Designing with Data

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Designing with Data: A Designerly Approach to Data and Data Analytics

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Theme, Goals, background and motivation

This workshop focuses on Data as Design Material for connected products and services. It brings together HCI researchers, ethnographers, industrial designers, data scientists, tool developers and others interested in Designing with Data.

Internet of Things technologies are making it possible to collect large amounts of data about minute aspects of the world, which creates new **opportunities and challenges for designers to integrate data into the design process** of human-centric systems. The objective of this workshop to understand the current state of the art in designing with data and to explore research needs and opportunities. We invite participants to discuss case studies, theoretical frameworks and practical tools for integrating data into the design process, spanning the whole spectrum from ethnography to data science and machine learning.

As data collection methods becomes more prolific, for example through smart phones and sensors, researchers and designers have access to ever more detailed data about people, the environments they inhabit (e.g. homes, offices and entire cities) and the products and services they use (e.g. connected

toothbrush, car). Designers and researchers need to understand how to make sense of the increasing amount of data and how to use data in the design process to shape conception, definition and evaluation of connected products and services. Data can be used to inform a design process by revealing people's habits, or by validating the design choices that have been made ("*designing from data*"). Data can also be used as a material for design, becoming integrated into a final product or service, for example to adapt a products behavior ("*designing with data*").

Data driven design has a long tradition in the web community where data about online behavior is used to inform the design of web sites and web applications. The Internet of Things extends the ability for collecting data about the physical world, creating new opportunities for designers to integrate data into the design of physical objects and interactive environments. However, acquiring and making sense of data on a very large scale – including real-time sensor streams - is difficult and requires combining methods from human-centered design with methods from sensor networking, data science, visualization, and simulation.

Designing with data is becoming increasingly important as the amount of connected objects and environment increases and applies to the design of objects of daily use, as much as to the design of specialized equipment such medical devices – or indeed to smart cities where open data is used to offer creative solutions to urban problems. However, designing with data brings with it special challenges when it comes to handling personal data or data that can reveal sensitive insights about individuals.

The objective of this workshop to understand the current state of the art in designing with data and explore research needs and opportunities. The focus on the workshop is on designing of connected products and services, physical objects, interactive environments, smart cities etc. – not on design of web sites and web applications.

Topics of interest for the workshop include, but are not limited to:

- Design methods and methodologies, for example: prototyping with data, using data in participatory design, using data to validate design, design patterns for complex data, 'making' with data
- Design tools, for example tools for collecting design-relevant data, tools for behavior analytics and data visualisation as part of the design process
- Data sets: characteristics of real-world data sets and their use in the design process
- Case studies and application scenarios, for example, design for the Internet of Things, use of data in designing health applications, use of data for the design of smart city applications etc.
- Ethical issues, for example, issues of data ownership, privacy and security related to design.

Intended Audience and recruitment strategy

The intended audience are designers and researchers who are interested in how data can be used as part of design, or who are actively researching how to improve the use of data in design. We will recruit through the organisers own extensive networks in the areas of industrial design, design informatics, Internet of Things, smart cities and data science. News of the workshop will also be disseminated through standard channels such as Twitter, Wikicfp and other subscribed mailing lists such as pdworld.

Schedule and description of activities planned

The one-day workshop will focus on the sharing of participants' experiences in designing with data. We encourage participants to bring data sets (in digital or non-digital form) or related artifacts which we will use in group discussions and practical activities to identify challenges, distill insights, formulate best practices, and lay out future research directions.

Paper, markers and other materials will be made available. Participants may also use their own laptops. Group sessions will be organized around different stages of the design process and the role of data within each process, examples include:

1. **Conception – ideation from data.** In this group, participants will develop concepts and initial design mockups for products and services. Participants will have access to information about a number of datasets from which they can draw inspiration. Participants will also be free to seek out data to support their ideas, the organisers will provide a list of possible data sources, such as open data repositories. This will be a reflective process, in which participants think not just about the outcome of the design process but the ways in which using data as part of ideation has helped or hindered the process.
2. **Design process - validating design decisions using data.** In this group, participants will be tasked with identifying possible sources of data for validating design decisions for urban scale design.
3. **Prototyping with data as a design material.** In this group, participants will be tasked with producing a prototype that uses data as part of the prototype product or service.

The workshop schedule is as follows:

9.00-10.00	Introduction, welcome (including presentation on designing with data)
10.00-11.00	Brief paper presentations
11.00-11.30	Coffee Break
11.30-12.30	Organisation of groups and practical work in small groups
12.30-13.30	Lunch
13.30-15.30	Practical work in small groups
15.30-15.45	Coffee
15.45-16.30	Report back from group work
16.30-17.00	Discussion of next steps for the field

Intended outcomes of the workshop

The intended outcome of the workshop is increased understanding of the role of data in design, with emphasis on complex data sets, such as sensor data, or big data. These insights will help to build better tools and methods for including complex data in the design process.

Industrial designers and user experience designers will benefit from a better understanding of how to use data in the design process. Data scientists will benefit by gaining a better understanding of the needs and requirements of designers who want to use data.

Dissemination beyond DIS 2016

We plan to publish a paper based on the results of this workshop. We also plan to hold national workshops on this topic in both the UK and Netherland.

Short biographies of organisers (including photos)

Elisa Giaccardi is full professor of Interactive Media Design at the Department of Industrial Design Engineering, and one of the recipients of the TU Delft Technology Fellowship for top female scientists. Her background brings together humanities, digital media, and interaction design. She obtained her PhD in 2003 from the University of

Plymouth, UK (CAiiA-STAR) with a dissertation on metadesign. Prior to her position at TU Delft, she has been an Associate Professor at UC3M in Madrid, Spain and a Senior Research Scientist at CU Boulder in the United States.

Chris Speed is Chair of Design Informatics at the University of Edinburgh where his research focuses upon the Network Society, Digital Art and Technology, and The Internet of Things. Chris has sustained a critical enquiry into how network technology can engage with the fields of art, design and social experience through a variety of international digital art exhibitions, funded research projects, books journals and conferences.

Gerd Kortuem is Professor of Internet of Things at the Faculty of Industrial Design Engineering at Delft University of Technology. He also holds an associate professorship at The Open University in the UK, where he was deputy-director of the Milton Keynes smart city project MK:Smart between 2013-2016. His research focuses on the Internet of Things, Smart Cities, Human Computer Interaction and Data Science and explores the design of connected products and services for a sustainable future.

Annika Wolff is a Research Fellow in the faculty of Mathematics, Computing and Technology at the Open University, UK. Her research interests lie at the intersection between big data, machine and human learning. She is currently working on the MK:Smart project, using complex urban data sets for teaching data literacy in schools.

Daniel Gooch is a Research Assistant at the Open University, UK and a Visiting Research Fellow at the University of Bath. His interests focus primarily on Computer Support Communication and has worked on projects involving Long Distance Dating Relationships and Education Technology. He is currently working on the MK:Smart project, exploring different ways of harnessing citizen innovation for the development of Smart Cities.

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