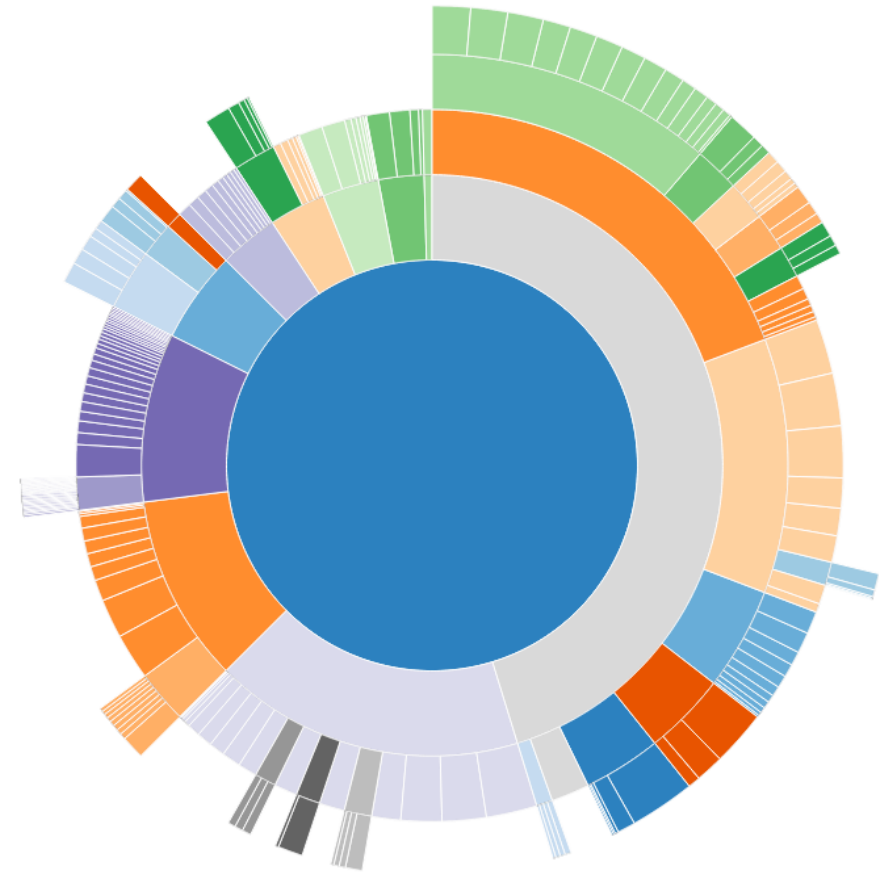
Visual Analytics
va602aa

ICICLE LAYOUT

- Stacked scheme
- Direction for arrangement
  - Vertically
  - Horizontally
