Information Design

Scott Klemmer

TAs: Marcello Bastea-Forte, Joel Brandt, Neil Patel, Leslie Wu, Mike Cammarano

25 September 2007
Color: Edward Tufte
Color (Java L&F)

- Six color semantic scheme
- Clean, consistent look
- Easy on eyes (mostly gray)
'RESPIRO'

Drama. Starring Valeria Golino and Francesco Casisa. Directed by Emanuele Crialese. (PG-13. 90 minutes. In Italian and Sicilian with English subtitles. At Bay Area theaters.)

"Respiro" is partly of interest for what it doesn't do. It's set on an Italian island south of Sicily, but it doesn't try to imbue the setting with romance. It's about a sexy young wife and mother who doesn't fit in with her neighbors, but the movie is not an indictment of village provinciality. She may be the prettiest and liveliest person on her island, but she is also a bit crazy.
How to get color right

- Design in grayscale first
- Keep luminance values from grayscale when moving to color
52: Bertin’s “retinal variables” form the basis for all forms of visual coding. A visual code can be based on (from left to right) contrasts in size, value, orientation, texture, shape, or position in 2D or 3D space. Hue (chromatic color) provides an additional dimension not pictured here.

Kevin Mullet and Darrell Sano, Designing Visual Interfaces
“Pridefully Obvious Presentation”
Marks of Typographic Style

What to do with CAPITALS in your text? SMALL CAPITALS are the best solution. If they aren’t available, reduce the point size of the full-size CAPITALS slightly and letterpace so they aren’t crashing into each other. Small caps are designed to work with lower-case letters.

What to do with CAPITALS in your text? SMALL CAPITALS are the best solution. If they aren’t available, reduce the point size of the full-size CAPITALS slightly and letterpace so they aren’t crashing into each other. If you don’t have small caps, set full-size caps smaller.

Ligatures

office flirt file afflict effect

Upper and lower case numbers

0123456789
Proper Quotes

- Distinguishing open from close makes reading easier
- Tags in HTML have open and close, e.g., `<html>` as opposed to `|html|`
- Spanish has open and close exclamation, question mark, e.g., ¡hay caramba!, ¿que pasa?
- Quotes “ ” have open and close too

Quotes in HTML

- `${\text{"}}$ ` Left Double Quotation
- `${\text{"}}$ ` Right Double Quotation
- `${\text{‘}}$ ` Left Single Quotation
- `${\text{’}}$ ` Right Single Quotation

4/6" = 4 feet, 6 inches
4/6" = 4 minutes, 6 seconds

“Typography is not an independent Art: it is a means to an end, not an end in itself. It must always be sub-servient to the text which is its raison d’être…”
—HARPBERTAPENCER
I take pride withal in my humiliation, and as I am to this privilege condemned, almost I find joy in an abhorrent salvation; I am, I believe, alone of all our race, the only man in human memory to have been shipwrecked and cast up upon a deserted ship.

Thus, with unabashed conceits, wrote Roberto della Griva presumably in July or August of 1643.

How many days had he been tossed by the waves, feverish surely, bound to a plank, prone during the hours of light to avoid the blinding sun, his neck stiff, strained unnaturally so as not to imbibe the water, his lips burnt by the brine? His letters offer no answer to this question: though they suggest an eternity, the time cannot have been more than two days, for otherwise he would never have survived the lash of Phoebus (of which he so poetically complains), he, a sickly youth, as he describes himself, a creature condemned by a natural defect to live only at night.

He was unable to keep track of time, but I believe the sea grew calm immediately after the tempest swept him from the deck of the Amaryllis, on that makeshift raft a sailor had
Some Starting Points

- Gather materials you find successful
  - Could be from a very different domain
  - “Good artists borrow, great artists steal” - Picasso
- Include visual design professionals in the iterative design cycle
**HISTORY OF O-RING DAMAGE ON SRM FIELD JOINTS**

<table>
<thead>
<tr>
<th>Cross Sectional View</th>
<th>Top View</th>
</tr>
</thead>
<tbody>
<tr>
<td>SRM No.</td>
<td>Erosion Depth (in.)</td>
</tr>
<tr>
<td>-------</td>
<td>-----------------</td>
</tr>
<tr>
<td>61A LH Center Field**</td>
<td>22A</td>
</tr>
<tr>
<td>61A LH CENTER FIELD**</td>
<td>22A</td>
</tr>
<tr>
<td>51C LH Forward Field**</td>
<td>15A</td>
</tr>
<tr>
<td>51C RH Center Field (prim)***</td>
<td>15A</td>
</tr>
<tr>
<td>51C RH Center Field (sec)***</td>
<td>15A</td>
</tr>
<tr>
<td>41D RH Forward Field</td>
<td>13B</td>
</tr>
<tr>
<td>41C LH Aft Field*</td>
<td>11A</td>
</tr>
<tr>
<td>41B LH Forward Field</td>
<td>10A</td>
</tr>
<tr>
<td>STS-2 RH Aft Field</td>
<td>2B</td>
</tr>
</tbody>
</table>

*Hot gas path detected in putty. Indication of heat on O-ring, but no damage.
**Soot behind primary O-ring.
***Soot behind primary O-ring, heat affected secondary O-ring.

