Visualization & Visual Analytics 1
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http://creativecoding.evl.uic.edu/courses/cs424
See anything unusual in this pile of wood?
See anything unusual in this brick wall?
Perceptual Illusions
Visual Encoding

Marks and Channels define how salient aspects of your data is “encoded” (i.e., represented) visually.

**Marks**: Basic geometric elements, or “primitives,” that depict items or links between items.

**Channels**: Controls the appearance of the primitives in order to encode its type (identity) or value (magnitude).
Marks

Marks as Items/Nodes

- Points
- Lines
- Areas

Marks as Links

- Containment
- Connection
Channels

- **Position**
  - Horizontal
  - Vertical
  - Both

- **Color**
  - Black
  - Red
  - Green

- **Shape**
  - Triangle
  - Star
  - Line
  - L

- **Tilt**
  - 

- **Size**
  - Length
  - Area
  - Volume
Visual Encoding

Particular combinations of marks and channels are more effective for more particular tasks.

*Psychophysics* – or the study of human perception – helps inform design choices regarding which marks and channels to use.

Despite this body of knowledge, choosing visualization elements is very much an art as well as a science.
Channels

(a) 
(b) 
(c) 
(d)
Channels

- Position + Hue (Color) - Fully separable
- Size + Hue (Color) - Some interference
- Width + Height - Some/significant interference
- Red + Green - Major interference
Principle of Expressiveness

Your visualization should express *all of the information* available in the dataset attributes.

Your visualization should express *only the information* available in the dataset attributes.

- If your data is orderable, then you should use an encoding that makes the order obvious.
- If your data is not orderable, then your encoding should not give the impression that it is.
Principle of Effectiveness

The most important attributes are the most noticeable and the most prevalent.
Channels

**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

Effectiveness:
- Most
- Effectiveness
- Same
- Least
Effectiveness =

- **Accuracy** – how well can we interpret the channel?

- **Discriminability** – how many levels or types can you easily distinguish via your channel?

- **Separability** – how much interference is there with other channels?

- **Popout** – Can you see distinctions preattentively?

- **Grouping** – Does the channel promote the ability to infer relationships and clusters easily
Pop-out
Pop-out
Grouping

Proximity

Similarity

Enclosure

Symmetry

Closure

Continuity

Connection

Figure & ground
Exercise

Download a visualization from the 2014 Best Infographics, posted on Piazza.

- What data is being visualized?
- What marks and channels are used?
- How expressive is the visualization (both in terms of the technical and everyday meaning)?
- How effective are the channels, in terms of: accuracy, discriminability, separability, etc)
- What elements are used in the visualization that aren’t described by Munzner’s marks and channels, but still seem to serve as an element of visual communication?
For next week

For Tuesday:

Read the Munzner text, Chapters 4 and 6

Tuesday and/or Thursday:

I will go over your projects and introduce Project 2