Improving Personal Informatics Through Social Sharing

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Abstract
Personal informatics applications are becoming more prevalent, and social sharing is a common feature in both commercial and research applications. In prior research, these social sharing features have been underutilized. I believe that there are substantial benefits to sharing as a motivational tool and to increase accountability. Thus far, I have focused on fine-grained activity sharing, looking at how to share it while hiding activities that someone finds too private. Moving forward, I look to find interesting properties to share, such as routines and anomalies in personal informatics data. I am also interested in studying how activity propagates on social networks to see if social influence can be used to increase activity.

Author Keywords
Personal informatics; social sharing; value-sensitive design; privacy

ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

Introduction
Personal informatics applications aid in collection of and reflection on personal information, and have become prevalent due to an increase in personal sensing tools

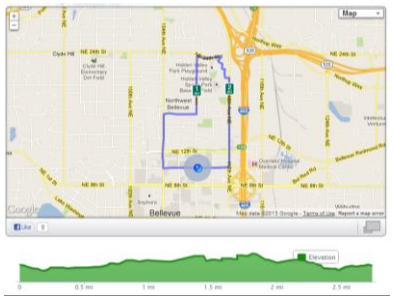

Figure 1. A scenario described in [2], in which a runner accidentally discloses the location of their home when sharing their running route on a running website.

Figure 2. A visualization of interactive deletion, explored in [1]. The sharer selects a region (denoted in light blue) and the activity is replaced with zero values, which is very common in step data.

[8]. Commercial personal informatics applications exist in a variety of domains, including physical activity [3], sleep [14], location [6], finances [12], weight loss [10]. The research community has also explored additional domains, including environmental sustainability [11] and home utility usage [5].

Sharing for social purposes is an integral feature to many personal informatics applications, both in research explorations [9,11,13] and commercial products [3,6,10]. However, prior research has often found the social features to be underutilized. For example, Lin et al.'s Fish N' Steps grouped participants into teams competing against each other for the highest step total, and could send encouraging messages to their teammates [9]. The messaging feature was rarely utilized, in part because participants felt uncomfortable sending messages to teammates who they did not know outside of the study. In Munson and Consolvo's GoalPost, participants could share their goals, progress, and physical activities with their Facebook network [13]. Participants worried about sharing too trivial of an accomplishment, and thus chose not to share at all.

Completed Research

I began my program by exploring the space of fine-grained sharing. Commercial applications enable sharing high-level summaries of activity (e.g., daily step count, length of a run), while leaving the fine-grained activity (e.g., steps in minute-long intervals, detailed location traces) for private self-reflection. I believe there are benefits to sharing fine-grained activity. It can create opportunities for friends to give advice, such as suggesting a new running route based on where someone normally runs. More accountability for goals is also possible. For example, a common goal for desk workers is to get up and stretch at least once per hour, which can easily be verified by friends viewing a fine-grained activity log.

In addition to the benefits, there are privacy concerns surrounding fine-grained sharing. Additional information can be inferred, unrelated to what the sharer intended to disclose. For example, as seen in figure 1, a sharer disclosing their running route may accidentally reveal where they live—the start and end point of their running route. This led to a scenario-driven analysis of fine-grained sharing, which I presented at the CHI 2013 Workshop on Personal Informatics [2]. These scenarios all demonstrated the benefits of fine-grained sharing while highlighting their potential privacy concerns.

Upon completion of the workshop submission, we began developing methods for mitigating these privacy concerns in physical activity applications. We then realized that we needed to consider perspectives other than privacy in these designs. We decided to take a Value Sensitive Design approach, an established method for addressing human values in a design process [4]. We expanded upon the scenarios we created and discussed the value tensions that they exposed, using those to motivate five transformations of fine-grained activity prior to sharing. These scenarios and transformations were then discussed in semi-structured interviews with pedometer users. This work will be presented at UbiComp 2013 [1].

