Visual Explainers

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CS 448B: Visualization
Fall 2021

with material from Matthew Conlen and Jessica Hullman

See How the Dixie Fire Created Its Own Weather

This year’s largest blaze generated powerful storm clouds. We show you in 3-D.

By Nadja Premerich, Noah Fisher, Nicholas Berdrowski, Evan Gottharm, Cameron Mangiapig, Katelyn Pontoyn and Scott Brafevard

09.10.2021
Last Time: Gestalt
Principles

- figure/ground
- proximity
- similarity
- symmetry
- connectedness
- continuity
- closure
- common fate
- transparency

Figure/Ground

Principle of surroundedness

Principle of relative size

http://www.aber.ac.uk/media/Modules/MC10220/visper06.html
Figure/Ground

http://www.aber.ac.uk/media/Modules/MC10220/visper06.html

Proximity

[Ware 00]
**Similarity**

Rows dominate due to similarity [from Ware 04]

**Symmetry**

Bilateral symmetry gives strong sense of figure [from Ware 04]
**Connectedness**

Connectedness overrules proximity, size, color shape [from Ware 04]

**Continuity**

We prefer smooth not abrupt changes [from Ware 04]

Connections are clearer with smooth contours [from Ware 04]
Continuity: Vector fields

Prefer field that shows smooth continuous contours [from Ware 04]

Closure

We see a circle behind a rectangle, not a broken circle [from Ware 04]

Illusory contours [from Durand 02]
Common fate

Dots moving together are grouped

http://coe.sdsu.edu/eet/articles/visualperc1/start.htm

Transparency

Requires continuity and proper color correspondence [from Ware 04]
Layering and Small Multiples

Layering: Gridlines

Signal and background compete above, as an electrocardiogram trace-line becomes caught up in a thick grid. Below, the screened-down grid stays behind traces from each of 12 monitoring leads.*

Electrocardiogram tracelines [from Tufte 90]
Layering: Gridlines

Stravinsky score [from Tufte 90]

Layering: Color and line width

IBM Series III Copier [from Tufte 90]
Small multiples

[Figure 2.11, p. 38, MacEachren 95]

Operating trains. Redrawn by Tufte to emphasize colored lights. [fromTuft 90]
Change blindness

[Example from Palmer 99, originally due to Rock]

Change detection
Change detection

Rensink’s demonstration

http://www.csc.ncsu.edu/faculty/healey/PP/index.html
Summary

Choosing effective visual encodings requires knowledge of visual perception

Visual features/attributes
- Individual attributes often preattentive
- Multiple attributes may be separable, often integral

Gestalt principles provide higher level design guidelines

We don’t always see everything that is there

Announcements
Assignment 3: Dynamic Queries

Create a small interactive dynamic query application similar to HomeFiner, but for restaurants data.

1. Implement interface
2. Submit the application and a short write-up on canvas

Can work alone or in pairs
Due before class on Oct 25, 2021
Discussing notebooks

Stay tuned for extra office hours

We are happy to discuss your code
  • But, do **not** publish your notebook
  • Instead enable link sharing in Observable and share the link with us privately through Slack

Visual Explainers
Topics

1. Storytelling
2. Design space of narrative visualization
3. Interactive documents
4. Chart sequences

Storytelling
As ancient as mankind

Going forward
I carried wax along the line, and laid it thick on their ears. They tied me up, then, plumb amidships, back to the mast, lashed to the mast, and took themselves again to rowing. Soon, as we came smartly within hailing distance, the two Sirens, noting our fast ship, off their point, made ready, and they sang…

All media tell stories

PEOPLE TELL STORIES

WORDS TELL STORIES

IMAGES TELL STORIES

COMICS TELL STORIES

MOVIES TELL STORIES

VISUALIZATIONS TELL STORIES
Narrative Storytelling

**narrative (n):** An account of a series of events, facts, etc., given in order and with the establishing of connections between them

"... require[s] skills like those familiar to movie directors, beyond a technical expert’s knowledge of computer engineering and science."

- Gershon & Page ‘01

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**Generals Wary of Move to Cut Their Ranks**

By GINGER THOMPSON and THOM SHANKER

WASHINGTON — Maj. Gen. Paul D. Eaton, a retired Army officer, is familiar with the perks and pitfalls of power, having commanded tens of thousands of troops at Fort Benning, Ga., managed budgets exceeding $5 billion in Iraq, and overseen layers upon layers of staff members who helped manage both his professional duties and his personal life.

