Deep Personalization in Tools for Reflection

Bon Adriel Aseniero
Department of Computer Science
University of Calgary
baasenie@ucalgary.ca

Sheelagh Carpendale
Department of Computer Science
University of Calgary
sheelagh@cpsc.ucalgary.ca

Anthony Tang
Department of Computer Science
University of Calgary
tonyt@ucalgary.ca

Abstract
Personal informatics (PI) tools that support reflection are "personalized" insofar as the data consists of an individual's data. Typically, this data is presented in visualizations that are generic and non-individuated. In this paper, we argue for deep personalization, where the visualizations are constructed by individuals. Such functionality gives individuals the power to build visualizations that are personally meaningful, allowing them to meet and address personal needs. We illustrate the power of this approach by considering a case study of the design of a multi-faceted reflection tool. Reflecting on the deep personalization of the design process, we propose an approach that will allow individuals to personalize their own visualizations.

Keywords
Deep personalization, Self-awareness, Aesthetic Design, Information Visualization, Feedback techniques

ACM Classification Keywords
H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

Introduction
While people all have the same basic needs, individuals are unique. These differences are manifested in overt ways (their bodies, dress, behaviors and activities), and less obvious ways (their personalities, preferences,

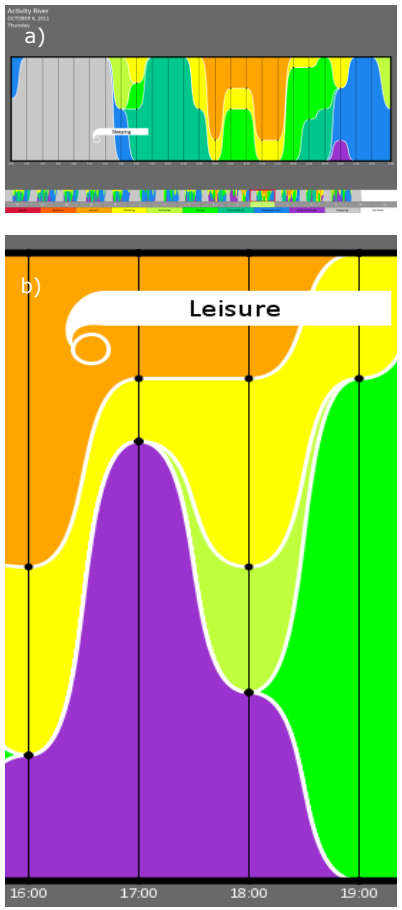

figure 1. a) Activity River

b) Close up view of a part of the visualization

thoughts, feelings). We might therefore infer that individuals' needs or desires from personal informatics would also be equally individuated: the kinds of data they are interested in collecting, how this data should be related, and so forth. Similarly, how individuals think and reflect on this process will be different: what they find meaningful, how they interpret the information, and so forth. Yet, the current state of personal informatics tools relies on generic, one-size-fits-all feedback mechanisms. While this may be mitigated by the wealth of PI tools generally available (i.e. individuals can select tools that match their needs), we argue also that PI tools for reflection should also support deep personalization, where people can *construct* their own visualizations. In addition to the ability to have more meaningful visualizations as a result, we argue that the *process of tailoring and customizing different visualizations as an activity* that in of itself provides considerable insight to individuals.

In this paper, we consider a specific case study of the construction of a multi-faceted reflection tool to explore deep personalization. We reflect on our design process, which included the exploration of different aspects of the first authors' life that he considered to be important or interesting. The final design incorporates the first author's preference for pleasing visual aesthetic, though more importantly, the "final system" reflects a uniquely and deeply personalized visualization. While the final design is inherently interesting, the important lesson here is that the first author learned about himself not merely from the final visualization, but through the explorative process of generating and creating the design.

The following sections detail each aspect (dataset) and component visualizations that were designed. They are written from the first author's perspective to illustrate the insight that was gleaned from the process.

