

Welcome!

Considering Physical Variables for Data Physicalization

Trevor Hogan, Uta Hinrichs, Samuel Huron, Bettina Nissen

6th workshop (series): VIS'14, CHI'15, TEI'16, DRS'16, DIS'17 & DRS'18 (VIS'18)

Today's schedule

11:00 – 11:40	Introduction
	Who are we? Who are you? What is Physicalization?
11:40 – 12:45	Physicalization Activity: Group forming, Ideation & Design
<i>12:45 – 1:30pm</i>	<i>Lunch break</i>
1:30 – 2.45pm	Physicalization Activity: Design & Making
2:45 – 4.00pm	Presentation of the physicalization Discussion & Conclusion
4pm	End of Workshop
<u>RECORDING:</u>	We will record audio-visual footage during the workshop, for potential publication this will be anonymised. If you prefer not to be recorded, let us know.

Trevor Hogan

Lecturer in Interaction Design
Crawford College of Art and Design, CIT, Ireland

Human-Data Interaction Group

“Extending the use representational modalities and extending evaluation criteria, methodologies and audience”

Interests

- # Physicalization & Multisensory Data Representations
- # Tangible Interaction
- # Data Experience
- # Design & Evaluation Methods

www.tactiledata.net hello@tactiledata.net @tactiledata



Samuel Huron

Associate professor
Design, Infovis, HCI

University of Paris Saclay
Telecom Paris-Tech
I3 - UMR 9217 CNRS

Twitter : [@cybunk](#)

Interests:

- # Construction of vis
- # Information visualization
- # Design methods in Research
- # Design paradigms



Understanding how physically **building** information representation **impact** the construction of people **understanding**.

Making visualization authoring **accessible** for “non visualization experts”

Bettina Nissen

Research Associate | Design Informatics
University of Edinburgh, UK

bettina.nissen@ed.ac.uk

www.data-things.com

[@bettinanissen](https://twitter.com/bettinanissen)

*design
informal*

Interests

Data Engagement
Digital Fabrication
Public Data Making
Data Craft Practices
Materiality



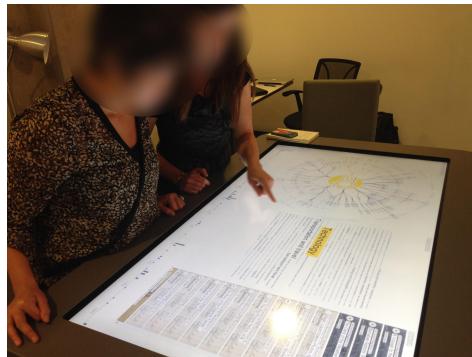
Uta Hinrichs

Assistant Professor in Human-computer Interaction & InfoVis
www.utahinrichs.de | uh3@st-andrews.ac.uk | [@uta_ente](https://twitter.com/uta_ente)

SACHI Research Group; University of St Andrews, Scotland
<http://sachi.cs.st-andrews.ac.uk>

Interests

- # information visualization
 - # physical data representations
 - # interface design
-
- # studying experiences with visualization
 - # visualization as a method to engage & facilitate a dialogue



University of
St Andrews

Who are you?

Name

Affiliation

Domain

Why are you interested in
physicalization?

In 20 seconds :-)

What is Physicalization?

