Advanced Data Visualization

CS 6965
Fall 2019
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University of Utah

Lecture 09
Personal Visualization
Physical Visualization
International Pie Day!

Behind the Doodle: 30th anniversary of Pi Day!

https://youtu.be/flV213YW0-8
Project 4

- Project 4 is going to be different from all previous projects
- It combines Personal Visualization with Physical Visualization
- Before describing the project, we need to go over an overview of personal visualization and physical visualization
What is Physical Visualization?
Physical Visualization is Data Physicalization

http://dataphys.org/  https://youtu.be/RG0sSDBjdmQ
Physical Visualization

- Data physicalization aims to help people explore, understand, and communicate data using computer-supported physical data representations.
- We call these representations physicalizations, analogously to visualizations – their purely visual counterpart.

http://dataphys.org/
“…asked people to create, update and explain their own information visualizations using simple materials such as tangible building blocks. We learned that all participants, most of whom had no experience in visualization, were readily able to create and talk about their own visualizations…”

http://edutechwiki.unige.ch/en/Physical_visualization
Huron, Samuel; Yvonne Jansen, Sheelagh Carpendale (2014)
Token-based constructive visualization

http://edutechwiki.unige.ch/en/Physical_visualization
Token Based Constructive Vis

Need:
- A set of basic units or tokens, which can be mapped to data
- A token grammar, which declares how the attributes of the tokens can signify data
- An environment in which the tokens can be placed
- An assembly model, which describes the constraints and freedom with which the tokens can be assembled

The process of developing the constructed visualization starts from initializing the environment in which the construction will take place. Then the data units are mapped to the tokens and the tokens visual attributes are assigned meaning according to the data. These tokens are then assembled in the environment. Changes in data can subsequently be expressed by manipulating the data token.

http://edutechwiki.unige.ch/en/Physical_visualization
"WellStar is using the boards to track on-time starts at the doctor’s office, and even manage its physician-payee relationships--which has led to a series of fixes projected to save the company $1 million." (ditto)
Examples of Physical Visualization

http://dataphys.org/list/
The earliest data visualization were likely physical.
Arranging stones: the tokens could be ordered in special columns according to types of merchandise, entries and expenditures.
"Patterning, the presentation of data in a particular configuration, was developed to highlight special items (Luria 1976. 20). "

http://dataphys.org/list/mesopotamian-clay-tokens/
2007 Wable: Web Behavior

https://youtu.be/e6G5YIICVRg
http://dataphys.org/list/wable-visualize-web-behavior-as-a-physical-bar-chart/
2008: Activity Logging with LEGO

- A visualization and logging method for personal work activity.
- Every tower is a day of the week.
- A layer is one working hour, horizontally subdivided in four quarters of an hour.
- Different colors are different projects.
- The constant availability of this interface makes it easier to log personal activity data on-the-fly, before entering it in a PIM software (an automatic method involving computer vision is being considered).

Physical visualization for personalized visualization

http://dataphys.org/list/activity-logging-with-lego-bricks/
2015 Canadian Federal Election Explained

https://www.youtube.com/watch?time_continue=7&v=laUPeXZIPEg
2015 – Dan Gilbert’s TV Ads

https://www.youtube.com/watch?v=rV7c9LHdE8Y
http://dataphys.org/list/dan-gilberts-tv-ads/
2014: Making Mocktails + Heart Beats

https://www.youtube.com/watch?v=hIdMvfV16tA
https://www.youtube.com/watch?v=RRKR0dekPxo
https://www.youtube.com/watch?v=hIdMvfV16tA
2015 – Multivariate Beer

- 4 different types of beer based on county demographics.
- Population density: total amount of hops
- Race percentages: type of hops used

http://dataphys.org/list/multivariate-beer/
Tangible data visualization of green areas and water in Berlin.

A living map showing parks and forests in Berlin. The green areas on the wooden map are laser cut, with moss growing through the holes.

http://dataphys.org/list/green-berlin/
2015 – The Prudential Ribbons
Experiment 60

https://www.youtube.com/watch?v=OI-nEn0c0w4
2017 – The Prudential Walkways

Physical visualization for personalized visualization

https://www.youtube.com/watch?v=OI-nEn0c0w4
2017: Wearable Self: your data jewelry

March

April

May

June

Week 3

July

August

Physical visualization for personalized visualization meet art

https://vimeo.com/208423272
https://vimeo.com/217167660
https://jennykang.me/wearable-self-2/
http://dataphys.org/list/wearable-self/
2017 – Wearable Self

User experience

Data → Design + Technology = Fashion × UX

Physical visualization and art for personalized visualization
## 2017 – Wearable Self

<table>
<thead>
<tr>
<th>Design Research</th>
<th>Ideation, planning</th>
<th>Data collecting, visualization</th>
<th>Prototyping &amp; user testing</th>
<th>PR &amp; exhibition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research the problem</td>
<td>Develop the solutions</td>
<td>Data collecting, mining</td>
<td>Create physical prototypes</td>
<td>Branding, Identity design</td>
</tr>
<tr>
<td>Observation</td>
<td>Imagine the future</td>
<td>Programming: d3.js</td>
<td>Choosing materials, colors</td>
<td>Website design</td>
</tr>
<tr>
<td>1:1 Interviews</td>
<td>Domains and precedents</td>
<td>2D Fabrication</td>
<td>3D printing, laser cut</td>
<td>User interaction design</td>
</tr>
<tr>
<td>Contextualization</td>
<td>User scenario</td>
<td>Digital to physical</td>
<td>User testing and re-design</td>
<td>Exhibition design</td>
</tr>
<tr>
<td>Market research</td>
<td>Technical research</td>
<td>Fashion trend research</td>
<td>Usability test</td>
<td>Presentation design</td>
</tr>
<tr>
<td>Define a design goal</td>
<td>Color testing</td>
<td>Color testing</td>
<td>Survey, user feedback</td>
<td>Video, photo shoot</td>
</tr>
</tbody>
</table>

Physical visualization and art for personalized visualization

[https://jennykang.me/wearable-self-2/](https://jennykang.me/wearable-self-2/)
2018: Global Life Expectancy

https://youtu.be/zXJPlwaYKzo
On the “research” side
An Empirical Investigation of Physical Visualizations

Evaluating the Efficiency of Physical Visualizations

http://www.aviz.fr/phys
https://youtu.be/N-nVQ3bL6H4
What is personalized visualization?
Personalized visualization

- Making data meaningful to a person in the context of daily life
- Visualizing personal (one’s own) data
- Personalization in visualization
- Visualization that targets specific person: e.g. personalized visualization of web information
- Personalized e-learning
- Adaptive visualization that does not neglect individual differences, instead of one-size-fits-all approaches
- ...
Project 2: An Overview
What type of personal data would you like to visualize? (The one from yourself, or someone you know closely)
How do you obtain the data?
Why studying such a data set is important and meaningful for you?
What sort of insights do you expect to get out of this visualization project? (And what sort of insights you end up getting?)
Other requirements

- Creative and original
- Interpretable and Informative
Possible medium or building blocks

- Legos, Play-Doh, threads…
- Being creative: cereals, mud, grass…
- Be cost-effective
Thanks!

Any questions?

You can find me at: beiwang@sci.utah.edu
CREDITS

Special thanks to all people who made and share these awesome resources for free:

- Presentation template designed by Slidesmash
- Photographs by unsplash.com and pexels.com
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Presentation Design

This presentation uses the following typographies and colors:

Free Fonts used:
https://www.fontsquirrel.com/fonts/open-sans

Colors used

[Color Swatches]