CSCI 4964/6963
Interactive Visualization
Spring 2016

http://www.cs.rpi.edu/~cutler/classes/visualization/S16/
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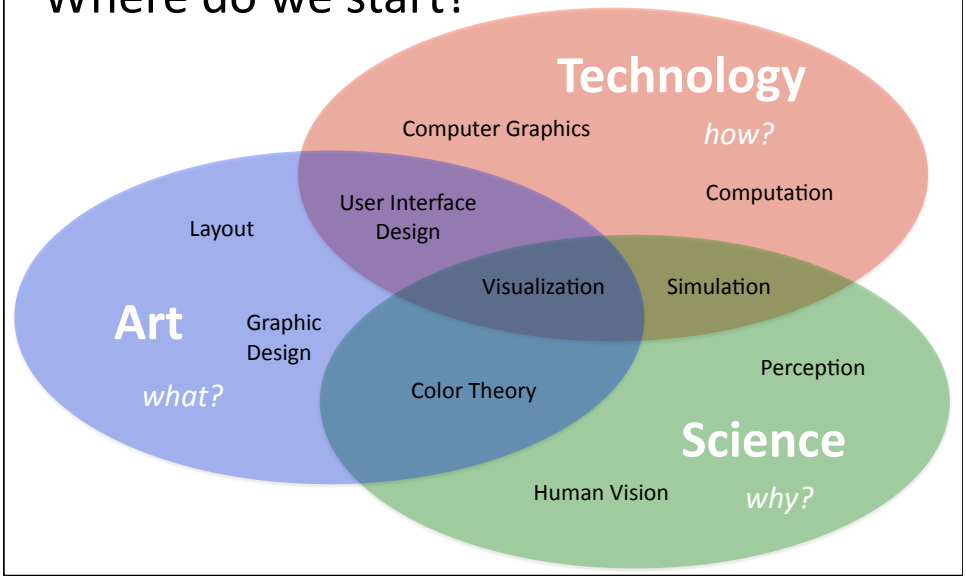
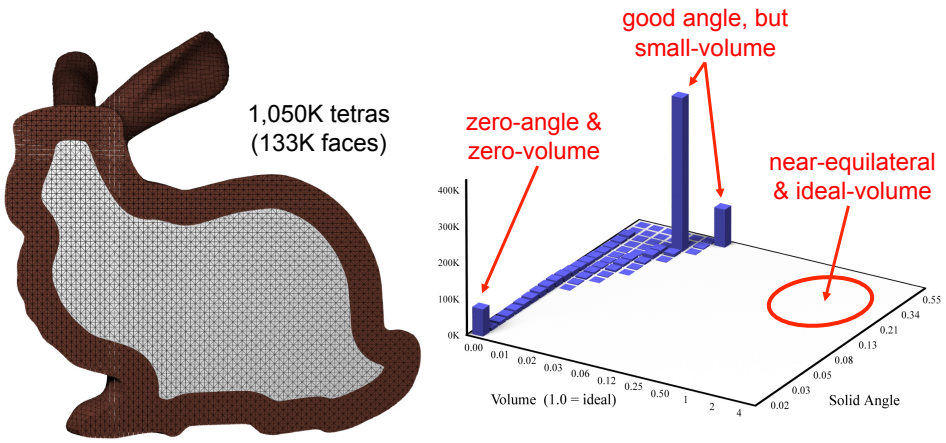
MRC 331A

"Introduction" to Visualization: Where do we start?



