Presentation:
Design, Organization, Simplification, Photography, Website Design, User Interface Design, …

Today

• Assignment #2 Mini-Presentations
  • Scott, Irene, Gary
• Photography tips
• Principles of Effective Website Design
• Principles of Good User Interface Design
• Principles of Good Visualization Design
• “Useful Junk? The Effects of Visual Embellishment on Comprehension and Memorability of Charts”
• D3.js: Courtney (great for web based visualizations, & use of jQuery), Jesse (hard to get planar graphs w/o hardcoding some starting positions), Altan, Theodore, Jaron (shove it on a webserver and see stuff!), Gary
• Gephi: Irene, Greg, Jazmine & Robert (bulky & buggy), Rebecca, Jorel (buggy scripting language?)
• Processing: Gerrett (lots of coding req’d, but powerful), Bolong (moving objects!), Zev (easier than the brutal C++/OpenGL from ACG)
• Network X: Shoom (good generators for certain types of graphs & layout engines)
• GraphVis (& GVedit): Q (easy setup, but takes a lot of time to produce a good visual), Andrew (decently complex input took a while to get nice-looking plot)
• VTK: Max & Ian (industrial, not easy to use, not easy to customize, not great for 2D plots)
• Sigma.js: Scott (not as mature as other tools, only one layout tool)
• VisIt: Mark (for meshes, scatterplots, no editor…)

Today

• Assignment #2 Mini-Presentations
• Photography tips
  – Canonical Viewpoints
• Principles of Effective Website Design
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“Canonical” Viewpoints

• From Dictionary.com:
  – authorized; recognized; accepted
  – the body of rules, principles, or standards accepted as axiomatic and universally binding in a field of study or art: the neoclassical canon
  – a fundamental principle or general rule: the canons of good behavior
  – a standard; criterion: the canons of taste

“What object attributes determine canonical views?” Blanz, Tarr, & Bulthoff, Perception 1999
Suppose you were making a brochure and you tried to give your customers the best possible impression of the objects shown on the static page. Which views would you choose?

- Salience and significance of the features
- Stability of viewpoint to small transformations
- Minimize number of occluded features
- Familiarity, Functionality, Aesthetic criteria
Rule of Thirds


– align subject with guide lines and intersection points, discourage placement of the subject at the center
– placing the horizon on the top or bottom line, avoid dividing picture in half

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Principles of Effective Website Design

- Guiding the eye (position, color, contrast, size (design elements)
- Spacing, padding, white/empty space, reduce cognitive load
- Navigation/orientation
- Typography (font, size, color, paragraphs)
- Usability/standards/conventions be obvious, “Don’t make users think”
- Consistency
- Alignment, polished, simplicity
- Effective writing
- Clarity, sharpness, contrast

http://psd.tutsplus.com/tutorials/designing-tutorials/9-essential-principles-for-good-web-design/
http://uxdesign.smashingmagazine.com/2008/01/31/10-principles-of-effective-web-design/

Principles of Good User Interface Design

- Consistency and standards
  - Match real world: words, phrases and concepts familiar to the user, real-world conventions, natural and logical order, coherency
  - Flexibility and efficiency of use: cater/tailor to both inexperienced and experienced users
    - Know your user, user testing, listen to the user
  - User control and freedom: clearly marked "emergency exit" to leave the unwanted, support undo and redo
  - Aesthetic and minimalist design: every extra unit of information competes with and diminishes visibility of relevant information
    - System status: keep users informed
- Recognize, diagnose, and recover from errors
  - Error prevention: good error messages, eliminate error-prone conditions, confirmation option
- Help and documentation
  - Recognition rather than recall: information/instructions should be visible or easily retrievable

http://www.useit.com/papers/heuris-c/heuris-c_list.html
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- Photography tips
- Principles of Effective Website Design
- Principles of Good User Interface Design
- Principles of Good Visualization Design
  - Scientific Visualization vs. Information Visualization
  - Simple clean design vs. “Chart Junk”
  - Managing & leveraging huge amounts of data
  - Understanding your Audience
    - E.g., Visualization for Science, Communication, Education, Debugging, etc.
  - Importance of companion text
    (title, axis labels, legend, caption)
  - Targeting visualization design to human perception & low-level vision processing
- “Useful Junk? The Effects of Visual Embellishment on Comprehension and Memorability of Charts”

Paul Butler
http://www.facebook.com/notes/facebook-engineering/visualizing-friendships/469716398919
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**Active Forces II**
Number of soldiers per 100,000 people

- **North Korea** 4,711
- **Eritrea** 4,012
- **Israel** 2,482
- **Djibouti** 2,064
- **Iraq** 2,045

- **US** 507 (45th)
- **UK** 263 (93rd)
- **China** 164 (124th)