  - Centrally
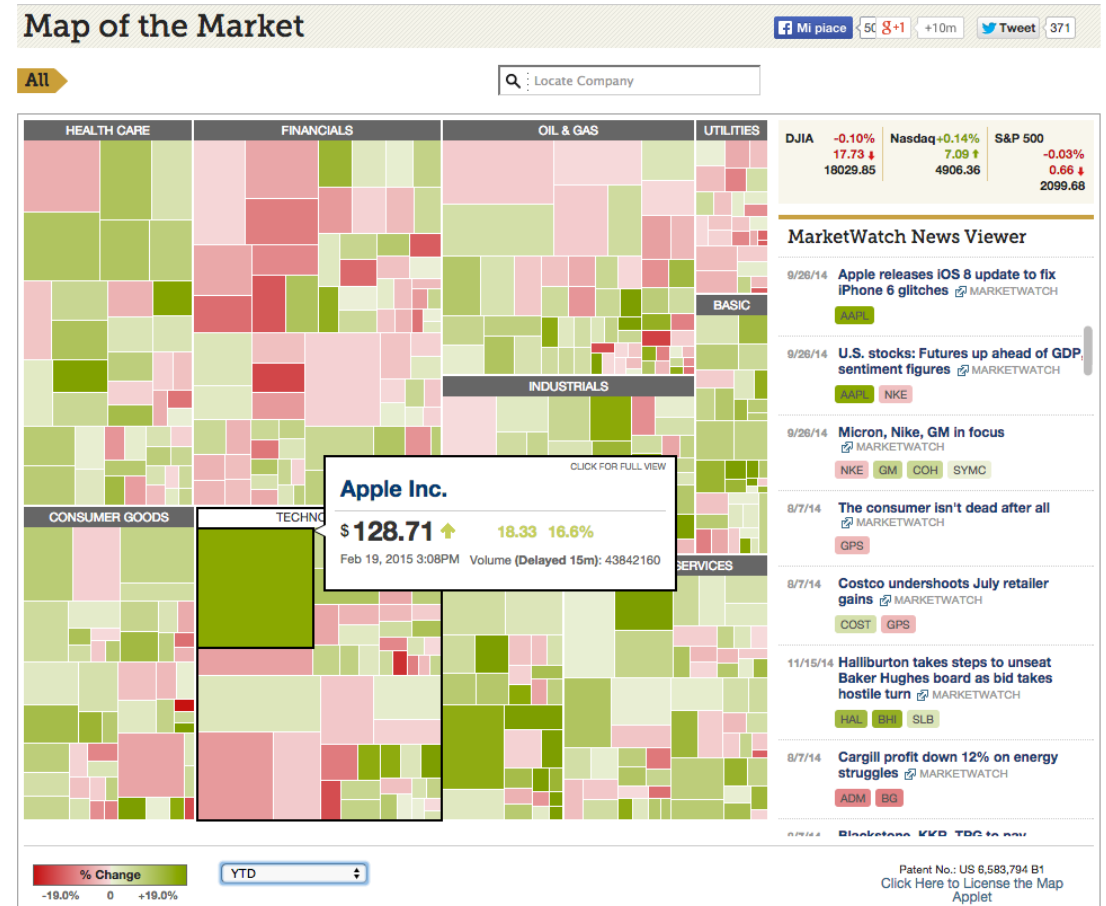- Height/color of each shape/node may encode properties
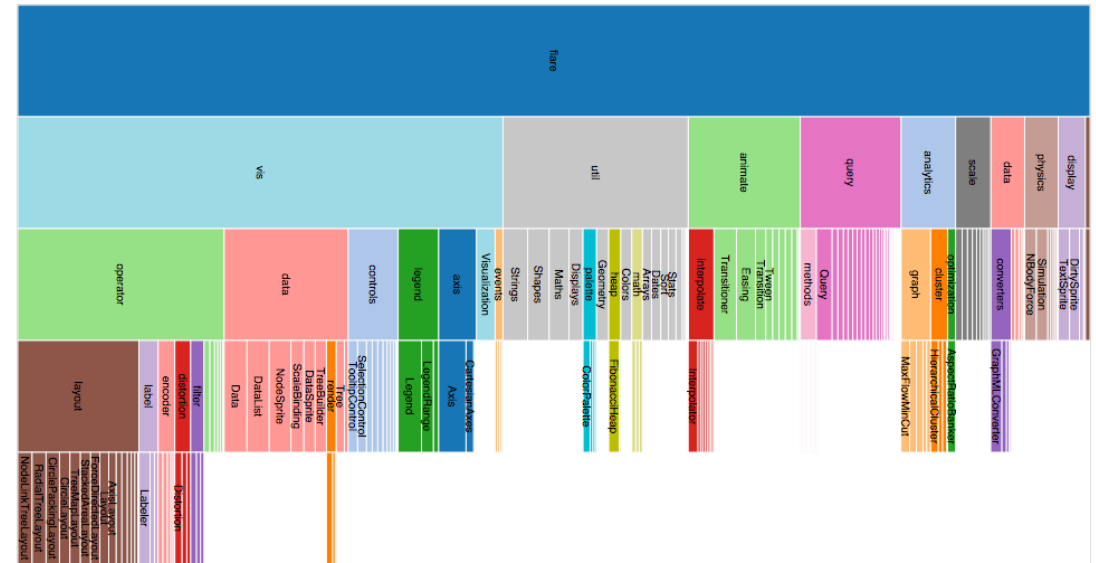
RADIAL ICICLE LAYOUT