Visualization of Tetrahedra Quality



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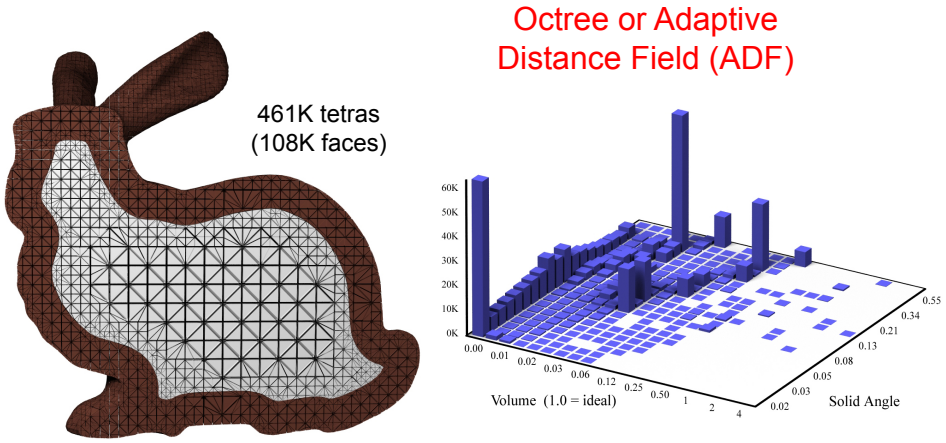
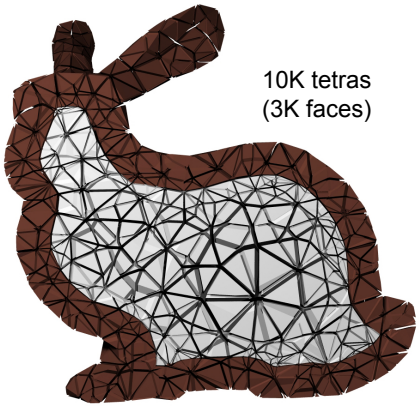
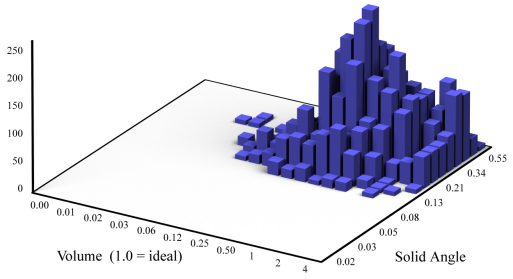


Visualization of Tetrahedra Quality

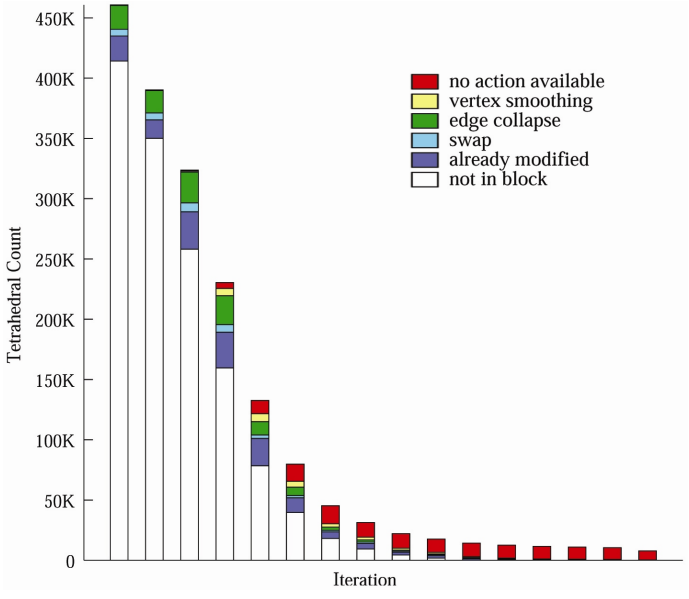


10K tetras
(3K faces)

After Simplification
& Mesh Improvement



Visualization of Simplification Algorithm



Exercise: Social Network Data Collection

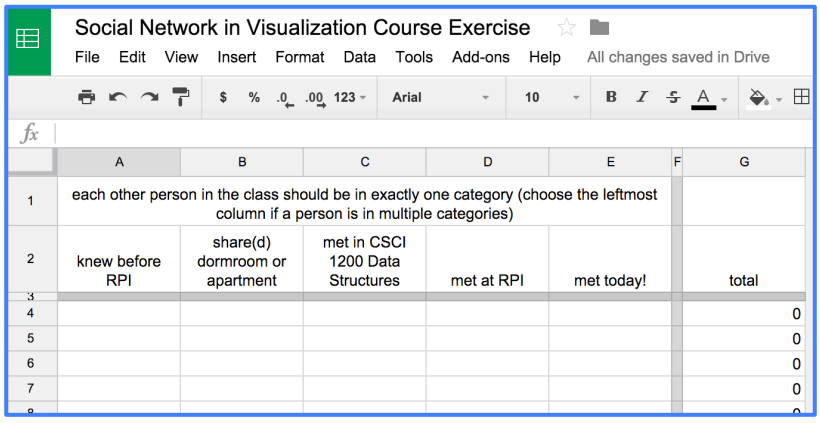
- Grab a sheet of paper & a pen/pencil.
- In a moment we will go around the room for introductions.
- Keep a running tally (count only, names not necessary) for each category below. If someone fits in multiple categories, put them in the leftmost.

knew before RPI	share(d) dormroom or apartment	met in CSCI 1200 Data Structures	met at RPI	met today!

