

# Improving Organic Recollection with Memory Prosthetics

David Elweiler, Gareth Jones

Dept. Computer Science 8 (AI), University of Erlangen-Nuremberg, Germany  
School of Computing, Dublin City University, Ireland  
david@elsweiler.co.uk, Gareth.Jones@computing.dcu.ie

## 1 Introduction and Background

The limitations of human memory are well documented [ERJ07]. As exposure to information continues to increase, information-based memory problems will become even more commonplace and systems will be needed to support peoples' organic memory (OM). A potential solution, that has been a popular research focus in recent years, is to create prosthetic memory devices (PM) –digital stores containing all of an individual's information, media content and context data [GBL<sup>+</sup>02]. The idea is to create a resource where the user can lookup forgotten information if and when the need arises.

There are obvious trade-offs between the permanence and reliability of PM against the speed of access that can be achieved with OM [KW07] and consequently, most research in this area has aimed at improving facilities to search within these stores e.g. [KJ10]. While there is obvious merit in this approach, one problem is that as search facilities improve and costs of re-finding decrease, it is possible that users will become overly reliant on PM with detrimental effects on OM, comparable to the effects of continued calculator use on mental arithmetic abilities. Our work will complement re-finding research by investigating how PM content can be used to facilitate improved organic recollection, reducing the need to re-find. In this position statement, we outline the fundamental approach and present some key open research questions to be addressed by our research.

## 2 Approach

The basis of our approach will be to select appropriate PM content, in order to remind the user of what is stored as well as contexts (people, places, events etc.) associated with content. The idea is to reinforce and strengthen the user's recollection of links that exist between objects and contexts.

There is an abundance of psychology literature on the effects of rehearsal and cuing on recollection that suggests such an approach could be useful. However, there are a number of open questions regarding how to best implement the idea in practice e.g.

- What to information to show - which items or contexts will be remembered best or worst, which are the most important to remember and which, if shown, will facilitate the best cued recall?
- When to show it - after which delay to people need reminders? How often are reminders required?
- How to show it - how do presentation factors such as form and size influence the effect on recollection, is it important to provide meta-data or surrogates for non-visual objects and if so, which form should these take?

To answer these kinds of questions we are planning two phases of experimental work. The first phase will be qualitative in nature, using techniques such as interviews and tours to investigate the links people establish between objects and contexts and also the strengths of these links. Understanding which links are likely to be forgotten or remembered, which are important and which types of items facilitate enhanced recall will inform a second phase of work where algorithms for selecting items will be developed and evaluated in various contexts surround PM collections.

One context of particular interest is the study of how PM content can be used to improve the vocabulary retention of foreign-language learners. We believe this is a good group to study because firstly, it is a restricted context where we have more experimental control. Second, the context in which new vocabulary is learned can often act as a cue to reinforce the word.

We also plan to evaluate how the approach influences recollection in the less controlled setting of recollection of PM content in general. Our previous work has developed methods for testing recollections for information objects [ER07] and this will form the basis of the evaluation.

Our aim is that the combined findings of these studies will provide insight into how PM stores can be used to promote improved OM.

## Literatur

- [ER07] D. Elswailer und I. Ruthven. Towards task-based personal information management evaluations. In *Proc. ACM SIGIR '07*., Seiten 23–30, New York, NY, USA, 2007. ACM Press.
- [ERJ07] D. Elswailer, I. Ruthven und C. Jones. Towards memory supporting personal information management tools. *JASIST*, 58(7):924–946, 2007.
- [GBL<sup>+</sup>02] J. Gemmell, G. Bell, R. Lueder, S. Drucker und C. Wong. MyLifeBits: Fulfilling the Memex Vision. In *ACM Multimedia '02*., Seiten 235–238, 2002.
- [KJ10] L. Kelly und G.J.F. Jones. Biometric Response as a Source of Query Independent Scoring in Lifelog Retrieval. In *Proc. of 32nd ECIR*, 2010.
- [KW07] V. Kalnikaitė und S. Whittaker. Software or wetware?: discovering when and why people use digital prosthetic memory. In *Proc. SIGCHI '07 conference on Human factors in computing systems*, Seiten 71–80, New York, NY, USA, 2007. ACM.