WAHM 2014: Workshop on Ubiquitous Technologies for Augmenting the Human Mind

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Abstract

Ubiquitous sensing will soon allow us to record any moment of our lives. These moments can be restored and used to create radically new ways of aiding human memory. The goal with memory aids is: recalling what matters. This implies retrieving relevant information at the right time to the right extent and in a context-driven way.

We are looking for visions and research projects that aim to re-think and re-define the notion of memory augmentation. The goal is to combine technological innovations in ubiquitous computing with basic research questions in memory psychology, thereby elevating memory augmentation technologies from a clinical niche application to a mainstream technology and initiating a major change in the way we use technology to remember and to externalize memory.

This workshop will bring together researchers, designers and practitioners at the intersection of technology and cognitive psychology to discuss elements and viewpoints of forms of e-memory and new forms of memory aids.

Author Keywords
human memory; memory aids; cognitive systems; quantified mind; recall;

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

Introduction

The human memory is an incredibly vast storage space capable of holding a lifetime worth of information. As people go about their lives memories accumulate and form our base of knowledge, our character and our identity. However, as Schacter [1] points out, human memory is fallible in many ways and hence it is important to care for the mind, just as people care for their bodies. Tools and Technologies support people with their everyday cognitive tasks, such as remembering a busy schedule or taking down notes so no information is lost. Still people struggle when it comes to remembering certain events, people and pieces of information. But what if people never had to forget anything, but had complete control over what they remembered?

The goal of lifelogging is to gather all your digital and real-world experiences, everything you have ever seen, heard, read and done. Recent developments in capture technology and information retrieval allow for continuous and automated recordings of many aspects of our everyday lives. To harness these trends and develop new paradigms for memory augmentation technologies, it is crucial to look at feasibility, human cognition, user acceptance and benefits to society. In order to build such memory augmenting system, all aspects of biological memory need to be taken into account: procedural memory (i.e. muscle memory and memory for physical skills), semantic memory (i.e. meanings, definitions, concepts), as well as episodic memory (i.e. autobiographical memory that encodes experiences from the past).

A recent movement towards a quantified self has produced a number of consumer products, such as unobtrusive cameras, microphones, location trackers, but also biometrical sensors measuring heart rate and blood oxygen levels. This data helps being proactive about one's health and habits, but furthermore awareness may lead to behavior change. A holistic quantified self, however, should include the mind as well: What we have read, seen, experienced or felt [3]. Technology has always had a direct impact on how and what humans remember. This impact is both inevitable and fundamental. Technology radically changes the nature and scale of the cues that we can preserve outside our own memory in order to trigger recall. Such change is not new, we have seen the transition from story-telling to written books, from paintings to photographs to digital images and from individual diaries to collective social networks.

Vannevar Bush's Memex vision [2] has become partly reality through the advent of the Internet. With lifelogging data combined with context-driven memory aids, his vision is further put into reality. People have their entire set of experiences and knowledge at their fingertips. However, simply having all this information at one's disposal is far from being enough. In order to make this information applicable, pieces of information need to surface in the right amount at the right time. Smart memory aids can sift through this vast amount of information and retrieve and present information at

the right time tailored to the user's current context. Hence, in this workshop we are looking at technologies that help make sense of life log data and proactively put it into applications to support people in their everyday lives. This includes sensor technologies making sense of people's environment, intelligent algorithms to sift through this kind of data and different modalities and ways of presenting information on the output side. These developments also have social, economical and ethical implications, which need to be taken seriously [1]. Relevant research in the field contributes to our fundamental understanding of human memory and has a transformational impact on all aspects of life, the workplace, family life, health and education, by measurably improving the acquisition of new knowledge, the retention of existing knowledge, and the loss of unwanted knowledge.

In recent years three separate strands of technology have developed to the extent that collectively they open up entirely new ways of augmenting human memory:

(1) Near-continuous collection of memory cues has become possible through the use of technologies such as Microsoft's SenseCam, social networks and interaction logs.