- But before we do that, make a few hypotheses about the results. Your totals, the class average, outliers, etc. Write them down.

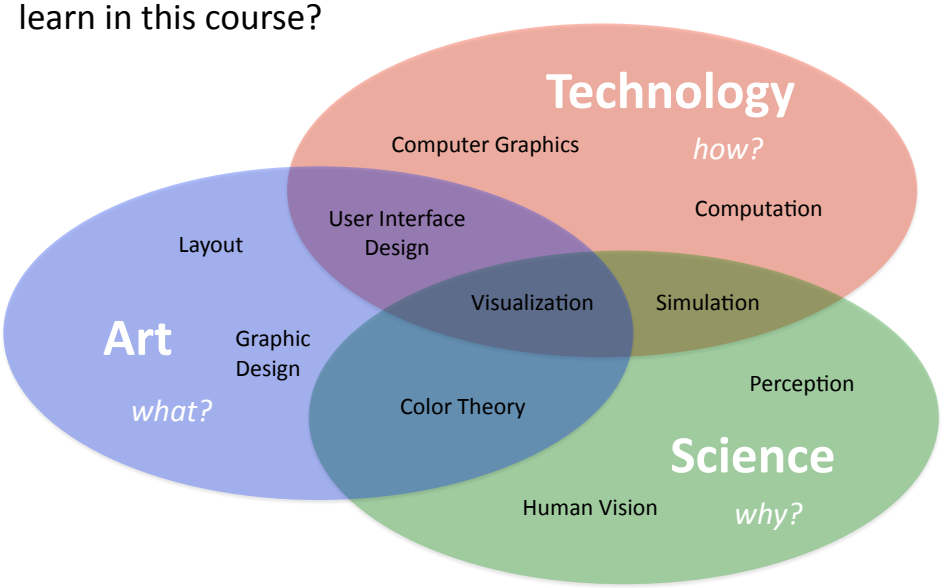
Exercise: Social Network Data Collection

- I'll share this google drive link on our LMS site.
- Everyone will (anonymously*) enter their data as a row

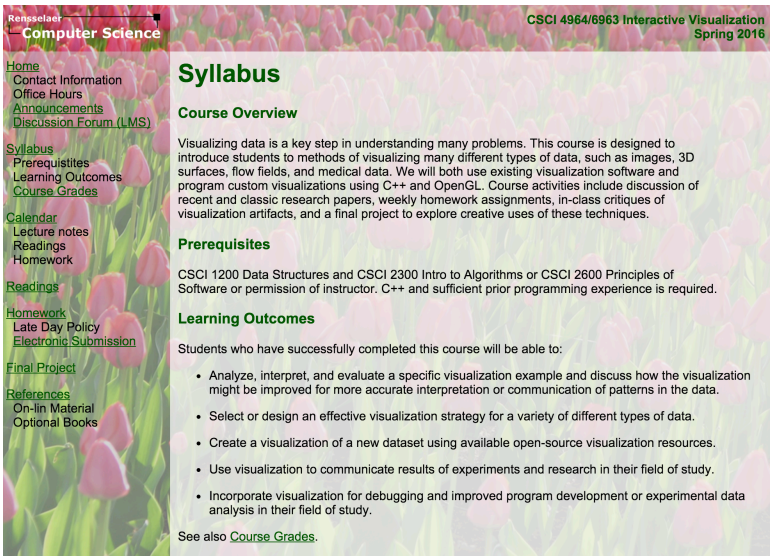


Is anonymity guaranteed?

And you? Major/Research Area? Skills & Strengths? Related hobbies? Career direction? What do you hope to learn in this course?



