A Framework Supporting "Forgetting" in Personal Lifelong Informatics.

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Personal Lifelong Informatics

Advances in ubiquitous computing technologies are creating new ways for people to use low cost sensors to capture diverse personal information.

Figure 1: Personal Digital Ecosystem

Figure 1 shows the technologies that people can own and use which creates the notion of a personal digital ecosystem. One approach to harnessing such technologies is based on Personal Informatics (PI) tools that aim to provide effective interfaces for reflection on the information that the personal digital devices have collected. This personal data has the potential to play an important role in helping people achieve their long term goals for physical wellness, sustainability, learning high level skills particularly when this is kept in a *lifelong user model*.

Once this huge set of personal data is captured in one unified platform, it creates a number of challenges. Figure 2 shows some of those key reasons for user controlled remembering and forgetting in personal lifelong informatics in colour-codes. For example, over long term, this data set might slower the system or become difficult to visualise and understand. Most importantly, users might become overwhelmed and lose

- Managing speed and storage;
- Removing errors and unwanted data;
- Maintaining privacy and security;
- Ensuring understandability of the system;
- Enhancing user control over data

Figure 2: Reasons for user controlled remembering and forgetting in personal lifelong informatics

control over their personal information. This in turn will pose challenges on the privacy of the system.

Research Aims

This research will explore and refine mechanisms to support users to control remembering and forgetting in personal informatics . First we have established a theoretical framework. We will use this as a foundation to design and evaluate a software framework. Key to this will be the user interface with mechanisms enabling people to efficiently manage and control personal information. We envisage that by following this systematic approach we can address some of the concerns mentioned in Figure 2.

Inspiration from Human forgetting

"The process of forgetting is one whereby the important features are filtered out and preserved, while irrelevant or predictable detail is either destroyed, or sorted in such a way that it is not readily accessible in its original form."

- Baddeley A.D.

Approach

Theoretical model of the Framework

We have identified five core mechanisms of forgetting, taking inspiration from theories of

- Decay: User can set the lifetime of the information so that this will be decayed.
- Archive: User can archive the older information in a slow storage.
- Compact: User can summarize the detailed information while removing the fine grained detail to the back-up.
- Deletion: User can delete the unwanted or erroneous information which will be kept in a very slow storage.
- Blocking: User can block some private information to hide those from being accessed by other applications.

Figure 3: Potential Mechanisms for User Controlled Forgetting

human forgetting and other research in forgetting in computing systems.

In Figure 3, we have colour-coded these mechanisms to map to the reasons in Figure 2. For example, the first three mechanisms might be used to address the issue of speed and storage. Overall using these mechanisms will make the model simpler and easier to understand and control.

Software architecture of the framework

Figure 4 presents the software architecture of our proposed framework for personal lifelong informatics.