→ Mapping data to visual / physical properties / material / forms

DATA

Example: Going out with friends

Date	How many people	Costs (\$)	Where	How enjoyable
11/03/2016	5	45	Bar	**

dates & time

numbers

categories

ordered items

COLOUR



Image courtesy Alice Thudt
<http://alicethudt.de/>

MAPPING DATA TO COLOUR

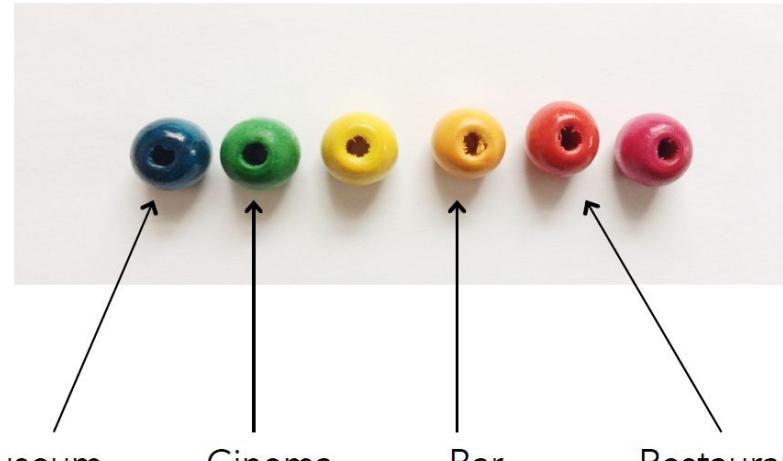


Image courtesy Alice Thudt
<http://alicethudt.de/>

SIZE

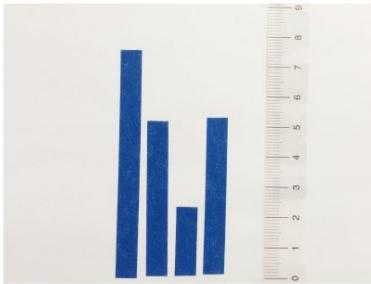
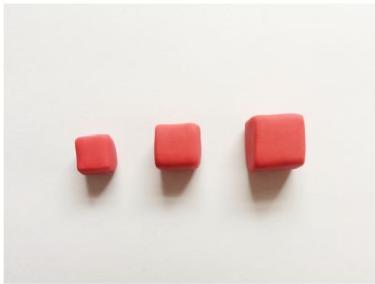


Image courtesy Alice Thudt
<http://alicethudt.de/>

MAPPING DATA TO SIZE

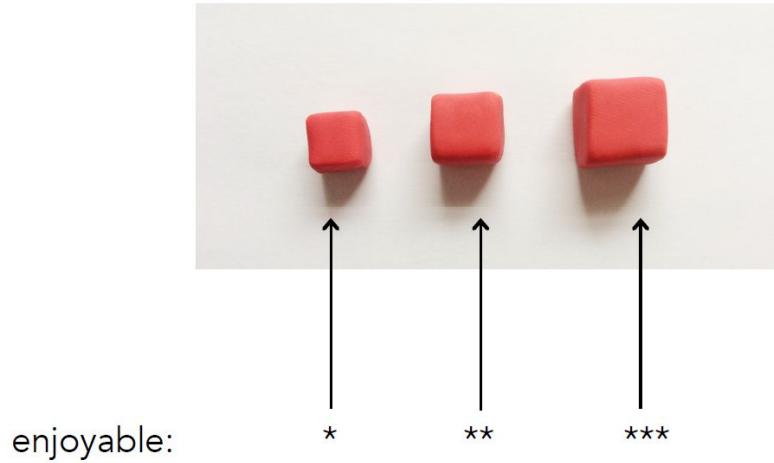


Image courtesy Alice Thudt
<http://alicethudt.de/>

POSITION

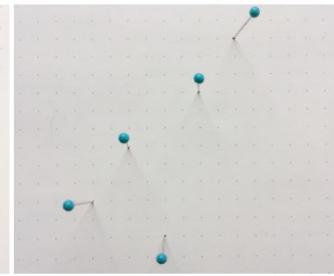
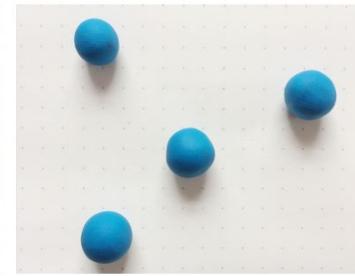
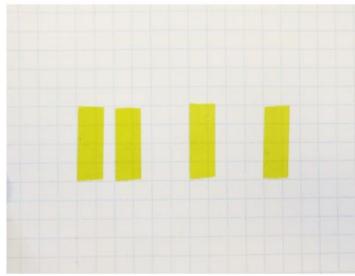
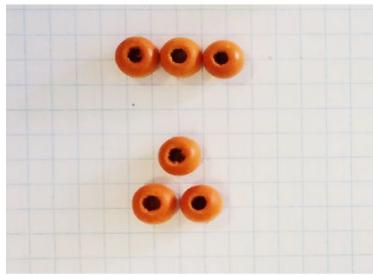