Some transformations, such as the interactive deletion transformation illustrated in figure 2, were designed specifically to preserve privacy while maintaining the

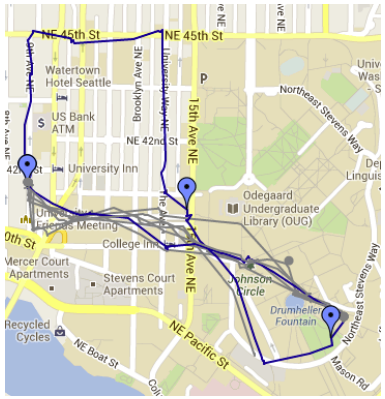

Figure 3. A view of a week of location history. The blue line describes the location trace on a day of especially high activity.

primary reason for sharing. Although they believed the transformations could be useful in some circumstances, participants in our study believed that these transformations required too much mental effort. A sharer needs to reflect deeply on their data to notice any unintentional disclosures. Our participants either felt comfortable disclosing their fine-grained activity as-is, or would rather share a high-level summary. They believed that the transformations were potentially beneficial, but required too much effort to be regularly incorporated into typical sharing practices.

Future Approaches

Drawing from our findings in the UbiComp paper, I have developed two primary questions that I want to explore in the future.

What to share?

I still believe that there are benefits to sharing more data than the current high-level summaries support. Fine-grained data appears too private to share directly, but yet too valuable to hide away. In our evaluation of activity transformations, participants gave comments that led me to consider an intermediate level of sharing, one that reduces the potential for unexpected disclosures while still providing some of the benefits of sharing fine-grained activity. Some examples I am considering are giving a city-level abstraction of a running route or splitting activities by the time of day.

Some participants also were concerned that fine-grained activity is too trivial to share [1]. This led me to begin exploring approaches to finding captivating information to share from a fine-grained personal activity stream. To this end, I am exploring activity in terms of routines and anomalies, such as typical commuting patterns or places that are visited infrequently. These are potentially more interesting to reflect on and to share, as they are summaries of the salient bits of fine-grained activity.

This leads to two research questions that I will continue exploring: 1) what do people consider as a 'routine' in their activity? 2) how can we design a system to identify important routines and anomalies?

I anticipate that the process for discovering routines and anomalies is domain-dependent. Current finance applications present spending habits for a month, while physical activity is typically considered by the day or week. There are also a variety of factors that impact routines. For example, spending may increase on weekends or physical activity may drop if it rains. Figure 3 illustrates an increase in activity as a result of nicer weather. Determining what factors impact routines can be important to reflect on and share.

With whom to share?

Participants also expressed concerns about sharing fine-grained activity with friends who they were not as close with, such as a co-worker [1]. They believed these friends would not be interested in the details of their activity and the activity was too private to disclose to such friends. This led me to think about whether a catch-all social network (e.g. Facebook, Twitter) is an appropriate forum for sharing personal informatics data. The benefits of dedicated networks have been studied in weight loss communities [7]. Some commercial personal informatics systems have dedicated social networks [3,10], where people can compete against and offer support to their friends.

This has led me to question how effective these dedicated networks are at motivating people. In these networks, are the number of friends correlated with activity level? Is there an increase in progress toward a goal immediately after gaining a new friend on the network? These networks are typically public, so data on them can be pulled and analyzed.

One question that I am particularly curious about is how activity propagates through these networks. I suspect that if my activity significantly increases, this will motivate my friends to increase their activity as well. Their friends will then in turn be motivated to increase their activity, leading to a positive influence on the entire network.

Doctoral School Participation

The UbiComp Doctoral School looks like an excellent opportunity to meet researchers in the field where I will be working for the foreseeable future. As a junior member in this field, I am always looking for opportunities to meet researchers and gather feedback on my ideas. The mix of junior and senior students at this doctoral school excites me, as it will serve as a great opportunity to discuss with experienced researchers and to meet researchers who are at the same stage of their careers as me.

Biography

I started as a PhD student in Computer Science and Engineering at the University of Washington in September 2012, and expect to graduate in the Spring of 2018. I am advised by James Fogarty, and also collaborate with Alan Borning and Sean Munson. I am an active member of the DUB group and the Intel Science and Technology Center for Pervasive Computing.

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