Activity River: My Hourly Activities

One of the aspects of my life that I was interested in was my daily activities. My goal is to be able to understand the types of activities I was spending my time on from an hourly to a daily basis. Based on this, it is possible that I might be encouraged to do more physical activities, leading to a healthier lifestyle. The data for this visualization was collected through an hourly log, where I notated activities, and estimated durations. Over time, I also created a set of categories meaningful to me, and labeled my activities appropriately: Sports, Exercise, Leisure, Walking, Self-prep, Eating, Studying/Working, Computer use, Resting/Commuting, and Sleep.

My general design process was to sketch (on paper) multiple variations of visualizations that would allow me to explore and study the data set (e.g. figure 5). In this case, I settled on the design illustrated in figure 1. Taking inspiration from FlickrFlow [2], Theme River [4] and ColourVis [3], this visualization represents each activity as a wave in a stream representing a single day. The stream is partitioned into slices in the horizontal axis for each hour of the day. Each slice is then partitioned through the vertical axis like a stack diagram [1] depending on the duration of each activity in the hour it was performed. For example, in figure 1b, during 5pm to 6pm, the visualization shows that the activities were commuting (shown in purple) for much of the hour, walking for a bit (shown yellow), and having fun (leisure, shown in orange).

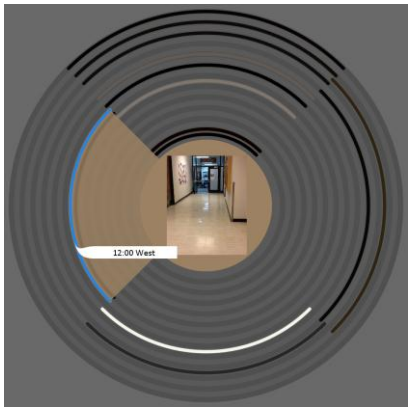

figure 2. D'Ripples: Directional Ripples

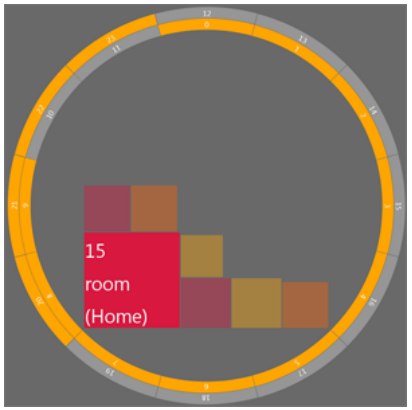

figure 3. Place Well

D'Ripples: What I Look At

As a visual person, another aspect of my life which I was interested in was my physical "view" of the world. What are the dominant colors that I frequently see? Is this related to where I am looking? To collect the data, every hour, I used a digital camera to take a picture of the immediate view I was seeing, and a compass to record the direction I was facing. To explore this data, I designed D'Ripples (Directional Ripples) which represents each recorded direction as an arc shaped ripple in a circular visualization representing time (figure 2). Time is represented per day, linearly from hour 0, the innermost ring, to hour 23, the outermost ring. Each ring is divided into four quadrants representing the four cardinal directions. Each ripple in the four quadrants in the ring that represents the hour when the direction was recorded. Also, an image of the immediate view is recorded. The ripple's color comes from the dominant color (i.e. the color of the pixel that appears most in the image.) of the image corresponding to it. The image corresponding to a ripple is displayed in the middle of the visual whenever a ripple is hovered over or clicked. To provide association to which ripple the image corresponds to, a semi-transparent arc filled with the dominant color of the image is drawn from the image to the arc it corresponds to.

Place Well: Visualizing Places through Time

Finally, I wanted to know at which places I frequently stay in, and as a student, I expected that I stay in three "places": home, school, and commuting. The data for this visualization is taken through an hourly post-log of the places I stayed at for a significant amount of time. Durations could be from 15 minutes to a full hour. The three categories are Home, School, and Other and were assigned personally. Places at home include my room, the kitchen, living room, and other parts of the house I stay for significant amount of time. School includes specific places in school that I stay at (e.g. lecture rooms I have a classes at, the laboratory I work at, the school cafeteria, etc.). However, transitory places such as inside buses, trains, or stops during commuting were all recorded as commute under Other because those places hold no significance for me in detail. To explore this set of data, I designed Place Well (figure 3) which represents the places I go to as squares inside a well. Each square is color-coded based on their category (Red for Home, Yellow for School, and Orange for Other) and its size depends on how frequently I visit the place it represents. By default, the squares appear less opaque and contain no labels. However, once a square is in focus, it becomes opaque and the data it represents is superimposed for specificity.