He has experienced the full range of lifestyles that come with military leadership, living at one point in an elegant antebellum mansion, and at another, with eight other officers crowded in a marble bathhouse behind one of Saddam Hussein’s old palaces.

When he traveled, he was occasionally able to justify the use of military aircraft, but most times, he said, he flew coach. And today he lives on a pension worth 75 percent of his military salary, with health benefits that cover everything except dental and eye care for himself and his wife.

“We are well compensated, and we live very comfortable lives,” General Eaton said, referring to the military’s most senior leaders. “But when you look at all the things going on around a general, the nation is getting a very, very high return on its money.”

Not everyone at the Pentagon agrees. Two weeks ago, Defense Secretary Robert M. Gates announced a sweeping effort to improve efficiency that, among other things, takes aim at the military’s senior executive corps of generals and admirals, ordering his staff to cut at least 50 positions, and making clear that he would be happier if they cut more.
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Design Space of Narrative Visualization
Value of storytelling [Gershon and Page 2001]

A way of structuring information
• Easier to understand than lists
• Uncertainty, conflict, resolution
• Text and visuals can be complementary

CASE STUDIES
70% Journalism
20% Business
10% Research

[Segel & Heer 2010]
Janet L. Yellen, on the Economy’s Twists and Turns

Inflation and unemployment:
The Federal Reserve is said to have a “dual mandate”: keeping inflation in check and the unemployment rate low. These measures, which tend to change cyclically and in concert with each other, are charted for every year since the Great Depression.

In speeches and in meetings, Ms. Yellen, the nominee for the next Fed leader, has commented on the Fed’s actions during significant periods, providing a window into her views and priorities.

Budget Forecasts, Compared With Reality

Just two years ago, surpluses were predicted by 2012. How accurate have past White House budget forecasts been?

Falling short:
President Obama’s budget proposal projects a deficit of $3.8 trillion for the current fiscal year and $3.9 trillion in 2014.

Actual surplus, in billions of dollars:
- 2011: $1.2 trillion
- 2012: $1.4 trillion
- 2013: $1.5 trillion
- 2014: $1.6 trillion
- 2015: $1.6 trillion
- 2016: $1.5 trillion
- 2017: $1.2 trillion
- 2018: $1.1 trillion
- 2019: $1.0 trillion
- 2020: $0.9 trillion
Genres for Narrative Visualization (Segel & Heer 2010)

Visual Design Genres
Genres + Interactivity + Messaging =

**DESIGN SPACE**

<table>
<thead>
<tr>
<th>STORYTELLING</th>
<th>CLARITY</th>
<th>SPEED</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Author Driven</strong></td>
<td>strong ordering</td>
<td>heavy messaging</td>
</tr>
<tr>
<td><strong>Reader Driven</strong></td>
<td>weak ordering</td>
<td>light messaging</td>
</tr>
</tbody>
</table>

Concrete to abstract

**Here's how to start**
How 2 M.T.A. Decisions Pushed the Subway Into Crisis

By ADAM PLAEBER OCT 7, 2014

By now, New York City commuters are familiar with the wait. We descend from the bitter cold or the stifling heat to find subway platforms teeming with other bodies trying to make it to work on time. Delays ripple through the system, so there’s barely room to squeeze into the next train that
Watch how the measles outbreak spreads when kids get vaccinated – and when they don’t

Who Should Get Parole?

Even the best risk assessments yield probabilities, not certainties. That means they label as “high risk” some people who won’t commit another crime and label as “low risk” some people who will. This simulation lets you sort offenders into risk categories based on the results of an assessment. Think we should only lock up anyone who wouldn’t reoffend? Set the “low risk” threshold high and the “high risk” threshold even higher. Have little tolerance for recidivists? Try the opposite. In the real world, policymakers have to strike a balance. Read more →
Why Momentum Really Works

We often think of Momentum as a means of dampening oscillations and speeding up the iterations, leading to faster convergence. But it

You Draw It: What Got Better or Worse During Obama’s Presidency

By LARRY BUSHMAN, HADYOUN PARK and ADAM PEARCE  JAN. 15, 2017

Draw your guesses on the charts below to see if you’re as smart as you think you are.

Under President Obama, the unemployment rate ...

Draw the line for the Obama years.
Chart Sequences