Ch 7+8: Tables, Spatial Data

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CPSC 547, Information Visualization
Day 8: 6 October 2015

Keys and values
- key: independent attribute
  - used as unique index to look up items
  - simple tables: 1 key
- multiple tables: multiple keys
- value: dependent attribute, value of cell
- classify attributes by key count:
  - 0, 1, 2, many...

Idiom: table
- express values
  - tabular form
  - marks: lines
  - aligned horizontally, separated vertically
  - indexes by 2 categorical attributes

Idiom: heatmap
- for visualization
  - map items
  - high/low values
- marks: color
  - scales
  - colorbars
- alignment
  - ascending/descending

Idiom: scatterplot
- general visualization
  - relationships
  - data points
  - mark shapes
  - aligned horizontally

Idiom: stacked bar chart
- general visualization
  - multiple data series
  - bars: heights
  - width: independent

Idiom: streamgraph
- general visualization
  - continuous data
  - aligned horizontally
  - trends
  - alignment

Idiom: line chart
- general visualization
  - x, y: axes
  - trends
  - discrete data

Idiom: cluster heatmap
- general visualization
  - x, y: axes
  - clusters
  - dendrogram

Idiom: bar chart
- general visualization
  - x-axis: categories
  - y-axis: values
  - marks: bars
  - alignment

Idiom: scatterplot matrix, parallel coordinates
- general visualization
  - x, y: axes
  - trends
  - alignment

Choosing bar vs line charts
- depends on type of key attrib
  - bar charts if categorical
  - line charts if ordered

News
- clarification on artery vis
- diverging colormap since doctors care about high and low values
- not much about the axes in the middle
- personal communication with Birkin, not clearly stated in paper
- second guest lecture today from Kosara
- will be presentation (versus discovery/exploration)
- then continue with lecture/discussion
- catch up on chapers, leave papers for Thu
- remember
- I have office hours on Tuesdays
- pitches are coming up Thu Oct 22
- start talking to me about project ideas!
Task: Correlation

Idioms: radial bar chart, star plot

- scatterplot matrix
- positive correlation
- diagonal/low-to-high
- negative correlation
diaogonal/high-to-low
- uncorrelated
- parallel coordinates
- derived data (from field)
- 3D vector field
- line chart
- isoline geometry
- Saddle Point:
  - characterized according to sides
  - two critical values
  - sometimes underlaid
  - uncorrelated
- visualization
- task: part-to-whole judgements

Idioms: pie chart, polar area chart

- derived data (from field)
- bar chart
- radial axes meet at central point, line mark
- bar chart
- rectilinear axes, aligned vertically
- accuracy
- length unaligned with radial
- less accurate than aligned with rectilinear

Idioms: normalized stacked bar chart

- task
- derived data (from field)
- rectilinear axes, aligned vertically
- accuracy
- length unaligned with radial
- less accurate than aligned with rectilinear

Further reading

- Arbor Avis: 1999

Arrang spatial data

- Up-Given
  - Geometry
    - Spatial Fields
      - Scalar Fields (one value per cell)
      - Isoline Geometry
        - Vector Field Rendering
          - Direct Isoline Rendering
      - Vector and Tensor Fields (vector values per cell)
    - Flow Graphics
      - Streamlines (area traced)
      - Texture (clarion seeds)
      - Features (globally derived)

Idioms: DVR, multidimensional transfer functions

- direct volume rendering
  - transfer function maps scalar values to color, opacity
  - derived data
  - isosurface geometry
  - isosurface (isovalues for specific scalar values)

Further reading

- Arbor Avis: 1999

Idioms: glyphmaps

- rectilinear good for linear vs nonlinear trends
- radial good for cyclic patterns
- use given spatial data
- when central task is understanding spatial relationships
- data:
  - geographic geometry
  - scalar spatial field
- derived data:
  - contour map
  - isoline geometry
- sequential segmented colormap
- isosurface geometry
- isovalues for specific scalar values
- task:
  - spatial relationships

Idioms: choropleth map

- use given spatial data
- geographic geometry
- scalar spatial field
- derived data:
  - contour map
  - isoline geometry
- sequential segmented colormap
- derived data:
  - data (per streamline)
    - curvature, torsion, surfrusity
    - signature: complex weighted combination
    - compute cluster hierarchy across all signatures
    - encode color and opacity by cluster
    - tasks:
      - find features, query shape
      - scalability:
        - millions of samples, hundreds of streamlines
  - task:
    - spatial relationships

Idioms: topographic map

- data:
  - geographic geometry
  - scalar spatial field
- derived data:
  - contour map
  - isoline geometry
  - isovalues for specific scalar values
- task:
  - spatial relationships

Idioms: isosurfaces

- data:
  - scalar spatial field
  - contour map
  - isoline geometry
  - isovalues for specific scalar values
- task:
  - spatial relationships

Vector and tensor fields

- data:
  - many arrows per cell
- idiom families:
  - flow glyph
  - contour
  - geometric flow
- derived data:
  - derived from tracing particle interactions
  - sparse set of seed points
  - texture flow
- derived data:
  - derived data, dense seeds
  - flow streamlines
  - global composition to detect features
- empirical study tasks:
  - many arrows per cell
  - identifying critical points, identifying flow types
  - identifying what type of critical point is at a specific location
  - predicting where a particle starting at a specified point will end up (prediction)

Idioms: similarity-clustered streamlines

- data:
  - 3D vector field
  - derived data (from field)
  - streamline trajectory particle will follow
- derived data (per streamline)
  - curvature, torsion, surfrusity
  - signature: complex weighted combination
  - compute cluster hierarchy across all signatures
  - encode color and opacity by cluster
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Next Time

* to read

- VAD Ch. 9: Networks
- paper type: technique