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Considering Physical Variables for Data Physicalization

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1. Workshop Organizer/s

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Abstract

The use of physical representations to facilitate communication, analysis, teaching, and research is as old as humanity (the Sumerians used clay tokens to represent data more than 7000 years ago). However, it is only in the past decade that Data Physicalization[1] is being discussed as a dedicated form of research and design practice primarily concerned with the design of physical artefacts "whose geometry or material properties encode data"[2] to facilitate sense-making and communication. While for visualization, as the dominant form of data representation, and, to a lesser extent, sonification, principles and taxonomies exist to guide designers, the equivalent design vocabulary has yet to be established for Data Physicalization. The aim of this workshop is to draw together practitioners and researchers from various design disciplines in order to explore a potential physical design language for Data Physicalization. Through a series of hands-on data physicalization activities, workshop participants will get a first-hand experience thinking through data in a physical way while actively exploring and discussing their process of mapping data to physical artefacts along a given framework spanned by physical properties and interaction mechanisms.

[1] See also http://dataphys.org/
[2] Y. Jansen, et al. Opportunities and Challenges for Data Physicalization. CHI 2015.

2. Context of Workshop

This workshop is the 6th in a loosely connected series of Data Physicalization workshops that we have conducted since 2014 at different venues to discuss Physicalization practices with practitioners and researchers working in visualization[3], Human Computer Interaction[4],[5] and Design[6],[7] (including DRS). While the general aim of previous workshops was to build a community around Data Physicalization, this workshop primarily addresses the issue of facilitating the design of Data Physicalizations, as critical for the evolution of this field and is therefore targeted specifically to the DRS community. Through presentations and hands-on activities, we will engage workshop participants in a discussion about the design language of Data Physicalization and how physical properties enable data encoding and engagement.

3. Planned Activities and Expected Outcomes

Part 1: Introductory Talks [1.5h]. We will provide a brief overview of the state-of-the-art and key concepts of physicalization, including current frameworks and theory for design of Data Physicalization. Following this, each participant will introduce themselves and their interest in the topic in a Pecha Kucha-like format[8]. We will then introduce the physicalization design activities planned in the following session, allowing participants to think about possible designs over the coffee break.

Part 2: Designing Physicalizations [2h]. Participants will work in small groups to design and build a physicalization based on a given set of data, a usage scenario, and materials. As part of this, participants will explore and experience the interplay between the data semantics, metaphor, analogue materials (e.g., paper/cardboard, plasticine, LEGO), and design goals, i.e., and the intended usage scenario for the physicalization. The outcome of this part of the workshop will be a number of different physicalization designs created by participants that they will present to each other.

Part 3: Reflection & Discussion [1.5h]. In a participant-driven discussion, we will reflect participants' physicalization process. The discussion will be structured into questions of data encoding and how this is enabled by particular materials, how the physical properties of the physicalizations promote interaction, data exploration and reflection, and how a formalized design vocabulary, in order to facilitate design practice and teaching, could look like.

4. Intended Audience

We invite designers, researchers and practitioners (ideally 20 participants) from all backgrounds. No previous knowledge is required.

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[3] Death of the Desktop: Envisioning Visualization without Desktop Computing. VIS 2014, Paris. Y. Jansen, P. Isenberg, J. Dykes, S. Carpendale, and D. Keefe.
[4] Exploring the Challenges of Making Data Physical. CHI 2015, Seoul. J. Alexander, Y. Jansen, K. Hornbæk, J. Kildal, and A. Karnik.
[5] Tangible Data, explorations in Data Physicalization.TEI 2016; Eindhoven. T. Hogan, E. Hornecker, S. Stusak, Y. Jansen, J. Alexander, A. Vande Moere, U. Hinrichs and K. Nolan.
[6] Let's Get Physical, Exploring the Design Process of Data Physicalization. DRS 2016, Brighton. Y. Jansen, P. Gourlet, S. Huron, U. Hinrichs, and T. Hogan.
[7] Pedagogy & Physicalization. DIS 2017, Edinburgh. T. Hogan, U. Hinrichs, Y. Jansen, S. Huron, P. Gourlet, E. Hornecker and B. Nissen.
[8] https://www.pechakucha.org/faq

5. Length of Workshop

We envision a full-day workshop (see above for timing). From our experience, a full-day is just enough to offer participants a hands-on experience of the concepts involved in data physicalization, while allowing time to reflect on their data-driven artefacts and to discuss questions and challenges about data physicalization.

6. Space and Equipment Required

A studio-like environment with large tables, a projector, and a whiteboard would be ideal. We will provide all other equipment and materials.

7. Potential Outputs

Our workshop will produce a number of data physicalizations. This will be used as the basis to discuss the design vocabulary to facilitate encoding data in physicalizations. This discussion, as well as the resulting data physicalizations will be documented and displayed on a website, along with the challenges and questions revealed during the workshop.

About the Organizers:

Trevor Hogan is a lecturer at the Cork Institute of Technology, Ireland, in the Human-data Interaction group. He received his PhD from the Bauhaus-Universität Weimar, Germany.

Uta Hinrichs is a Lecturer at the University of St Andrews, Scotland, at the School of Computer Science. She received her PhD in Computational Media Design from the University of Calgary.

Bettina Nissen is a Research Associate in Design Informatics at the University of Edinburgh with a PhD from Newcastle University.

Samuel Huron is an assistant professor at Mines-Télécom ParisTech. His research lies within the domains of design, information visualization, and tangible interfaces.