Website, Syllabus, & Course Grades



http://www.cs.rpi.edu/~cutler/classes/visualization/S16/

"Rules" for the course

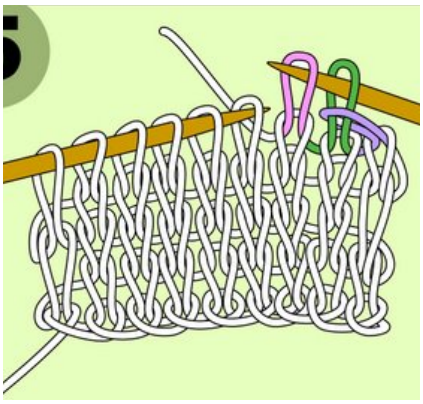
- As class participation is 10% of your grade:
  - Use of laptops for reference during paper discussion and general note-taking is allowed
  - If you are likely to be distracted by your laptop (email, web-surfing, games), please close the lid
- Sit in a different seat, next to different people, each lecture
  - To facilitate mixing for feedback and brainstorming during in-class exercises

The Visualization Process

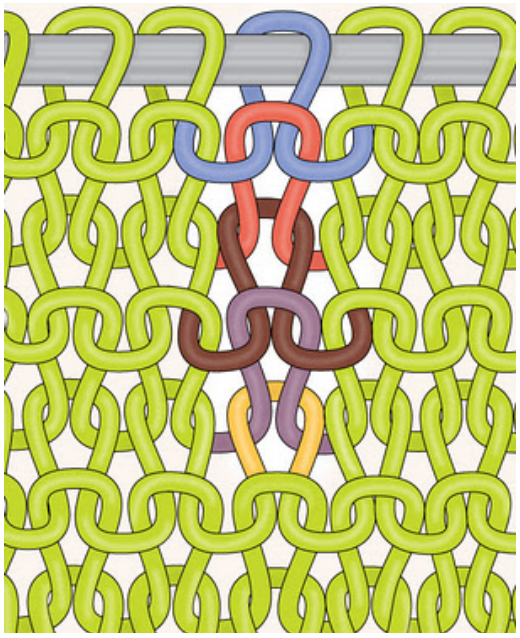
- Motivation & Problem Definition
- Visualization Design
- Data Collection
- Visualization Execution
- Analysis & Validation
- Visualization Revision
- Presentation

The Visualization Process

- Motivation & Problem Definition
  - e.g., audience, purpose, goals, interdisciplinary collaboration
- Visualization Design
- Data Collection
- Visualization Execution
- Analysis & Validation
- Visualization Revision
- Presentation



