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

Today

• Selection of Results from Assignment 2
• 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”
Today

• Selection of Results from Assignment 2
• Photography tips
  – Canonical Viewpoints
• Principles of Effective Website Design
• Principles of Good User Interface Design
• Principles of Good Visualization 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

“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?”

“What object attributes determine canonical views?” Blanz, Tarr, & Bulthoff, Perception 1999
• Salience and significance of the features
• Stability of viewpoint to small transformations
• Minimize number of occluded features
• Familiarity, Functionality, Aesthetic criteria

“What object attributes determine canonical views?” Blanz, Tarr, & Bulthoff, Perception 1999
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, exaggeration

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: a clearly marked "emergency exit" to leave the unwanted,
- 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/heuristic/heuristic_list.html
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- **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
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Paul Butler
http://www.facebook.com/notes/facebook-engineering/visualizing-friendships/469716398919
Theodor Benfey, “periodic snail”, 1964
Scientific Visualization (SciVis)
- really large quantities of data
- data usually has inherent structure
- often has a spatial and/or temporal component (coordinate system)
- often appropriate to use of 3D visualization techniques
- such as medical, hurricane, CFD data

Information Visualization (InfoVis)
- smaller datasets
- data that does not have an inherent structure (may not have coordinate system)
- financial stock market data, demographic census data, genetic data, etc.

Visual Analytics
- involves a cycle of rapidly creating visualizations to answer questions and generate new questions about a dataset

Infographics are typically in the realm of InfoVis, and often they show the results of the visual analytics process, but SciVis is not really a part of most infographics.

Annual IEEE Visualization and IEEE InfoVis (Information Visualization) conferences are two separate entities. The set of people organizing, attending and involved one conference is almost disjoint from the other set.
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**Active Forces II**
Number of soldiers per 100,000 people

<table>
<thead>
<tr>
<th>Country</th>
<th>Soldiers per 100,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Korea</td>
<td>4,711</td>
</tr>
<tr>
<td>Eritrea</td>
<td>4,012</td>
</tr>
<tr>
<td>Israel</td>
<td>2,482</td>
</tr>
<tr>
<td>Djibouti</td>
<td>2,064</td>
</tr>
<tr>
<td>Iraq</td>
<td>2045</td>
</tr>
<tr>
<td>US</td>
<td>507 (45th)</td>
</tr>
<tr>
<td>UK</td>
<td>263 (93rd)</td>
</tr>
<tr>
<td>China</td>
<td>164 (124th)</td>
</tr>
</tbody>
</table>

*source: Guardian Datablog, milexdata.sipri.org 2008*
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National Telecommunications and Information Administration, October 2003.
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### Week of Jan 23, 2012

<table>
<thead>
<tr>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
<th>Saturday</th>
<th>Sunday</th>
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<tr>
<td>10am</td>
<td>MATH 4030-01</td>
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<td>10:00 am-11:50</td>
<td>10:00 am-11:50</td>
<td>10:00 am-11:50</td>
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<td>SAGE 3705</td>
<td>CARNEG 112</td>
<td>SAGE 3705</td>
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<td></td>
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</table>

| 11am         |               |                |                |               |               |               |

| 12pm         |               |                |                |               |               |               |

| 1pm          |               |                |                |               |               |               |

| 2pm          | PSYC 2100-01  | PSYC 2100-01   |               |               |               |               |
|              | 95:480 Class  | 95:480 Class   |               |               |               |               |
|              | 2:00 pm-3:50  | 2:00 pm-3:50   |               |               |               |               |
|              | SAGE 208      | CARNEG 208     |               |               |               |               |

| 3pm          |               |                |                |               |               |               |

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**http://sis.rpi.edu**

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**http://imgs.xkcd.com/comics/movie_narrative_charts_large.png**
Edward Tufte says it “may well be the best statistical graphic ever drawn”

**Figurative Map of the successive losses in men of the French Army in the Russian campaign 1812-1813.**
Charles Joseph Minard, 1869.

The numbers of men present are represented by the widths of the colored zones at a rate of one millimeter for every ten thousand men; they are further written across the zones. The red designates the men who enter Russia, the black those who leave it. — The information which has served to draw up the map has been extracted from the works of M.M. Thiers, de Ségur, de Fezensac, de Chambray and the unpublished diary of Jacob, the pharmacist of the Army since October 28th.

In order to better judge with the eye the diminution of the army, I have assumed that the troops of Prince Jérôme and of Marshal Davout, who had been detached at Minsk and Mogilev and have rejoined near Orsha and Vitebsk, had always marched with the army.

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First name BEGINS WITH (vertical axis) ENDS WITH (horizontal axis)

Are some letters more feminine or masculine?

Names beginning with 'W' are usually male, while names ending with 'A' are usually female.

Hardly any names end in 'J', 'Q', or 'U'.

http://everyonehasaname.com/visualizations.php

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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
Reading for Today

• “Useful Junk? The Effects of Visual Embellishment on Comprehension and Memorability of Charts” Bateman et al., CHI 2010.

Study Design

• Compare embellished charts to plain ones
• Measured:
  – interpretation accuracy
    \textit{was no worse for embellished charts}
  – long-term recall (2-3 weeks later)
    \textit{was better for embellished charts, topic & details of the chart were more memorable}
• Prior work:
  – Higher data-to-ink $\Rightarrow$ 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!

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

• Viewing time was unlimited for this study
  – Participants ended up spending the ~same amount of time on embellished vs. non-embellished
  – Effect of 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 your recall them in 2-3 weeks? Why didn’t the authors use embellishment?
• When to use embellishments?
  – Don’t overdo it, don’t clutter
  – Only if they are well-executed (requires skill & time)
  – Can this be automated? An ‘embellish’ button in Excel?
  – Embellishment shouldn’t negatively affect the use of other good design principles (e.g., color choice)
• Paper was highly experimental
  – To some, conclusion wasn’t shocking (predicted the outcome before reading it)
  – To others, some of the results were surprising
  – Benefit to having it proven scientifically
• Bias
  – Even the title of an illustration (not just embellishments) can cause bias
  – Choosing to present data (or not) and how is already introducing bias
• More research is necessary…
  – Not enough people. What is appropriate sample size? (ANOVA?)
  – Only studied chart embellishments of single designer
  – What about color blind users?
  – What about less extreme/exaggerated embellishments? (unfair choice to users, should have middle choice)
  – Examples of charts with embellishments that are not relevant to the data?
• Can embellishments really improve comprehension?
  Paper neglects “readability” of chart.
• Simple chart embellishments might trivialize and stereotype the topic

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“Info Chart” vs. Visualization?

http://ngm.nationalgeographic.com/big-idea/05/carbon-bath
http://nigelholmes.com/graphic/carbon-bathtub/
Reading for Friday


Homework Assignment 3: due Thursday @ 11:59pm

Intro to (Web-Based) Interaction

• Explore the examples on the D3: Data-Driven Documents
• http://d3js.org/ website (download the examples, modify them, start to read the documentation)
• Make an interactive (visualization) artifact:
  – Depends on your level of prior experience with Web Development tools (if you’re already a D3 expert, you can choose another new-to-you tool)
  – Purpose: Can be silly & possibly exemplify our “bad visualization” traits (pie charts, chart junk, etc.)
  – Types of “interaction” may include:
    • pop up text messages
    • data hide/reveal/emphasize/restructure
    • font/size/color/transparency change