Clocking location of leak check port - 0 deg.

**OTHER SRM-15 FIELD JOINTS HAD NO BLOWHOLES IN PUTTY AND NO SOOT NEAR OR BEYOND THE PRIMARY O-RING.**

**SRM-22 FORWARD FIELD JOINT HAD PUTTY PATH TO PRIMARY O-RING, BUT NO O-RING EROSION AND NO SOOT BLOWBY. OTHER SRM-22 FIELD JOINTS HAD NO BLOWHOLES IN PUTTY.**
Blow By History

SRM-15 Worst Blow-by
- 2 Case Joints (90°), (110°) Arc
- Much worse visually than SRM-22

SRM-12 Blow-by
- 2 Case Joints (30-40°)

SRM-13A, 15, 16A, 18, 23A 24A
- Nozzle Blow-by

HISTORY OF O-RING TEMPERATURES (DEGREES F)

<table>
<thead>
<tr>
<th>MOTOR</th>
<th>MBT</th>
<th>AMB</th>
<th>O-RING</th>
<th>WIND</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dm-4</td>
<td>68</td>
<td>36</td>
<td>47</td>
<td>10 mph</td>
</tr>
<tr>
<td>Dm-2</td>
<td>76</td>
<td>45</td>
<td>52</td>
<td>10 mph</td>
</tr>
<tr>
<td>Qm-3</td>
<td>72.5</td>
<td>40</td>
<td>48</td>
<td>10 mph</td>
</tr>
<tr>
<td>Qm-4</td>
<td>76</td>
<td>48</td>
<td>51</td>
<td>10 mph</td>
</tr>
<tr>
<td>SRM-15</td>
<td>52</td>
<td>64</td>
<td>53</td>
<td>10 mph</td>
</tr>
<tr>
<td>SRM-22</td>
<td>77</td>
<td>78</td>
<td>75</td>
<td>10 mph</td>
</tr>
<tr>
<td>SRM-25</td>
<td>55</td>
<td>26</td>
<td>29</td>
<td>25 mph</td>
</tr>
</tbody>
</table>
History of O-Ring Damage in Field Joints (Cont)

O-Ring Temp (°F)

SRM No. 1 2 3 4 5 6 7 8 9 10 11 12
A 66° A 70° A 66° A 80° A 68° A 72° A 70° A 57° A 63° A 78°
B 67° B 70° B 72° B 73° B 70° B 69° B 76° B

O-Ring Temp (°F)

SRM No. 1 2 3 4 5 6 7 8 9 10 11 12
A 70° A 67° A 75° A 70° A 81° A 76° A 79° A 76° A 58°
B 67° B 67° B 75° B 76° B

Code

- S = Heating of Secondary O-Ring
- B = Primary O-Ring Blowby
- E = Primary O-Ring Erosion
- H = Heating of Primary O-Ring
- Blank = No Damage

* No Erosion

Information on this page was prepared to support an oral presentation and cannot be considered complete without the oral discussion.

E. Tufte, pp. 46-47, Visual Explanations
O-Ring damage index, each launch

26°–29° range of forecasted temperatures (as of January 27, 1986) for the launch of space shuttle Challenger on January 28

Redrawn by E. Tufte, p. 49, Visual Explanations
Functions of visualizations

Communicate information to others
   Make a point
   Tell a story
Make decisions
   Support analysis and reasoning
Answer a question
   “One image = One diagnosis”
To explore and discover; encourage creativity
   Look at things in a new way
   “The purpose of computing is insight, not numbers”
   [R. Hamming]
Inspire
The Purpose of Data Visualization is to Help People Think and Communicate
Gulfs of Execution & Evaluation

Evaluation

Execution

Conceptual model (Goals)

Real world (Interactions)

Gulfs

Norman 1986
Gulf of Evaluation

Real world:
Conceptual model: x, y correlated?

<table>
<thead>
<tr>
<th>X</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.67</td>
<td>0.79</td>
</tr>
<tr>
<td>0.32</td>
<td>0.63</td>
</tr>
<tr>
<td>0.39</td>
<td>0.72</td>
</tr>
<tr>
<td>0.27</td>
<td>0.85</td>
</tr>
<tr>
<td>0.71</td>
<td>0.43</td>
</tr>
<tr>
<td>0.63</td>
<td>0.09</td>
</tr>
<tr>
<td>0.03</td>
<td>0.03</td>
</tr>
<tr>
<td>0.20</td>
<td>0.54</td>
</tr>
<tr>
<td>0.51</td>
<td>0.38</td>
</tr>
<tr>
<td>0.11</td>
<td>0.33</td>
</tr>
<tr>
<td>0.46</td>
<td>0.46</td>
</tr>
</tbody>
</table>
Gulf of Evaluation

Real world:

Evaluation

Conceptual model:
x,y correlated?
Gulf of Evaluation

Real world:

Causal model:
x, y correlated?