(2) Advances in data storage and processing now enables widespread mining of stored cues for proactive presentation, both in terms of cues collected by an individual and in terms of complex networks of related cues contributed by others.

(3) The presence of ubiquitous displays (both in the environment and via personal devices such as Google Glasses) provides many new opportunities for displaying memory cues to trigger recall.

In this workshop we want to bring together and discuss leading edge technologies that aim at supporting and augmenting human memory in order to not only help people with cognitive disabilities, but furthermore to bring applications to the mainstream to be incorporated into people's everyday lives with respect to their health, work and lifelong learning.

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Themes

To approach the challenges of augmenting the human mind, we will focus on the following themes, depending on participant contributions.

- Applied cognitive memory theories: how can technology augmented recall be used to both re-enforce and attenuate memories? Uncued recall is particularly vulnerable to age-related decline. Technology could be used to help remedy this memory loss by providing older users with time-relevant and context-appropriate cues.

- Novel capture technologies: Lifelogging technologies, such as Microsoft's SenseCam, have been researched for a while. Nowadays, an increasing number of commercial products are available quantifying people's lives. Fitbit, Jawbone and various smartphone apps allow people to track their activities and habits. So the question arises how to merge this data to automate the acquisition of personal memories?

- From an information retrieval and processing perspective we want to discuss potential technologies relevant for memory processing and retrieval. Through adaptive algorithms automated daily summaries can be compiled from lifelogging footage.

- On the output side we are looking for Innovative User Interfaces for e-memories, including technologies for information priming. For example, how can feedback through ambient large displays and personal mobile devices aid personal memory acquisition, retention, and attenuation?

- Designing knowledge acquisition points: wherever people consume information or make new experience they advance their personal knowledge. Acquisition points include but are not limited to museum visits, reading activities, or classroom technologies.

- Commercial application areas for e-memories: While many of the application domains for such technologies are for the public good, the same technologies can also be employed in the commercial context. For example, technology could be used to support a new form of advertising in which users have memories triggered explicitly to drive purchasing decisions.

- Privacy and security: Widespread pervasive sensing, personal recording technologies and systems for the quantified self raise new challenges to people's security of personal memory data. When private memory records are stored for later retrieval, they need to be protected from unauthorized access and tinkering.

Goals and Submissions

The goal of the WAHM 2014 workshop is to formulate visions and develop a research agenda for the technologies that nurture the augmentation of the human mind.

The above-mentioned themes will be used as a starting point for discussions. We received a number of high-quality paper submissions with topics ranging from health sciences to wearable technologies and grander visions of how technology can be used to support the human mind.

Proposed topics further include Lifelogging through wearables,but also through infrastructure augmentation. Here, many discussions focus on user perceptions and actual utilities of such approaches.

Other topics explore the direct influence of technologies on the human mind and behavior. Ubiquitous

technologies can be used to offer support when needed and challenge the mind if appropriate, which can result in changing people's awareness and behavior patterns.

Activities

We propose a one-day workshop with presentation sessions in the morning, development of scenarios in the early afternoon, and group discussions on fundamental challenges in the late afternoon. We will also describe here pre-workshop preparation and post-workshop follow up.

Presentations

The workshop will start with an introduction to the workshop topic (9:00-9:15), followed by short introductory presentations to get familiar with the participants and the topic they are working on. Authors will get 5 minutes to present their work having their presentations short and focused. While listening to the presentations, all participants will be asked to take notes on provided Post-Its, which we will share on a large whiteboard in order to prepare for the discussion sessions.

The presentation session will be broken into two parts (9:15-10:00 and 10:30-12:00) with a short coffee break in between (10:00-10:30). This will allow enough time to discuss different ideas coming out from the presentations.

Scenario Development

After the lunch break (12:00-13:00) workshop participants will start developing scenarios in groups. All participants will write notes on Post-Its, which will be added to the Post-Its from the morning session on the whiteboard. In order to sort out the challenges and opportunities for technology that augments the human mind we will do an affinity diagrams analysis of the Post-Its. Group analysis will start at 13:00 and will end at 15:30 with a short coffee break in between (14:30-14:45).