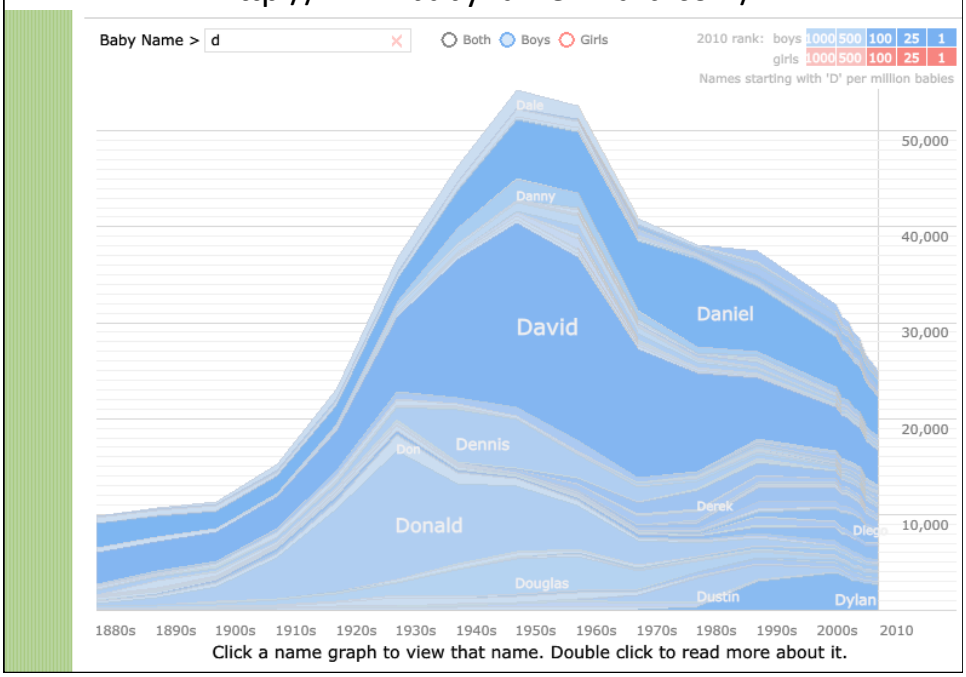
http://techknitting.blogspot.com/



The Visualization Process

- Motivation & Problem Definition
- Visualization Design
  - e.g., media, color, organization, layout, static vs. dynamic, creativity
- Data Collection
- Visualization Execution
- Analysis & Validation
- Visualization Revision
- Presentation

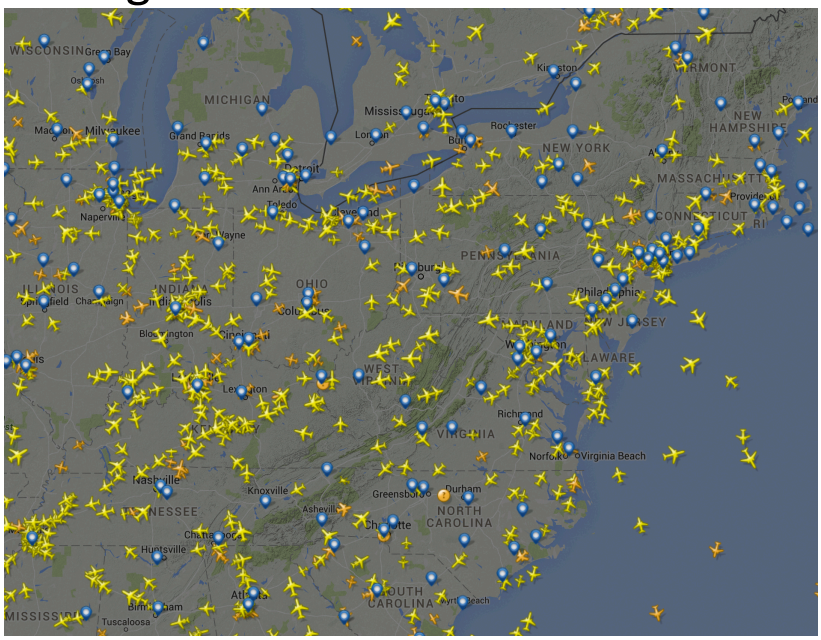
http://www.babynamewizard.com/

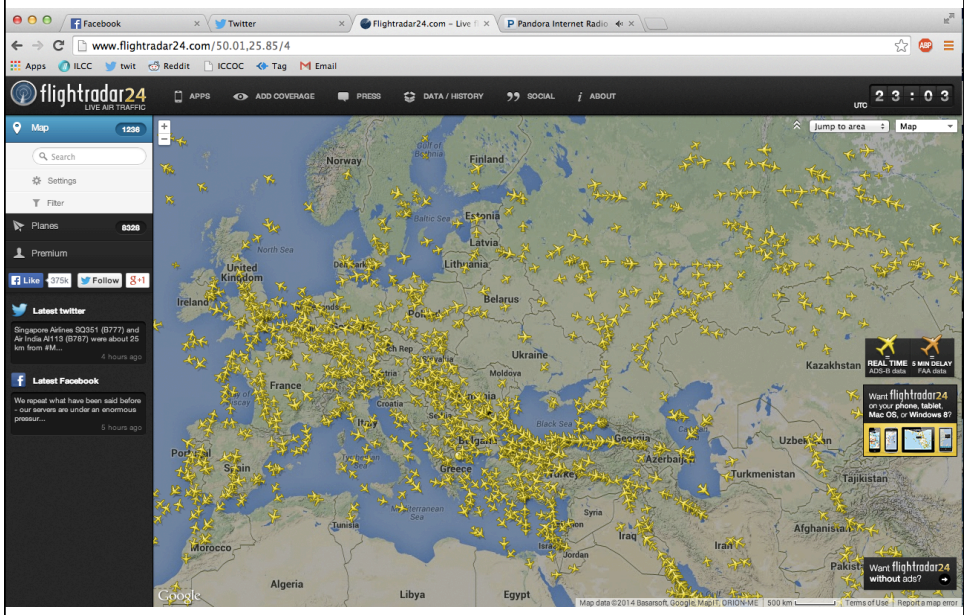


The Visualization Process

- Motivation & Problem Definition
- Visualization Design
- Data Collection
  - e.g., data structures, file formats, parsing, performance & efficiency, databases, very large datasets, interdisciplinary collaboration
- Visualization Execution
- Analysis & Validation
- Visualization Revision
- Presentation

