Framework for User Control over Personal Data for Lifelong Wellbeing Goals

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AIMS

- Establish the theoretical foundations for people to manage and control stores of personal data from pervasive computing sensors for monitoring health and activity.

- Design and evaluate a software framework for enhancing user control over personal data for lifelong goals.

- Design and evaluate the user interface with mechanisms enabling people to efficiently manage and control   personal data over long term.

MOTIVATION

Currently many pervasive and ubiquitous sensors in people's personal digital ecosystem can collect data that has the potential to be valuable to help them achieve long term, important goals in their lives.
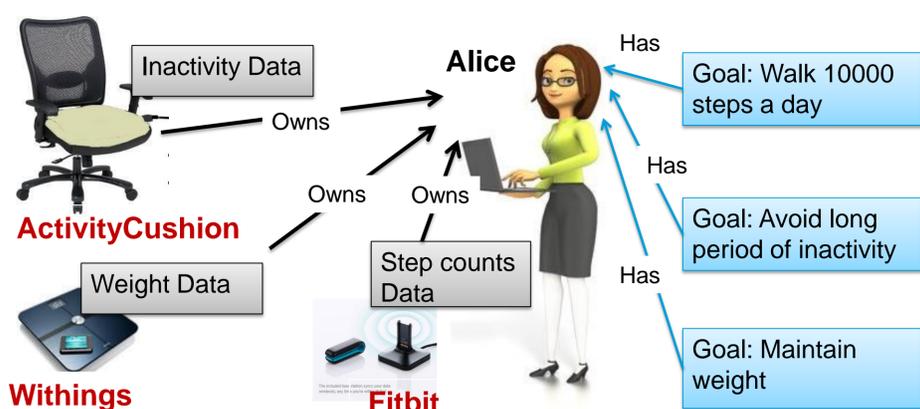

Figure 1: Challenges for integrating and managing personal data and goals in pervasive computing

Figure 1, for example, depicts the current situation. Alice owns several devices, each capturing a different type of her personal data. ActivityCushion (top-left) tracks how long she sits, Withings (bottom-left) monitors her weight and Fitbit (bottom-middle) tracks her step counts. At the right of Figure 1 are her wellness goals. The devices can help her to achieve these. Fitbit, for example, helps monitor her step goals, while ActivityCushion helps her avoid long periods of inactivity. A person like Alice, with a goal for becoming more active might like to use many such systems together. But there is no infrastructure that enables her to combine data from several systems to gain an integrated and comparative view. More importantly, none of the commercial systems allows her to delete or change her data in case of disagreement. Consequently, over long term, these personal data, now scattered in different systems might impose challenges in terms of proper control over management and privacy.

THEORETICAL MODEL:

We created a theoretical model to tackle the important issues for ensuring user control over personal data:

1. It aims to create an infrastructure that aggregates data from several sources.

2. It aims to manage the data in a data store controlled by the user.

3. It designs interfaces enabling users to control the data associated with their personal lifelong wellbeing goals.
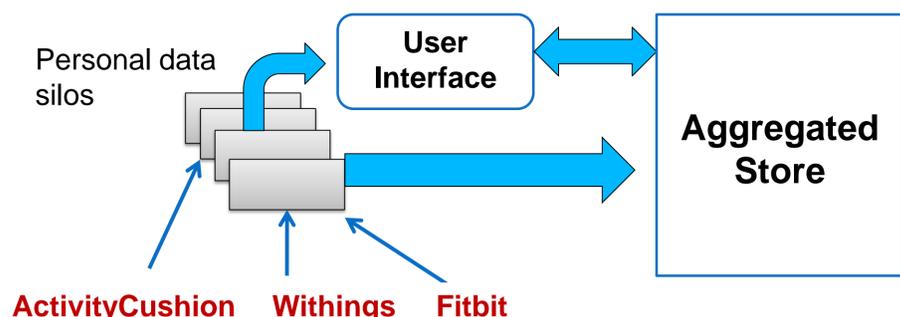
System Architecture:

Figure 2: System architecture

Figure 2 presents the system architecture in its simplest form. At the bottom level are the devices that captures personal wellbeing data. In this architecture, each device will come up with a list of default goals that a user wants to set. The user interface (at the top-middle) will enable users to link these devices to their goals to the data in the aggregated store (at the right).