Group Discussion

After the group analysis we will have a longer coffee break (15:30-16:00) and then discuss identified challenges and opportunities (16:00-17:00). The organizers will actively interact with the audience to stimulate discussion. After that we will summarize key experiences from the workshop and will plan follow up activities (17:00-17:30).

Post-Workshop Follow Up

At the workshop organizers will take pictures/document the outcome of the analysis and the content on the whiteboard. This will be made available to the workshop participants through a shared Dropbox folder. The participants will be invited to an existing online repository on Zotero where they can share relevant papers to the workshop themes.

Participants

We are expecting up to fifteen participants at the workshop (including the workshop organizers). We expect that workshop participants will provide a position paper on the topic of the workshop.

Organizers

Tilman Dingler is a researcher at the Institute for Visualization and Interactive Systems at University of Stuttgart. He focuses on concepts and applications in the field of Pervasive Computing, thereby developing embedded devices and software for context-aware systems that put users and their context at the center.

Tilman holds a Diploma in Media Computer Science from the University of Munich, a Master's degree in Web Science from the University of San Francisco and an Honors degree in Technology Management from the Center for Digital Technology and Management in Munich.

Kai Kunze works as an assistant professor at the Intelligent Media Processing Group, Osaka Prefecture University, directed by Prof. Koichi Kise. He received a Summa Cum Laude for his PhD thesis, University Passau. He was visting researcher at the MIT Media Lab. His work experience includes internships at the Palo Alto Research Center (PARC), Sunlabs Europe and the Research Department of the German Stock Exchange. His major research contributions are in pervasive computing, especially in sensing, physical and cognitive activity recognition. Recently, he focuses on tracking knowledge acquisition activities, especially reading.

Nigel Davies is a Professor in the School of Computing and Communications at Lancaster University. His research focuses on experimental mobile and ubiquitous systems and his projects include the MOST, GUIDE, e-Campus and PD-NET projects that have been widely reported on in the academic literature and the popular press. Professor Davies has held visiting positions at SICS, Sony's Distributed Systems Lab in San Jose, the Bonn Institute of Technology, ETH Zurich, CMU and Google Research in Mountain View, CA. Nigel is active in the research community and has co-chaired both Ubicomp and MobiSys conferences and was an editor-in-chief of IEEE Pervasive Magazine. He is the chair of the steering committee for HotMobile and one of the founders of the ACM PerDis Symposium on Pervasive Displays.

Albrecht Schmidt is a professor for Human Computer Interaction at the University of Stuttgart. He studied in Ulm, Manchester, and Lancaster, where he received his PhD. His research interest is in human computer interaction beyond the desktop, including UIs for mobile devices and cars. Understanding the impact of contextual factors on the user experience and on the systems design is driving his work. He is co-founder of the ACM conference on Tangible and Embedded Interaction (TEI). He is on the editorial board of the IEEE Computer Magazine.

Marc Langheinrich is an Associate Professor at the Universitá della Svizzera Italiana (USI) in Lugano, Switzerland, where he works on privacy and usability in pervasive computing systems. Marc has served as General Co-Chair for PerCom 2012 and UbiComp 2010, and most recently as Program Co-Chair for UbiComp 2013. He is on the editorial board of Elsevier's Personal and Mobile Communications, IEEE Pervasive, and Dagstuhl's Open Access Series in Informatics. Marc holds a PhD from ETH Zurich.

Niels Henze is assistant professor at the University of Stuttgart (Germany). He received awards from different conferences including CHI and MobileHCI. He is interested in large-scale studies using mobile application stores as a research tool, interlinking physical objects and digital information, and multimodal interfaces. Niels developed and supervised the development of a number of mobile applications and games to conduct large-scale user studies. His apps

and games have been installed more than a million times.

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