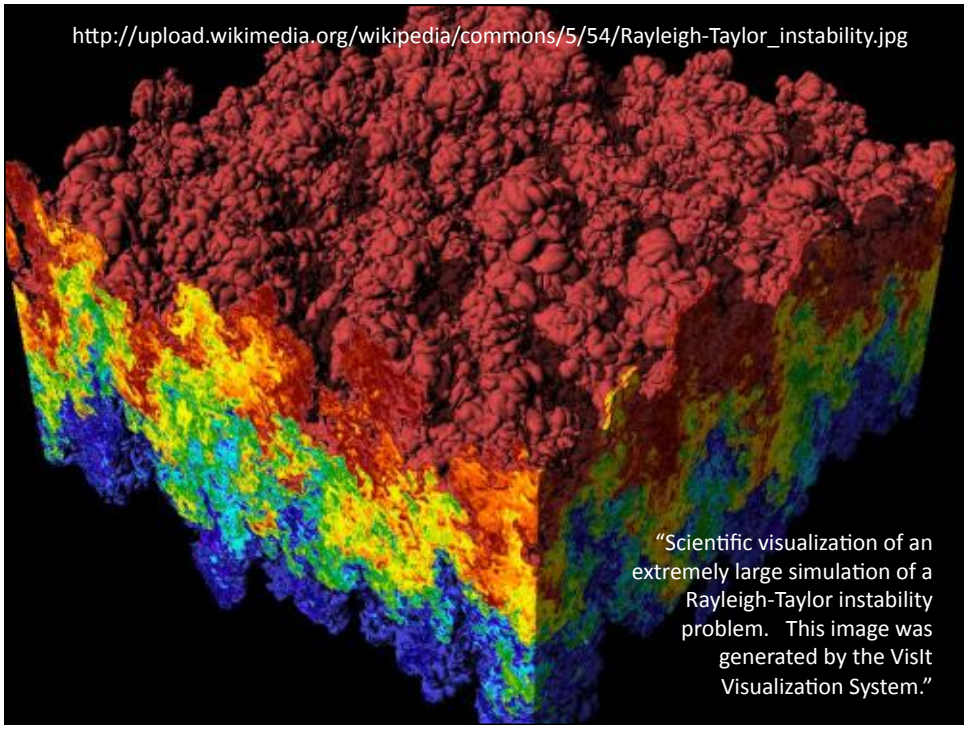
www.flightradar24.com





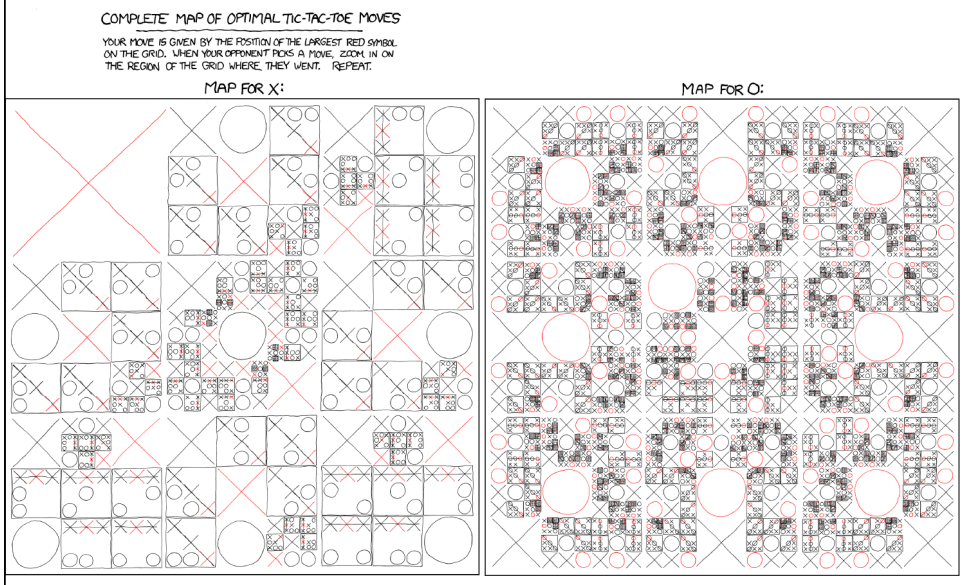
The Visualization Process

- Motivation & Problem Definition
- Visualization Design
- Data Collection
- Visualization Execution
  - e.g., data structures, implementation details, visualization tookits/environments (VTK, OpenGL, d3.js, etc.), performance & efficiency
- Analysis & Validation
- Visualization Revision
- Presentation



The Visualization Process

- Motivation & Problem Definition
- Visualization Design
- Data Collection
- Visualization Execution
- Analysis & Validation
  - e.g., debugging, drawing conclusions from data, accuracy, precision, interpretation, useability
- Visualization Revision
- Presentation



http://xkcd.com/832/

The Visualization Process

- Motivation & Problem Definition
- Visualization Design
- Data Collection
- Visualization Execution
- Analysis & Validation
- Visualization Revision
  - e.g., prototype & revise, iterated design, comparing before & after, solicit user feedback, formal user studies
- Presentation