Image courtesy Alice Thudt
<http://alicethudt.de/>

MAPPING DATA TO POSITION

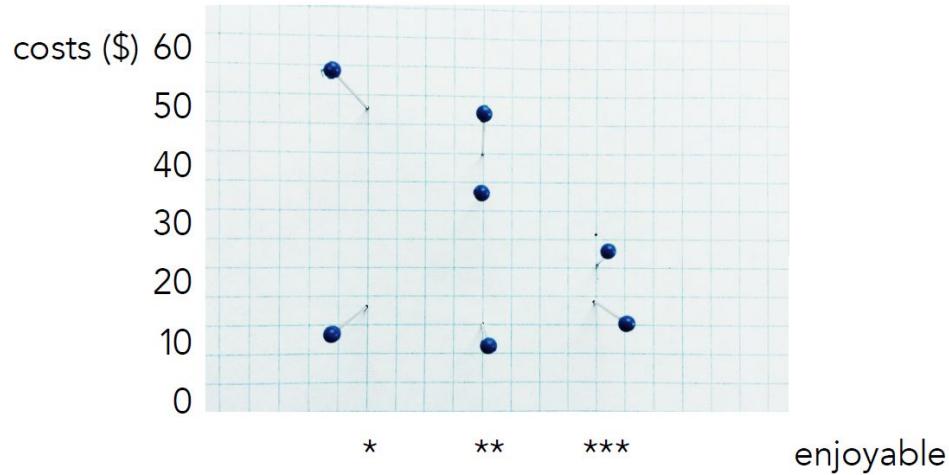


Image courtesy Alice Thudt
<http://alicethudt.de/>

COUNT

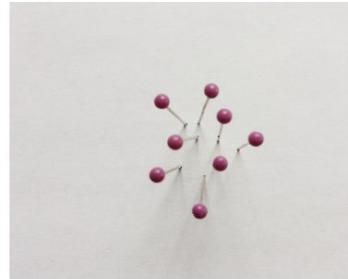
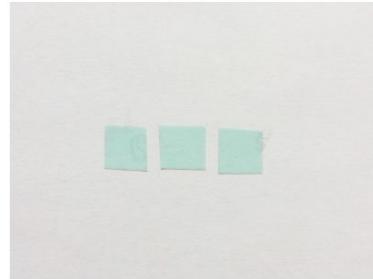