- Stacked scheme

- Direction for arrangement
  - Vertically
  - Horizontally
  - Centrally

- Height/color of each shape/node may encode properties

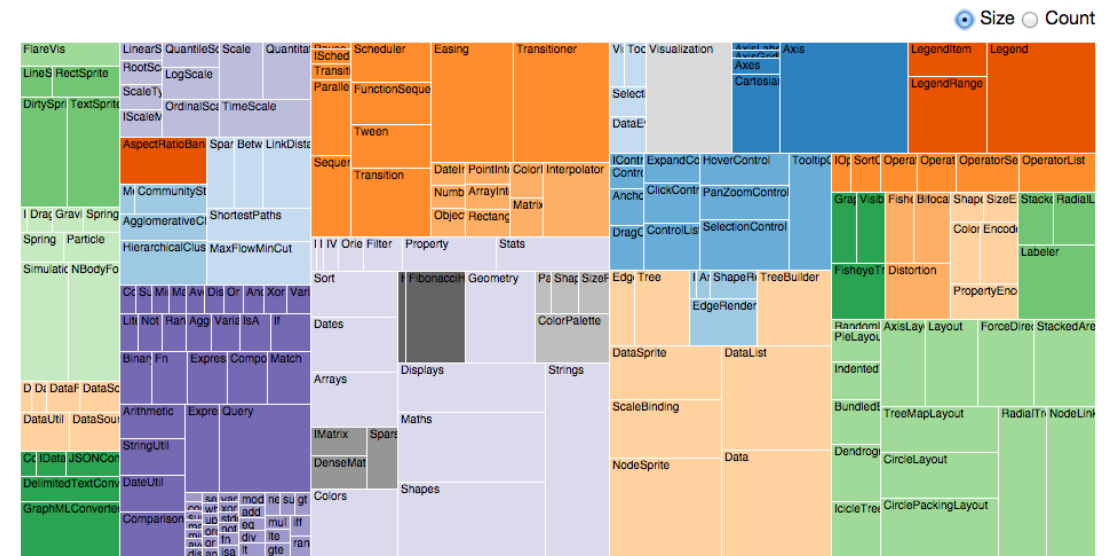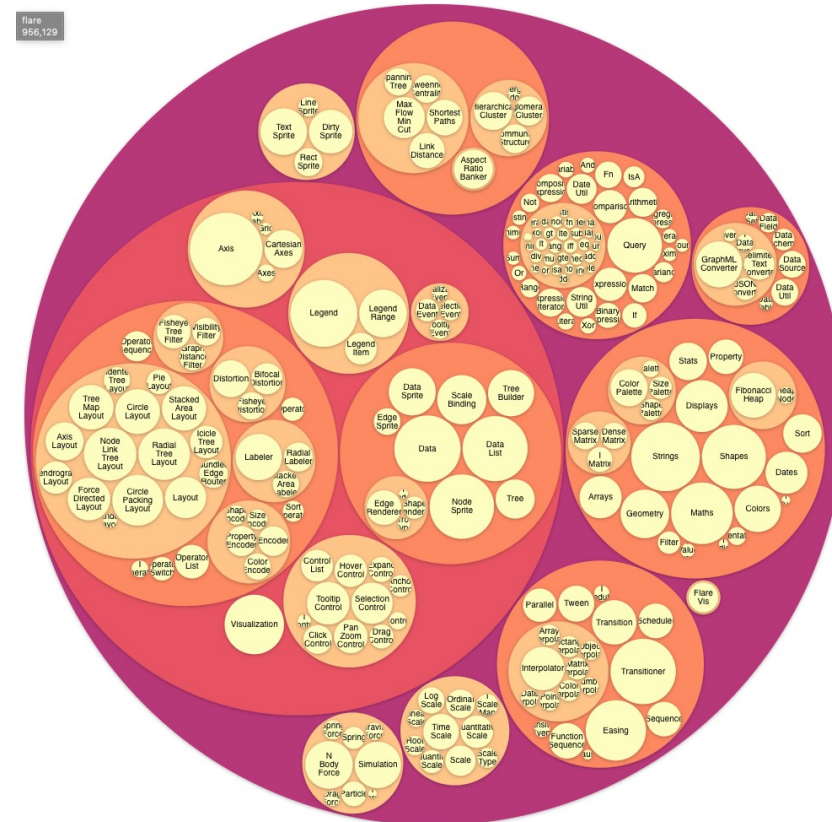https://observablehq.com/@d3/sunburst

TREEMAP LAYOUT

- Container scheme

- No direction for arrangement

- Height/color of each shape/node may encode properties

- Usually additional linked display are useful to explore data

http://www.marketwatch.com/tools/stockresearch/marketmap

TREEMAP LAYOUT

- Container scheme

- No direction for arrangement

- Height/color of each shape/node may encode properties

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VORONOI TREEMAP

LAYOUTS

LAYOUTS

- A layout encapsulate a strategy to position elements on the screen

- For example: alignment along a reference axis
  - Exploit d3.scale to handle the projection on the screen

LAYOUT

- A layout works on a set of elements (unlinke for selection)
- In d3, a layout enrich the input data to provide new properties to determine the position on the screen

AVAILABLE LAYOUTS

- D3 provides a vast library of layouts
  - Hierarchies https://github.com/d3/d3-hierarchy
  - Chords https://github.com/d3/d3-chord
  - Force https://github.com/d3/d3-force