Physical Visualization and Personal Visual Analytics

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Abstract  
Personal data is increasing in both volume and variety. Personal visual analytics (PVA) can help us to make use of such data. How might physical visualizations serve in this context? Such representations of data can be aesthetically pleasing and may feel less task-like; in some situations, physical visualizations also improve information retrieval over screen-based representations.

Author Keywords  
personal visualization; personal visual analytics; physical visualization; data sculpture

ACM Classification Keywords  
H.5.2. Information interfaces and presentation

Introduction  
The variety and volume of collectable data concerning our everyday lives is enormous, and increasing. Open data initiatives and the evolution of new types of sensors contribute to this trend. Many types of data related to our personal lives can be collected using existing technology, ranging from details of electricity consumption [1], to transportation [2], to sleep [3]. The representation of personal (n = me) data can assist people in reflecting, increasing self-awareness, satisfying curiosity, changing behavior, and taking
away useful insights. How might representations of personal data be designed to fit with these (and other) priorities, and how might physical visualization serve in this context?

Physical Visualization

Physical visualization is a growing form of information visualization. With the rise of 3D fabrication\(^1\), the resurgence of maker culture and the possibilities of shape-changing representations, physical visualization is becoming more possible, more popular and more promising. I am interested in exploring the different affordances physical visualizations offer in comparison to screen-based representations, alongside how personal data might be represented in physical ways.

In exploration of personal data, priorities might be different than those involved in visualization in a work setting. With less of an obligation to examine data, the aesthetic nature of representation might become a greater priority. One characteristic of physical visualizations is that they have “both artistic and functional qualities” [7]; as a result, they might fit in a PVA setting.

Though not necessarily negative, screens “can remind us of productivity tools”; in cases where this is not desirable, physical visualizations can provide an alternative representation of data that feels less “work-like”. Physical visualizations are “a calm medium that encourages contemplation, analysis and reflection” [8]; such a medium might be of interest in examination of personal data.

An obvious affordance of most physical visualizations is that they are tangible. Haptic information might reinforce or add information to the visual, augmenting understanding. Recent work by Yvonne Jansen and colleagues has shown that physical visualizations improve efficiency of information retrieval over screen-based 3D visualizations [4]. Theories about the effectiveness of physical visualization are based on the model of embodied cognition, the idea that “cognitive processes are deeply rooted in the body’s interactions with the world” [5]. The improved efficiency of interpretation of physical visualizations could be useful in a PVA setting. In addition, the haptic nature of physical representations could make personal visualization accessible to users with visual impairment.

Current Work

In my current work, I am exploring participatory physical visualization. My first project involved a representation of the collective sentiment of a lab group. A cloth backdrop was set up in a university lab environment, and lab members were invited to put up pieces of coloured yarn of varying lengths to represent their current feelings, over a period of 2 weeks (shown in Figure 1). Semi-structured interviews will be conducted in order to explore such representations, including questions such as: How does being involved in the creation of a representation (i.e. contributing data, contributing design ideas) affect understanding? How much do senses other than the visual play a role, and what is this role? Are visual variables analogous in other senses? What can other senses add to visual representations?

\(^1\) and the recent design of tools (e.g. (MakerVis [6], MixFab [7])) which lower entrance barriers to personal fabrication
Figure 1. Collective Sentiment of Lab Group as Yarn

Conclusion
To what extent are the efficient retrieval of information and non-work-like, aesthetically pleasing visualizations important in personal visual analytics? What other affordances of physical visualization might be useful in this domain? How does this differ depending on end goal (e.g. increasing self-awareness, satisfying curiosity, encouraging behavior change, promoting reflection etc.)? These are a few of the questions within personal visual analytics and physical visualization I am interested in exploring.

References


