TASKS & INTERACTION

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LAST TIME
- relativity of perception
- marks and channels
- planar position
- color
WEBER’S LAW
we judge based on relative, not absolute, differences

(a) A unframed unaligned
(b) A framed unaligned
(c) A unframed aligned
MARKS
geometric primitives

0D  points
1D  lines
2D  areas
Categorical
- What/where
  - Planar position
  - Color hue
  - Shape
  - Stipple pattern

Ordinal | Quantitative
- How much
  - Position on common scale
  - Position on unaligned scale
  - Length (1D size)
  - Tilt, angle
  - Area (2D size)
  - Curvature
  - Volume (3D size)
  - Lightness (black/white)

Effectiveness
- Networks | Same category
  - Grouping
    - Containment (2D)
  - Connection (1D)
  - Similarity (other channels)
  - Proximity (position)

Salience
- Effectiveness
WHAT’S SO SPECIAL ABOUT THE PLANE?

- power does not extend to 3D
  - perspective cues
  - interfere with color and size channels
- occlusion of data
WHY IS COLOR SO HARD TO USE?

Get it right in black and white.  
Maureen Stone

- **hue**: categorical

- **saturation**: ordinal and quantitative

- **luminance**: ordinal and quantitative
-analysis task taxonomy

interaction principles
target

translate

design

implement

validate
comments on readings?
- analysis task taxonomy
- interaction principles
WHAT ARE THE ANALYSIS TASKS IN A REAL-WORLD QUESTION?

What is cs6964 like?
What coffee drink should I order?
1) retrieve value
2) filter
3) compute derived data
4) find extremum
5) sort
6) determine range
7) characterize distribution
8) find outliers
9) cluster
10) correlate
RETRIEVE VALUE

-analysis task
  -given a set of specific items, find attributes of those items

-real-world subquestion
  -how many lectures are there in this class?
  -how much is a medium latte?
FILTER

-analysis task
- given some concrete conditions on attribute values, find items satisfying those conditions

-real-world subquestion
- which lectures have only two required readings?
- which espresso drinks come with milk?
COMPUTE DERIVED DATA

- **analysis task**
  - given a set of items, compute an aggregate numerical representation

- **real-world subquestion**
  - what is the average number of slides per lecture?
  - what is the median price of all coffee drinks?
FIND EXTREMA

- analysis task
  - find items possessing an extreme value of an attribute over its range of the data set

- real-world subquestion
  - what is lecture has the most required readings?
  - what is the cheapest espresso drink?
SORT

- **analysis task**
  - given a set of items, rank them according to some ordinal metric

- **real-world subquestion**
  - order lectures by popularity
  - order drinks by volume
DETERMINE RANGE

-analysis task
  - given a set of items an attribute of interest, find the span of values within the set

-real-world subquestion
  - what is the range of time for in-class activities?
  - what coffee drinks can I order?
CHARACTERIZE DISTRIBUTION

- **analysis task**

  - given a set of items a quantitative attribute of interest, characterize the distribution of that attribute’s values over the set

- **real-world subquestion**

  - what is the distribution of homework grades?
  - what is the distribution of caffeine content?
FIND OUTLIERS

- **analysis task**
  - identify outliers with a given set of items with respect to a given relationship or expectation

- **real-world subquestion**
  - are exceptions to the relationship of lecture time to in-class activity time?
  - are their outliers in size to price?
CLUSTER

- analysis task
  - given a set of items, find clusters of similar attribute values

- real-world subquestion
  - are there groups of students with similar grades?
  - is there a cluster of typical caffeine content?
CORRELATE

-analysis task
- given a set of items and two attributes, determine useful relationships between the values of those attributes

-real-world subquestion
- is there a correlation between lecture length and lecture popularity?
- do different genders have a preferred coffee drink?
- analysis task taxonomy

- interaction principles
  - classes of change
  - eyes over memory
CLASSES OF CHANGE
changing selection
Hit the letter z, or click the word zoom to enable or disable zooming. Hold down shift while typing a number to replace the previous number (U.S. keyboards only).

**Zipdecode**

This project began a very short sketch (a few hours) that I created because I was curious about how the numbering works for postal codes in the states.

A detailed description of this project (and source code for an updated version) can be found in my book *Visualizing Data*.