$\rho = -0.29$
Conceptual model: Draw a rectangle

Gulf of Execution

Execution

Gulf

Real world

Move 90 30
Rotate 35
Pen down
...

24
Gulf of Execution

Conceptual model: Draw a rectangle

Real world

Execution
Visualization: A Double Gulf?

Visualization user

Evaluation

Conceptual model

Visualization designer

Representation

Data

Visualization

Execution

Manipulation
Bad visualization?

Visualization user

Visualization designer

Evaluation

Representation

x, y correlated?

<table>
<thead>
<tr>
<th>X</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.67</td>
<td>0.79</td>
</tr>
<tr>
<td>0.32</td>
<td>0.63</td>
</tr>
<tr>
<td>0.39</td>
<td>0.72</td>
</tr>
<tr>
<td>0.27</td>
<td>0.85</td>
</tr>
<tr>
<td>0.71</td>
<td>0.43</td>
</tr>
<tr>
<td>0.63</td>
<td>0.09</td>
</tr>
<tr>
<td>0.03</td>
<td>0.03</td>
</tr>
<tr>
<td>0.20</td>
<td>0.54</td>
</tr>
<tr>
<td>0.51</td>
<td>0.38</td>
</tr>
<tr>
<td>0.11</td>
<td>0.33</td>
</tr>
<tr>
<td>0.46</td>
<td>0.46</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>X</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.67</td>
<td>0.79</td>
</tr>
<tr>
<td>0.32</td>
<td>0.63</td>
</tr>
<tr>
<td>0.39</td>
<td>0.72</td>
</tr>
<tr>
<td>0.27</td>
<td>0.85</td>
</tr>
<tr>
<td>0.71</td>
<td>0.43</td>
</tr>
<tr>
<td>0.63</td>
<td>0.09</td>
</tr>
<tr>
<td>0.03</td>
<td>0.03</td>
</tr>
<tr>
<td>0.20</td>
<td>0.54</td>
</tr>
<tr>
<td>0.51</td>
<td>0.38</td>
</tr>
<tr>
<td>0.11</td>
<td>0.33</td>
</tr>
<tr>
<td>0.46</td>
<td>0.46</td>
</tr>
</tbody>
</table>
x, y correlated?

**Visualization user**  **Visualization designer**

Better Visualization?

**Evaluation**  **Representation**

**Data**

<table>
<thead>
<tr>
<th>X</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.67</td>
<td>0.79</td>
</tr>
<tr>
<td>0.32</td>
<td>0.63</td>
</tr>
<tr>
<td>0.39</td>
<td>0.72</td>
</tr>
<tr>
<td>0.27</td>
<td>0.85</td>
</tr>
<tr>
<td>0.71</td>
<td>0.43</td>
</tr>
<tr>
<td>0.63</td>
<td>0.09</td>
</tr>
<tr>
<td>0.03</td>
<td>0.03</td>
</tr>
<tr>
<td>0.20</td>
<td>0.54</td>
</tr>
<tr>
<td>0.51</td>
<td>0.38</td>
</tr>
<tr>
<td>0.11</td>
<td>0.33</td>
</tr>
<tr>
<td>0.46</td>
<td>0.46</td>
</tr>
</tbody>
</table>
1. Find cognitive and perceptual principles
2. Optimize the visualization according to these principles
2004 presidential election

http://www-personal.umich.edu/~mejn/election/
Note: NV, with an estimated concert attendance of over 600,000, is excluded because of space limitations.

Elvis Concerts

Attendance per State, 1970 - 1977


© 1995 Andrew Dent and Linda Turnbull
Figure 1.8  Airlines’ view of the United States.
Maps can be scaled to units other than distance. In this case, airline fares are used instead of miles or other linear units.
(Map copyright by the author.)

Compiled from advertised one-way coach airfares in the Atlanta Journal Constitution from Atlanta to various American cities, American Airlines, September 24, 1987.

Map copyright Borden D. Dent, 1989
Carte figurative et explication des voyages de la France, 1844-1869, par M. Minard, bibliothécaire général des Ponts et Chaussées, à Paris.
Minard (1861)
Dynamic Queries

TimeSearcher: Hochheiser and Shneiderman 2001
Announcements

- Now online
  - Sample midterm questions
  - This week’s feedback schedule
  - Python tutorial video & resources
- Submissions: you can now view other group members
- Winter d.school class info session
  Thurs, 11/1, 5–6pm, Sweet Hall 2nd floor