Interface support for user control:

The interface aims to support following forms of control to ensure effective user control over personal data related to goals.

Effective usage of personal data silos		
Aggregation: User can aggregate silos from different sources.	**Goal setting:** User can set relevant goals related to the aggregated data.	**Self reflection:** User can visualise interactive charts with aggregated data.

Effective management of personal data in aggregated store			
Deletion: User is able to remove unwanted data.	**Decay:** User is able to set "use by date" timestamp to the dataset.	**Compaction:** User can transform fine grained data into compacted forms.	**Sharing:** User can set preferences for sharing which data to be shared, with whom.

USER STUDY

We are conducting an online survey to gain insight into people's understanding and attitude towards having these forms of control. We introduced the technologies shown in Figure 1 and asked questions about how users intend to use and manage their data captured by these.

Results: We have conducted qualitative and quantitative analysis of the responses of 50 participants. More than 30% of our participants had never recorded even weight. However, more than 90% would like to use these systems for easily monitoring their wellness. Figure 3 shows the percentage of user responses for few of these questions.
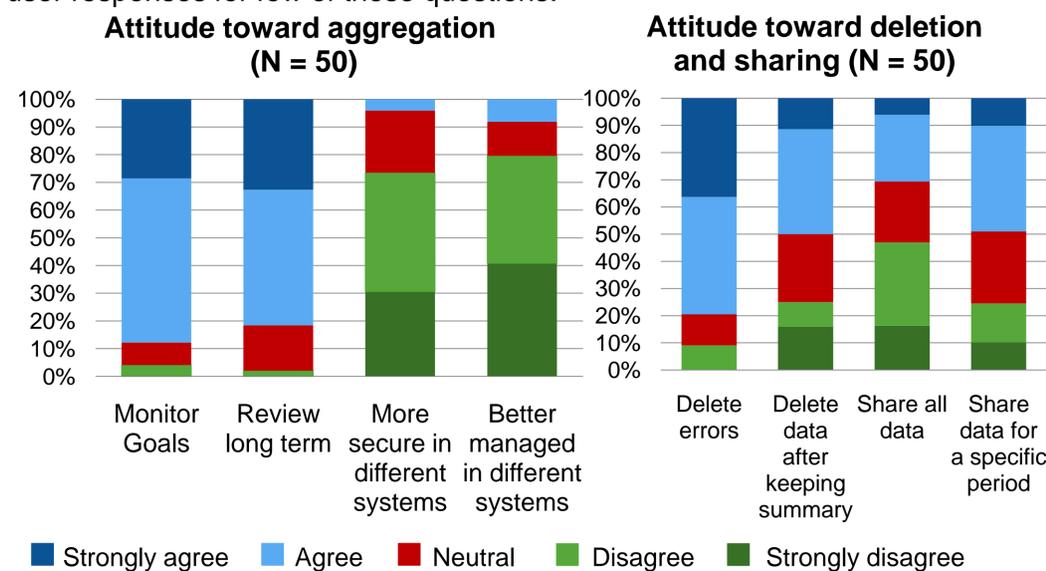

Figure 3: Response Percentage

The results in the left chart show that most participants preferred aggregation for monitoring goals (>80%) and reviewing long term trend (>90%). Moreover, nearly 80% did not consider that their personal data would be more secure and better managed in commercial systems than their own aggregated store. These results indicate that people value aggregation of their own data in their own store. As in the right chart, more than 80% of our participants wanted control over deleting errors. However, people in the study were concerned about deleting old data after keeping a summary (~50%) and sharing (<50%) .

Contributions

• Combined with our theoretical model of forgetting [1], this produces a principled basis of creating a new class of systems and interface .
• This is the first research to study people's attitude toward a rich collection of aspects for managing personal information particularly aggregation and deletion.

1. **Debjanee Barua, Judy Kay, Bob Kummerfeld and Cécile Paris. Theoretical Foundation for User-controlled Forgetting in Scrutable Long Term User Models. OzCHI '11, pages 40–49, 2011. ACM.**