Informationisbeautiful.net

Source: Guardian Datablog, milxdata.sipri.org 2008
World’s Deadliest Animals
Number of people killed by animals per year

- **Human**: 475,000
- **Mosquito**: 725,000
- **Snakes**: 10,500
- **Rabid Dog**: 10,000
- **Exposure to Bats**: 5,000
- **Ferrets**: 2,000
- **Krait**
- **Cobra**
- **Vipers**: 1,000
- **Elk**
- **Hippopotamus**: 500
- **Coral Snake**: 2,000
- **Sloths**: 2,000

http://www.gatesnotes.com/Health/Most-Lethal-Animal-Mosquito-Weak

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If you are admitted to a hospital, you have a 5% chance of contracting an HAI

- **1.7 million people** per year get an infection during a hospital stay
- **98,987 people in the U.S. die annually from HAIs**
- **69% of total inpatient costs are HAI-related**
- **$35 Billion/yr** in system costs
- **$1,100 per admission**

http://www3.gehealthcare.com/en/Products/Categories/Healthcare_IT/Quality_Management#tabs/tab19003287C74AC8AD78D4A2072591
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National Telecommunications and Information Administration, October 2003.
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<th>Monday</th>
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<td>CSC 4071-01</td>
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</tbody>
</table>

http://sis.rpi.edu

These charts show movie character interactions. The horizontal axis is time. The vertical grouping of the lines indicates which characters are together at a given time.

LORD OF THE RINGS

http://imgs.xkcd.com/comics/movie_narrative_charts_large.png
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https://www.scienceworksmuseum.org/Files/The%20Great%20Tree%20of%20Life%20Poster.pdf
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What is “Chart Junk”

• Extraneous elements in a chart or visualization
• Does not represent data
• Data-to-ink ratio (aim to convey more data with less ink)
• According to Edward Tufte: It’s not just unnecessary, it’s harmful (distracting)
• According to Nigel Holmes: Visualization should engage the reader’s interest


• Article discussed here: http://eagereyes.org/criticism/chart-junk-considered-useful-after-all
Study Design

• Compare embellished charts to plain ones
• Measured:
  – interpretation accuracy
    *was no worse for embellished charts*
  – long-term recall (2-3 weeks later)
    *was better for embellished charts,
      topic & details of the chart were more memorable*
• Prior work:
  – Higher data-to-ink ➔ faster response & greater accuracy
    [Gilan & Richman]
  – Other work shows a somewhat weak correlation between
    data-to-ink and interpretability or aesthetics
• Author’s caution:
  – Not an endorsement of chart junk
  – Embellishments can lead to bias!

• Relatively small sample pool
  – 10 tested with ~5 min recall
  – 10 tested with 2-3 week recall
• Found no difference in time
to read & describe
embellished vs.
non-embellished
• Participants preferred the
embellished charts and
found them more attractive

“Useful Junk? The Effects of Visual Embellishment on Comprehension and Memorability of Charts” Bateman, Mandryk, Gutwin, Genest, McDine, & Brooks, CHI 2010
• Viewing time was unlimited for this study
  – Participants ended up spending the same amount of time on embellished vs. non-embellished
  – Effect of limited effect limiting time not measured

• Chart junk for these examples was tightly coupled with subject & details of chart
  – Quote from Holmes: “I think [Tufte] missed the point of much that I was trying to do: TIME magazine charts were aimed at lay readers, not unintelligent ones, but busy ones. I knew they’d get the point quicker if they were somehow attracted to the graphic.”

• What about charts from paper on last slide? What was their point? How good is your recall? Will you recall them in 2-3 weeks? Why didn’t the authors use embellishment?

![Chart junk for these examples](http://ngm.nationalgeographic.com/big-idea/05/carbon-bath)

http://ngm.nationalgeographic.com/big-idea/05/carbon-bath

http://nigelholmes.com/graphic/carbon-bathtub/
Reading for Thursday @ 11:59pm


Homework Assignment 3: due Monday @ 11:59pm

Big Data & Summarization

- Identify a “really big” dataset
  - That is research-related [Required for grad students]
  - Or is of personal interest [Undergrads only]
- Collect this dataset in a variety of sizes (start small)
- Parse/Process/Organize for a preliminary visualization
- Identify challenges/flaws: “Data is so big it...”
  - “... crashes my favorite visualization toolkit”
  - “... runs really, really slow”
  - “... font/data overlaps/is so small I can’t read it”
- As time permits, propose/implement automatic simplification/summarization of data
- Focus: Data Collection (primary) & Visualization Execution (secondary) & Visualization Design (secondary)

**Team up with someone you haven’t worked with before [Optional]**

**Use a new visualization toolkit: Encouraged! But optional!**
http://nigelholmes.com/graphics/data-dump/