

Leveraging Data Physicalization in Healthcare Digital Twins: Enhancing Understanding and Interaction

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1 Personal Information

I'm a first-year PhD student at TU/e and RMIT University funded by Horizon EU, focusing on the application of digital twins in healthcare domain. I'm supervised by Regina Bernhaupt, the full professor focusing on measuring and analyzing quality of dynamic real-life systems at TU/e. She was the VP for Membership and Communication in the Executive Committee of SIGCHI and is the founder for the ACM SIGCHI CHI PLAY Conference. My study will explore the potential of utilizing physical data representations along with data-driven processes to facilitate better comprehension of health data among stakeholders. It aims to support individuals in self-reflection and engagement with their health data, thereby enhancing their understanding of their health status and providing additional information to the health care givers.

My background is in intelligent information system and human computer interaction. I have been involved in several research during my master program in Sweden regarding playful assistive technology for children with mobility difficulties, the design of personalized home rehabilitation solutions [1], and new forms of body maps [2], which increases my passion in healthcare area and motivates me to investigate how to build better communication between individual and their health data through design.

2 Motivation

My motivation for this workshop stems from the similar research problems I'm addressing in my PhD project concerning the representation of health data.

Digital twins, as a virtual representation of a physical object or system, have shown its potentials in testing, simulating, and providing predictions based on AI [3]. In the healthcare field, it has been experimented on the digital medical devices, digital hospital, digital organ, and digital patient, which gives lots of potentials to improve medical efficiency, facilitate diagnose, simulate health scenarios, and provide predictions for illness [4]. However, despite the technical challenges to integrate data from different sources and provide more accurate analysis result [4], it also creates the barriers for individuals to understand the complex or abstract health analysis provided by digital twins and actively participate in the health conversation. Similarly, in other studies on data-driven health interfaces, the lack of comprehension of health data provided by the intelligent interface [5] and varying levels of interest in self-care management [6] have also been noted as a challenge to provide effective healthcare service. To address this issue in my project, I'm going to explore the potential of incorporating data physicalization in the process. Compared to presenting data visually on a flat interface, physicalization offers more possibilities to encode the data using its geometry and material properties [7]. It allows the complex health data to be presented in a different way that leverages people's perceptual abilities [8] and enables tangible interaction with the data for a wider range of people. Thus, I think it has the potential to enhance the understanding of the health data for individuals who are concerned with their health condition, give more access to the health data for a wider diversity of individuals, for example, people with visual impairments, and promote new interactions on the physical representation.

I would contribute with my unique perspective on health data physicalization for and with digital twins in this workshop, especially in the discussion of challenges in engagement and understanding in health interface design. Additionally, I view this workshop as a valuable opportunity to critically reflect on my PhD research approach and identify new possibilities for innovation in this rapidly evolving domain.

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