Plan for today

• 45 30 min: mini-lecture w/ discussion of examples
• 30 min: breakout groups
• 20 min: reportbacks
• 10 min: wrapup w/ further examples
Reminder: Marks and channels

• marks
  – basic geometric elements

• channels
  – control appearance of marks

Points
  - Horizontal
  - Vertical
  - Both

Lines
  - Length
  - Area

Areas
  - Volume

Color

Shape

Tilt

Size
**Channels: Rankings**

**Magnitude Channels: Ordered Attributes**
- Position on common scale
- Position on unaligned scale
- Length (1D size)
- Tilt/angle
- Area (2D size)
- Depth (3D position)
- Color luminance
- Color saturation
- Curvature
- Volume (3D size)

**Identity Channels: Categorical Attributes**
- Spatial region
- Color hue
- Motion
- Shape

### Expressiveness
- match channel and data characteristics

### Effectiveness
- channels differ in accuracy of perception

### Distinguishability
- match available levels in channel w/ data
Redundant encoding

• multiple channels
  – sends stronger message
  – but uses up channels

Length, Position, and Value
Marks: Constrained vs encodable

• math view: geometric primitives have dimensions
  - Points
  - Lines
  - Areas

• constraint view: mark type constrains what else can be encoded
  - points: 0 constraints on size, can encode more attributes w/ size & shape
  - lines: 1 constraint on size (length), can still size code other way (width)
  - areas: 2 constraints on size (length/width), cannot size code or shape code
    • interlocking: size, shape, position

• quick check: can you size-code another attribute, or is size/shape in use?
Grouping

• containment
• connection

Marks as Links

→ Containment

→ Connection

Identity Channels: Categorical Attributes

Spatial region

Color hue

Motion

Shape
Marks for links

➡️ Connection

➡️ Containment

Containment can be nested

[Untangling Euler Diagrams, Riche and Dwyer, 2010]
Quiz: Name those marks & channels

• A: Shooting Media Coverage

https://twitter.com/MonaChalabi/status/1158779046693679106?sf=20
Quiz: Name those marks & channels

• B: Tax Rates

Quiz: Name those marks & channels

• C: Sunsqatch

https://flowingdata.com/2017/08/20/sunsquatch-the-only-eclipse-map-you-need/
Quiz: Name those marks & channels

- D: UFC fights

Analyzing marks

• what type of mark?
  – line?
    • no, not length coded
  – point mark with rectangular shape?
    • yes!
  – area?
    • no, area/shape does not convey meaning
Quiz: Name those marks & channels

- E: Alpen Forest Fires

Burned area in hectares on the southern side of the Alps

1990: 1629.83 ha, 98% of the area burned
1994: 99%
1996: 99%
1997: 1724.28 ha, 97% of the area burned
2002: 446.82 ha, 99%
2016: 441.41 ha, 97%

Source: Swiss forest fire database

Quiz: Name those channels

• F: Netherlands Commuters

Quiz: Name that mark

• G: Yet More Alpen Forest Fires

Most forest fires in Switzerland occur on the southern side of the Alps. ,

Annual number of forest fires between 1980 and 2014

Source: Climate Change Forest. Psenne et al., 2018

Quiz: Name those marks & channels

• H: More Alpen Forest Fires

Monthly distribution of forest fires in the Alpine regions caused by...

- den Menschen
- Blitzschläge
- unbekannt

Alpensüdseite

andere Alpengebiete

Average numbers in the period 2000-2018
Source: Swissfire forest fire database