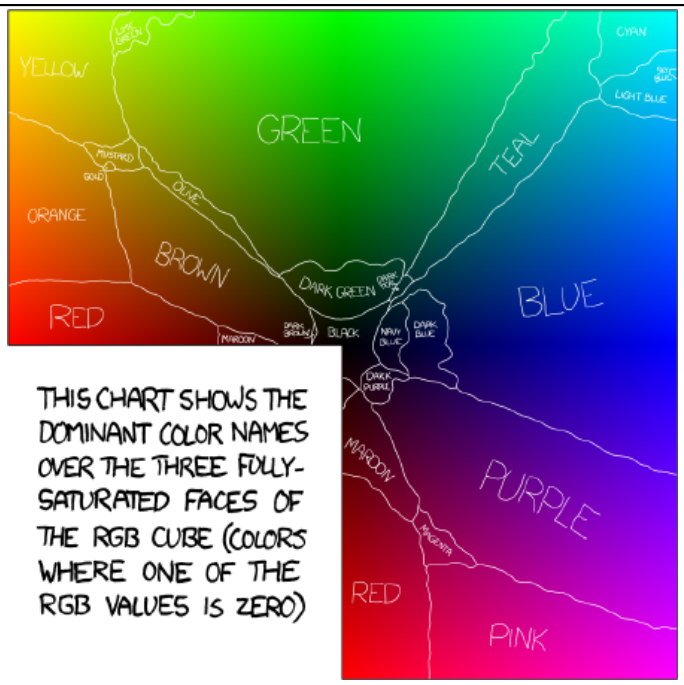
http://www.heraldsun.com.au/ Getty

http://www.digitalglobe.com/sites/default/files/italy_giglio_jan17_2012_0.jpg

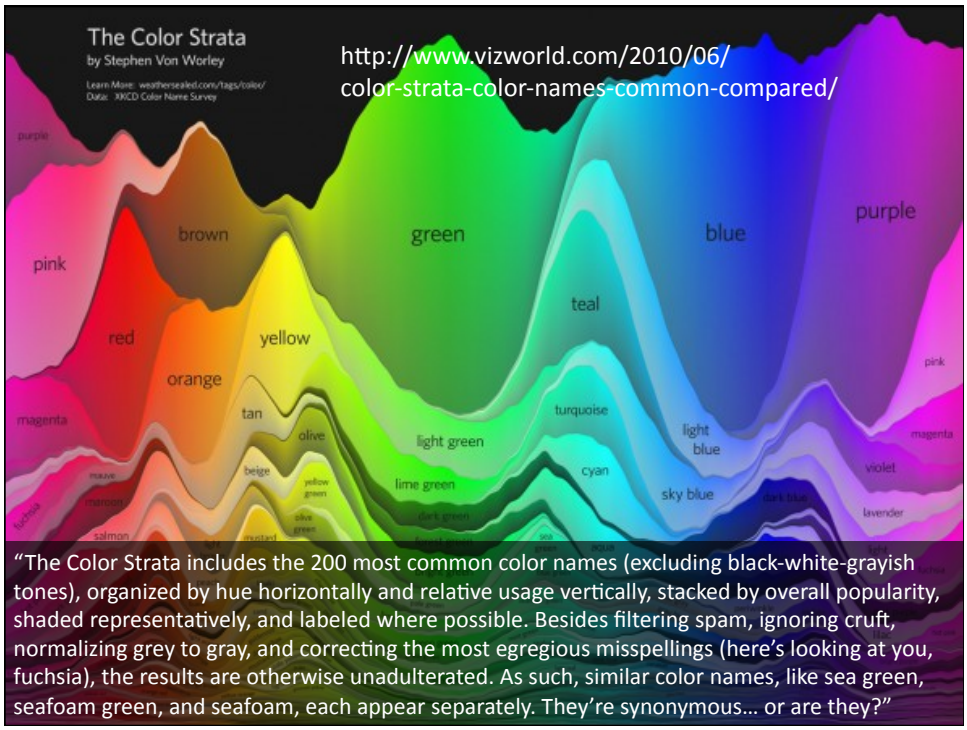
From somewhere on Facebook….
http://www.facebook.com/babayoff

The Visualization Process

- Motivation & Problem Definition
- Visualization Design
- Data Collection
- Visualization Execution
- Analysis & Validation
- Visualization Revision
- Presentation
  - e.g., mixed media, descriptive titles/labels, concise and complete captions/companion text, elevator pitch, documentation



http://blog.xkcd.com/2010/05/03/color-survey-results/



"The Color Strata includes the 200 most common color names (excluding black-white-grayish tones), organized by hue horizontally and relative usage vertically, stacked by overall popularity, shaded representatively, and labeled where possible. Besides filtering spam, ignoring cruft, normalizing grey to gray, and correcting the most egregious misspellings (here's looking at you, fuchsia), the results are otherwise unadulterated. As such, similar color names, like sea green, seafoam green, and seafoam, each appear separately. They're synonymous… or are they?"

Reading for Friday:

- "Eenie, Meenie, Minie, Moe: Selecting the Right Graph for Your Message", Stephen Few, Intelligent Enterprise, 2004 (link on webpage)
- Everyone must post a non-trivial comment or question on the reading (~200 words) to the LMS discussion by Friday @ 10:00am.
- Volunteer to lead the discussion (present ~5 minute summary of online discussion) during lecture on Friday?

Homework Assignment 1: Inspirational Visualization Images

- Find two example visualization *images*:
  - one great visualization
  - one example that needs revision to be effective