Last updated 28 September 2004... This version adds several features over the original, including zoom, some new colors (thanks to Eugene Kuo) and a better zip code database (because of all the people who
Baby Name Voyager: Names starting with 'MARIAH' per million babies

Expecting a baby? Click here to get a free subscription to American Baby!

NameVoyager: Explore name trends letter by letter

Baby Name > mariah
Press 'enter' to see exact matches.

Click a name graph to view that name. Double click to read more about it.
CLASSES OF CHANGE
changing highlighting
The Ebb and Flow of Movies: Box Office Receipts 1986 — 2008

Summer blockbusters and holiday hits make up the bulk of box office revenue each year, while contenders for the Oscars tend to attract smaller audiences that build over time. Here's a look at how movies have fared at the box office, after adjusting for inflation.

Find Movie

The Last Legion
This sword-and-sandal spectacle from those epic-loving De Laurentis's invokes a lot of better movies on its circuitous trip from the Roman empire to the Arthurian legend, but it doesn't do the one bit of borrowing that could have made this journey enjoyable.

Good Will Hunting
a Good as it Gets

Each shape shows how one film did at the box office.

Height shows weekly box office revenue

Width shows longevity

The area of the shape (and its color) corresponds to the film's total domestic gross, through Feb. 21

3862 million

360 million
CLASSES OF CHANGE
changing view | navigation
isometricblocks

When comparing the genome of two different people, you'll see single letter changes (called SNPs, pronounced "snips") every few thousand letters. An interesting feature of SNPs is that their ordering has distinct patterns, where sets of consecutive changes are most often found together. There are many methods for looking at this data, so this piece combines several of them into a single visual display. The project is described in greater detail in my dissertation, starting in chapter four.
CLASSES OF CHANGE

changing spatial ordering | sorting
EYES OVER MEMORY
many interaction techniques implicitly rely on memory

very limited working memory

“It is things that make us smart”
Donald Norman
IMPLICATIONS FOR ANIMATION

- external versus internal memory
  - easy to compare views by moving eyes
  - hard to compare view to memory of what you saw
Can you spot 12 differences between these pictures?
Can you spot 12 differences between these pictures?
Can you spot 12 differences between these pictures?

Solution:
1. Two freckles removed.
2. Nose line on left giraffe removed.
3. Shadow on lower left coconut removed.
4. Leaf vein below gecko
5. Ear line on left giraffe removed.
6. Bottom shadow on right giraffe colored in.
7. Small leaf on right of tree colored in.
8. Horn on right giraffe moved.
9. Shorter tail on left giraffe.
10. Gazebo on left side shorter.
Animation: can it facilitate?

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WHEN TO USE ANIMATION?
GOOD: STORYTELLING
Hazards of Storing Spent Fuel

Dangerous conditions can occur if water drains from pools storing radioactive fuel rods.

In older boiling-water reactors like these, pools of spent fuel are several stories above the ground. Fuel assemblies are transferred from the reactor core to the pool through water canals.
GOOD: TRANSITIONS
BAD: MULTIPLE STATES WITH MULTIPLE CHANGES
BAD: MULTIPLE STATES WITH MULTIPLE CHANGES
alternative: small multiples

Barsky 2008
questions?
THE PANCAKE CHALLENGE
target

translate

design

implement

validate
L7: Data and Task Abstraction 1

REQUIRED READING
What is a Affinity Diagramming?
Affinity Diagramming is a very simple but powerful technique for grouping and understanding information.

In particular, affinity diagramming provides a good way to identify and analyze issues. There are several variations of the technique.

When is affinity diagramming appropriate?
Use affinity diagramming in a workshop environment when you want participants to work together identifying, grouping and discussing issues.

You can also use affinity diagramming when you have a large amount of information—for example, at the end of a contextual enquiry, when you may have hundreds or even thousands of individual notes.

How is affinity diagramming conducted?
Affinity diagramming simply consists of placing related items together.

Although this can be done electronically for very small sets of data (using a word processor or spreadsheet program), it is better to work with paper. In group situations, always use paper.

Give participants some minutes for this activity, ask them to stop when a large majority of participants have stopped.

Get all participants to gather at a vertical surface suitable for Post-It notes. Windows are appropri...

Encourage participants to place notes, one at a time, on the surface. As each note is placed, participants may add similar notes in close proximity.