Integration

To explore these data sets together, I created a new visualization, Hours (figure 4). This visualization takes the most important parts of the previous visualizations, the stream of activities, the ripples representing directions, and the squares representing places, and combines them in a way that allows me to see, at a glance, an integration of information that I am able to see when they were individual visualizations.

Discussion and Conclusion

Each process of developing the previously discussed visualizations, from sketching to implementing, provides a wealth of information that is generally not accounted for by pre-created visualizations. Over 10 unique sketches were drawn for each data set, allowing

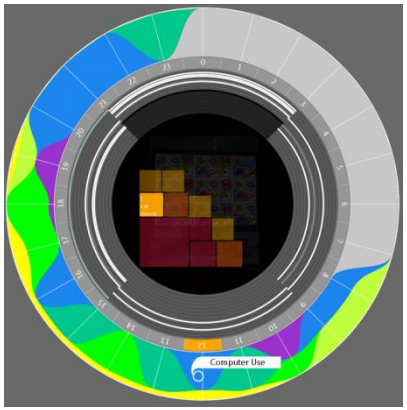

figure 4. Hours

figure 5. Several sketches were drawn for the design of each of the visualizations.

me to brainstorm different ways of how I wanted the data to be presented. Not only did this ensure that the resulting visualizations represented the data correctly, but it also helped me to find personally meaningful representations of the data. Being able to employ design subtleties, e.g. choosing the colors of each activity in Activity River, afforded a way of assigning importance into activity types. For example, I decided to choose warmer colors that stand out for activities that I believe require more physicality such as sports (red) and exercise (red orange). By coloring activities in colors that quickly attract my attention; I am able to see whether I get enough exercise in a day at a glance. Seeing a stream of activities for a day that contains no such colors prompts me to probably do them the next day or so. In addition, my own aesthetics were of prime importance in the design of the visualizations, which increased my desire to use them.

While designing, I also discovered relationships between the data sets that are meaningful for me but that I had not thought about in the earlier iterations of the project. During the integration process of the visualizations, I realized that I could then relate my activities, directions, and places I go to, not just with time but also across each data set. For example, I learned that I can relate the activities I performed with certain places by looking at the hours when I visited the place and then looking at the activities performed in that hour. Being able to deeply personalize the design of the visualizations made reflecting on them both effortless and appealing.

Nevertheless, even though the deep personalization of PI feedback techniques (e.g. visualizations, virtual agents, and persuasive technologies) may offer such benefits, the whole process can be long and tedious, costly, and will surely be different for each individual as a tailored visualization for a specific individual is for that individual alone. Moreover, not all individuals have the skills or tools to create their own PI feedback presentations. For this, we propose developing a system that will allow individuals, to a certain degree, to construct their own interactive visualizations from scratch, intuitively and effectively, and allow them to explore their data and tailor its representation to their own requirements. This system will, in theory, give the same benefits as with the process discussed in this paper, and bring Personal Informatics to a more personal level. We are looking to build a prototype of this system to explore smaller sets of data but we predict that from there, the process of deep personalization can be expanded to handle more complex, multi-dimensional data sets.

References

[1] Byron, L. and Wattenberg, M. Stack Graphs – Geometry & Aesthetics. *IEEE Transactions on Visualization and Computer Graphics 14,* 6 (2008), 1245-1252.

[2] FlickrFlow. http://hint.fm/projects/flickr/.

[3] Haber, J., Lynch, S. and Carpendale, S. ColourVis: Exploring colour usage in paintings over time. In *Proc. CAe 2011*, ACM Press (2011), 105-112.

[4] Havre, S., Hetzler, B. and Nowell, L. ThemeRiver™: In Search of Trends, Patterns, and Relationships. In *Proc. INFOVIS '00,* (2000), 115-119.