- For each example write a paragraph or two describing:
  - the author, context, audience, original media format and purpose of the visualization
  - your analysis of the positive and negative aspects of each example and how it could be improved, and
  - any generalizations you can make about what makes for a compelling, high-quality visualization
- Make your post before 6:00pm on Thursday. Comment on 2 other students posts before 10:00am on Friday.

Is this a Visualization?

"Been wondering for years where it is cats put their feet when they settle down into this pose"
"whoa, so that's how they do it!"

From somewhere else on Facebook

Criteria for label "(good) Visualization"

- Author choice,
- Not innately visual, the author transformed it to be visual
- Clearly (perfectly uncluttered) data
- Defined metrics (science)
- Highlight important aspects of the dataset
- Intention/purpose?
- Need more than one datapoint, need to show a trend, want to generalize? Do we need time? Maybe not.
  - Comparisons can be very valuable. Sufficient quantity of data to draw conclusions. Other similar datapoints, or datapoints for comparison.
- Needs to be interactive! Want to move the cat around, virtual reality cat!

Criteria for label "(good) Visualization"

- From the F14 class…
  - Reveals something you didn't know (about cats)
  - Needs to have an X & Y axis (not really?)
    instead… Needs to exist in a space
  - Should be clear in meaning & purpose
  - Just enough information and no more
  - Intentional
  - If the thing can be quantified, must indicate precision & accuracy
  - Shouldn't be trying to mislead you
    but ok to have busy-ness to express the complexity
  - Be a scientist, have a hypothesis but look at the data with fresh eyes – don't bias your conclusions, allow for interpretation