Image courtesy Alice Thudt
<http://alicethudt.de/>

MAPPING DATA TO COUNT



1 bead —————→ 1 person

Image courtesy Alice Thudt
<http://alicethudt.de/>

SHAPE

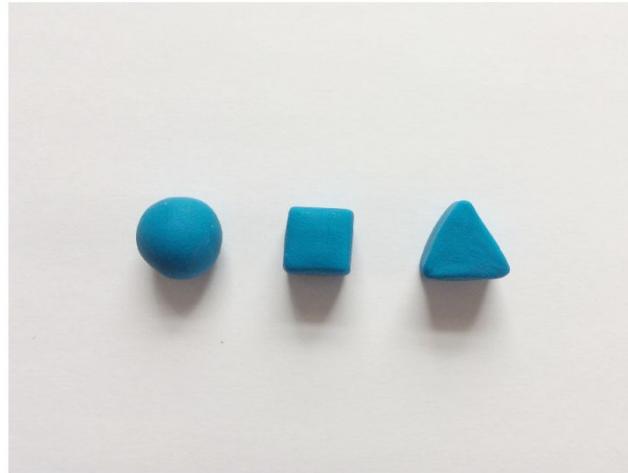


Image courtesy Alice Thudt
<http://alicethudt.de/>

MATERIAL

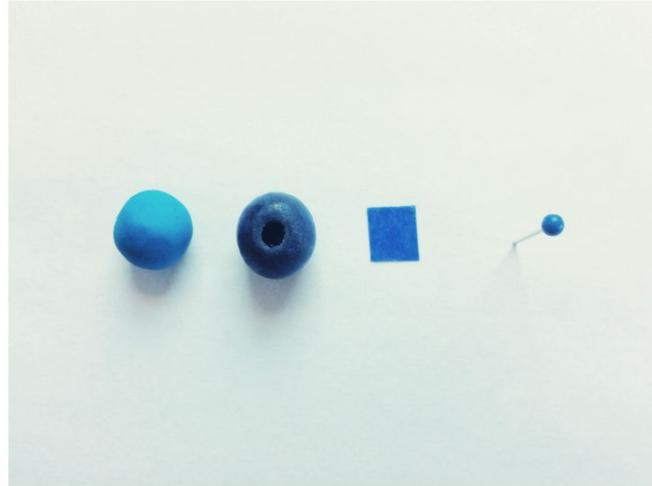
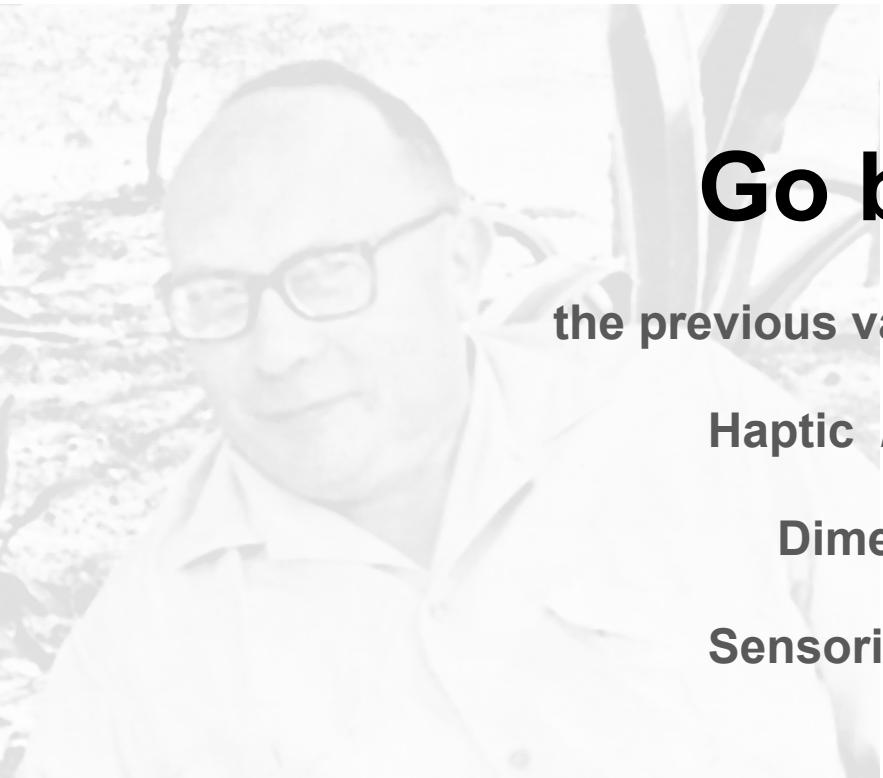


Image courtesy Alice Thudt
<http://alicethudt.de/>



	Points	Lines	Areas	Best to show
Shape		possible, but too weird to show	cartogram	qualitative differences
Size			cartogram	quantitative differences
Color Hue				qualitative differences
Color Value				quantitative differences
Color Intensity				qualitative differences
Texture				qualitative & quantitative differences



Go beyond

the previous variables and explore

Haptic / Feel / Touch

Dimensionality

Sensorial experience

Texture
...

Shape	Points	Lines	Areas	Best to show
<i>Color</i>				<i>qualitative differences</i>
<i>Hue</i>				<i>quantitative differences</i>
<i>Color Value</i>				<i>qualitative differences</i>
<i>Color Intensity</i>				<i>quantitative differences</i>
				<i>qualitative & quantitative differences</i>

Hands-on activity

Make your own physical representation of data!