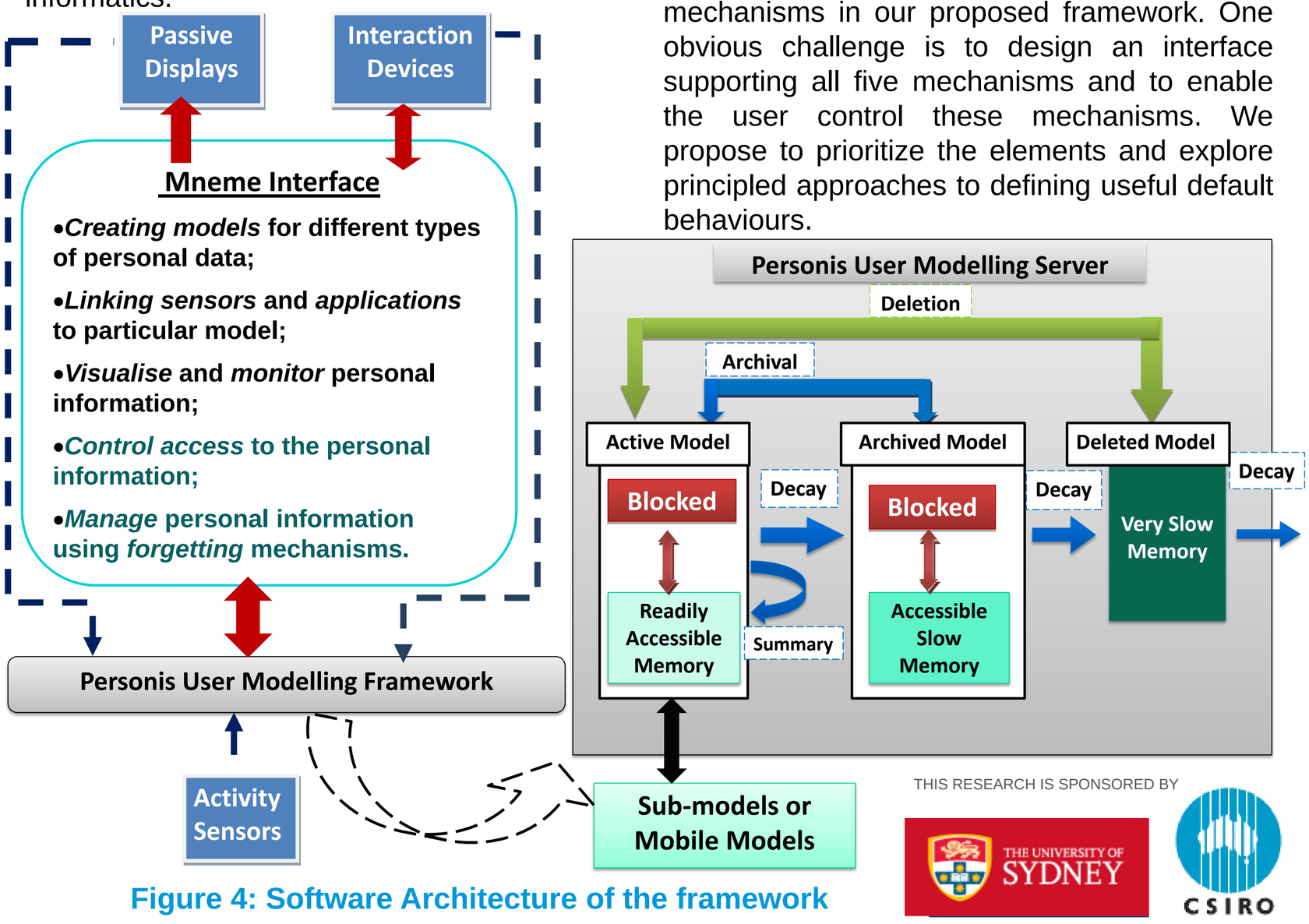

Figure 4: Software Architecture of the framework

This figure has two parts. The left part shows the flow of personal information from digital devices to the data store with the help of a user interface. Our work builds upon the *Personis* user modelling framework for holding personal information over long periods of time. This framework supports some mechanisms, notably forms of blocking. This framework also includes an interface called *Mneme* that offers ways for the end-users to link sensors and applications to their personal data models kept in Personis server. Mneme also supports the reflection of personal informatics. This part of the figure includes the key functionalities of Mneme. Among these, the first three have been implemented in previous work. We will evaluate this interface once we implement the last two functions.

The right part of Figure 4 shows the proposed mechanisms and storage hierarchy in the Personis server. There are three different parts of the model. First is the *Active* model which holds ad-hoc data accessible (light green) for all applications and devices. Second is the *Archived* model which holds obsolete data in a slow memory (green). Each of these two models hold an area (red) which maintains the blocked personal data. Finally, there is a very slow memory called *Deleted* model for deleted data (deep green). The forgetting mechanisms are shown as block-arrows which follow the colour-codes from Figure 2 and 3. Over time information will decay along the storage hierarchy from highly accessible memory to slower memories and finally be removed from the model forever. The user can control each operation and undo the action in case of accidents. Sub-models are kept in the personal devices, typically for highly used and recent data (e.g. last 6 months) from the active model.

Conclusion

The goals of this research are to design both theoretical and technical foundations for the design of user-controlled remembering and forgetting mechanisms for personal lifelong informatics and implement and evaluate these mechanisms in our proposed framework. One obvious challenge is to design an interface supporting all five mechanisms and to enable the user control these mechanisms. We propose to prioritize the elements and explore principled approaches to defining useful default behaviours.

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