Thesis

Personal informatics & context: Using context to reveal factors that affect behavior

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On August 19, 2011, Ian Li defended his Ph.D. thesis at Carnegie Mellon University, titled: "Personal Informatics & Context: Using Context to Reveal Factors that Affect Behavior". The research was funded by the National Science Foundation and the Quality of Life Technology Center. Ian Li defended his dissertation in a publicly open presentation held in the Gates-Hillman Center for Computer Science at Carnegie Mellon University, and was able to comment on every question raised by his thesis committee and the audience. The thesis was supervised by his advisors, Anind Dey and Jodi Forlizzi, and the rest of his thesis committee, Aniket Kittur and John Stasko. The thesis has been read and approved by his thesis committee. All of them were present at the presentation.
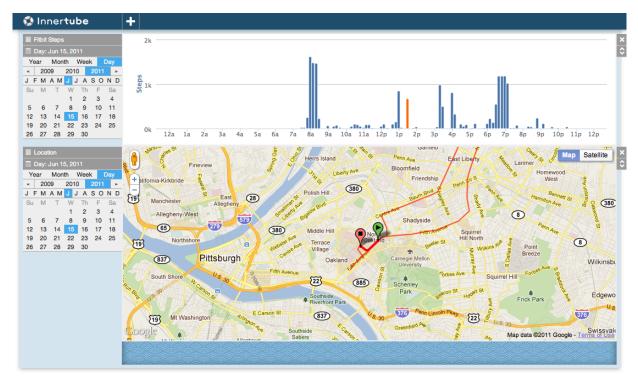
Thesis summary

Personal informatics systems help people collect and reflect on behavioral data to better understand their own behavior. Because most systems only show one type of behavioral information, finding factors that affect one's behavior is difficult. Supporting exploration of multiple types of contextual and behavioral data in a single interface may help.

To explore this, I developed two prototypes of *IMPACT* (Improving Monitoring of Physical Activity using ContexT), which supports collection and ref-

lection on physical activity and contextual information (activity, location, and people) [1]. With the first prototype, users manually collected behavioral data on a paper booklet and transcribed the data into a web site for visualizations. A field study showed that the prototype could increase users' awareness of opportunities for physical activity, but users reported that the manual collection was too burdensome. With the second prototype, a mobile phone automatically recorded the user's step counts and GPS location, and it had a simple interface to enter activity and people data. The data was also automatically synchronized with a web site. While this prototype was easier to use and allowed users to collect data over a longer period of time, participants were not more aware of opportunities for physical activity. Lessons from these studies indicate that supporting personal informatics systems and contextual information requires consideration of how collection and reflection on behavioral data is supported.

To improve support for personal informatics systems, I conducted a series of interviews and field studies. First, I interviewed people about their experiences using personal informatics systems resulting in the *Stage-Based Model of Personal Informatics Systems* [2], which describes the different stages that systems need to support and a list of problems that people experience in each of the stages. This study suggests that developing personal informatics systems requires a holistic consideration of how the dif-

The Innertube Dashboard with two widgets: the Fitbit Steps widget and the Location widget.
The user has selected the date June 15, 2011 and the time range between 1:25 PM and 1:30 PM.

ferent stages are supported. Second, I identified the kinds of questions people ask about their personal data (*Status, History, Goal, Discrepancy, Context, and Factors*). I found that the importance of these questions differed between two phases: *Discovery* and *Maintenance*, and that users transition between these two phases [3]. This study suggests that personal informatics systems should not be designed only for the Discovery or Maintenance phase, but should be flexible to allow for users' transitions. Third, I evaluated different visualization features to improve support for reflection on multiple kinds of data. Finally, based on this evaluation, I developed a system called *Innertube* to help people reflect on multiple kinds of data in a single interface using a *visualization integration* approach that makes it easier to build such tools compared to the more common *data integration* approach.

References

[1]　I. Li, A.K. Dey and J. Forlizzi, Using context to reveal factors that affect physical activity, *ACM Transactions on Computer-Human-Interaction (TOCHI)*, 2012. To appear.

[2]　I. Li, A.K. Dey and J. Forlizzi, A stage-based model of personal informatics systems, *CHI 2010*, Atlanta, Georgia, 2010.

[3]　I. Li, A.K. Dey and J. Forlizzi, Understanding my data, myself: supporting self-reflection with ubicomp technologies. *Ubicomp 2011*, Beijing, China, 2011.