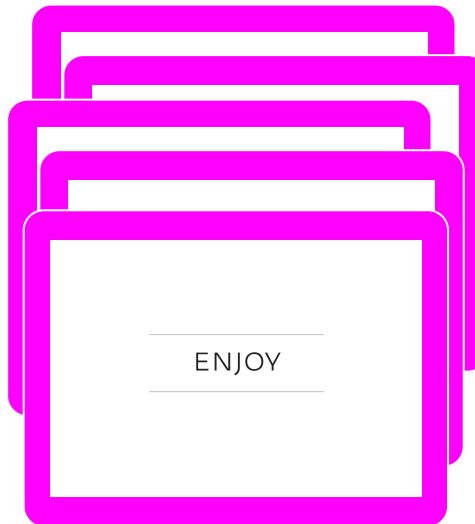
Hands-on activity

constraint-driven design of data physicalization

Scenarios



Activities



Data

Class	MEAN APPROPRIATENESS RATINGS				
	Kiss	Eat	Fight	Cry	Laugh
Date	2.10	4.23	1.21	2.21	6.23
Bus	8.73	7.79	3.58	3.04	8.00
Family dinner	4.37	5.48	1.52	3.08	7.10
Park	4.92	8.44	1.67	3.21	7.13
Job interview	7.71	8.13	3.06	5.21	8.10
Bar	1.08	1.73	1.04	1.37	5.88
Elevator	5.17	7.67	1.90	3.44	8.23
Restroom	4.79	5.10	1.58	3.48	6.77
	2.81	2.35	1.77	4.79	5.90

Questions to guide activity

- How would you describe the **physical properties** of your physicalization? Which of these are directly related to data?
- How would you characterize **your design process** when mapping your data to physical properties/form/material?
- What is the role of **performance / interaction / narrative** in your physicalization?
- What **types of materials** did you choose for your physicalization and why? How did your choice of materials influence the **modality of your physicalization**?
- What is the intended **type of experience** you wish to facilitate with your physicalization?
- Can you explain the **semiotic connection** (symbolic, metaphor, analogy, allegory, designation...) between the data and your physicalization?

Let's physicalise!

How to express your data in different media / materials?

Examine your data!

Explore the materials!

Consider the audience of your context!

Sketch out some ideas!

Record design decisions on post-it notes

Questions to guide activity

- How would you describe the **physical properties** of your physicalization? Which of these are directly related to data?
- How would you characterize **your design process** when mapping your data to physical properties/form/material?
- What is the role of **performance / interaction / narrative** in your physicalization?
- What **types of materials** did you choose for your physicalization and why? How did your choice of materials influence the **modality of your physicalization**?
- What is the intended **type of experience** you wish to facilitate with your physicalization?
- Can you explain the **semiotic connection** (symbolic, metaphor, analogy, allegory, designation...) between the data and your physicalization?

Presentations

Reflections

What types of materials did you choose for your physicalization and why?

How did your choice of materials influence the modality of your physicalization?

Can your physicalization be appreciated without generating any data insight?

How important is aesthetics in your physicalization?

Can your physicalizations be read without touching it?

References

Let's Get Physical: Promoting Data Physicalization in Workshop Formats. S Huron, P Gourlet, U Hinrichs, T Hogan, Y Jansen. Pictorial at ACM DIS 2017, June, Edinburgh.

Constructing visual representations: Investigating the use of tangible tokens. S Huron, Y Jansen, S Carpendale. IEEE transactions on visualization and computer graphics 20 (12), 2102-2111

Constructive visualization. S Huron, S Carpendale, A Thudt, A Tang, M Mauerer. Proceedings of the 2014 conference on Designing interactive systems, 433-442

Data Sensification, beyond representation modality, toward encoding data in experience. T Hogan, Proceedings of the 2018 DRS.

Pedagogy & Physicalization: Designing Learning Activities around Physical Data Representations. T Hogan, U Hinrichs, Y Jansen, S Huron, P Goulet, E Hornecker, B Nissen. Proceedings of 2018 DIS.

Data-Things: Digital Fabrication Situated within Participatory Data Translation Activities, B Nissen, J Bowers. Proceedings of the 2014 conference on CHI, 2467-2476.