2nd Workshop on Ubiquitous Technologies to Augment the Human Mind: Towards the Knowledge Log

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ABSTRACT

Lifelogging technologies, the use of sensing technologies to analyze and record one's lives, is on the rise. Products from industry and research in academia currently focus on using the collected data to support health and fitness. Given these trends, it is only a matter of time before we see mobile sensing technology applied to cognitive tasks, enabling novel research directions and use cases. In this workshop, we explore the implications of "knowledge logging", how to record and track what we read, learn, comprehend and how this impacts research towards mind augmentation. The goal of this workshop is to combine innovations in ubiquitous computing with basic research in psychology and cognitive science. The aim is to bring mind augmentation technologies from a niche application in rehabilitation to a mainstream technology and initiating a major change in the way we use technology to externalize our mind. This workshop will bring together researchers, designers and practitioners at the intersection of technology and cognitive psychology to discuss elements and viewpoints of knowledge logging, inferring cognitive states and extending our perception.

Author Keywords

cognitive systems; quantified mind; eye gaze; brain sensing; knowledge log;

ACM Classification Keywords

H.5.m. Information Interfaces and Presentation (e.g. HCI): Miscellaneous

INTRODUCTION

The recent "Quantified Self" movement 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 [6]. This data helps monitoring and therefore being proactive about ones health and habits. This awareness may ultimately lead to behavior change. A holistic quantified self, however, should include the mind as well: What we have read, seen, experienced or felt [5, 2, 1]. 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 for eventual 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.

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

(1) Advances in technology lead to miniaturization of sensors and the integration powerful processors into mobile devices. A wide range of research prototypes and commercial products enable 24/7 recordings of ones daily life. Life logging is on the brink of becoming mainstream.

(2) Progress in cognitive science and psychology led to a deep understanding of cognitive processes. It becomes possible to infer cognitive states and activities using data from non-invasive physiological sensors.

(3) Technology to track cognitive states and activities (e.g. reading, fatigue, concentration) was available in research for decades but only recently made the step outside the lab. First commercial products, including brain-computer interfaces and wearable eye trackers for daily life usage have become available.

Together, widely available life logging technology, deep understanding of the mind, and the ability to track cognitive activities will bring a new quality to the quantified self. They will ultimately lead to the knowledge log – externalizing our mind in and with technology.

The goal of lifelogging is to gather all your digital and real-world experiences, everything you have ever seen, heard,

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read and done. Recent developments in capture technology and information retrieval allow for continuous and automated recordings of many aspects of our everyday lives. Vannevar Bushs [3] Memex vision 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, how can we in addition also record and analyze the cognitive states of users and create "knowledge logs" (how much do you understand while reading, listening to a talk, attending a meeting)? How can we use these life and knowledge logs and define new approaches to externalize our mind?

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 peoples everyday lives with respect to their health, work and lifelong learning.

TOPICS

Whereas last year's workshop proposal [4] focused mainly on human memory augmentation, we realized from the submissions and discussions that there is a broader interest in mind augmentation, i.e. using UbiComp technology to improve comprehension, increase attention, and enhance creativity.

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

- Sensing Technologies: How do signals gathered from ubiquitous sensing devices relate to cognitive processes? Defining sensing and interaction modalities to better understand human behavior: Driven by application cases which sensing modalities are the most interesting. What are the important activities to focus on (e.g. fatigue detection, attention and concentration tracking?). Which modalities give us the most insights without too high demands on battery and processing power?

- Applied cognitive theories: How can we use these real life recordings of physical, physiological and cognitive signals to augment our mind and for example help us induce desired long-term behavior change?

- Building "knowledge logs": From an information retrieval and processing perspective we want to discuss potential technologies relevant for cognitive processing. Personal "knowledge logs" can be compiled from sensing using adaptive algorithms automated daily summaries.

- On the output side we are looking for Innovative User Interfaces for mind augmentation, including technologies for information priming. For example, how can feedback through ambient large displays and personal mobile devices aid personal knowledge 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 human mind augmentation: While many of the application domains for such technologies are for the public good, the same technologies can also be applied in a commercial context. For example, technology could be used to augment meetings detecting the comprehension of each participant and help mitigate potential misunderstandings.

- Discussing privacy and social implications: On the one hand, sensing becomes more and more personal, for example our eye gaze contains a lot of very intimate information and it would be very questionable if users were forced to share these signals with large corporations. On the other hand, using transparent wearable capture and access devices can violate the privacy of other people without them even realizing it, especially if they are integrated in unobtrusive wearables (e.g. a button).

GOALS

The goals of the WAHM 2015 workshop picks up on last year's theme: we want to foster discussions about technologies that nurture the augmentation of the human mind. Given the good reception of the first workshop and the feedback that we should include a broader range of topics (last year focused on memory), we are working on extending our community. The above-mentioned themes will be used as a starting point for the discussion and group analysis (described below). However, we will also pay attention to new themes possibly emerging from morning presentation and discussions.

In addition to shaping the research agenda, we will also discuss social impact and potential commercial applications. To this end we will also invite representatives from corporate research.

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. In the following we describe pre-workshop preparations and the post-workshop follow up.

Research and Industry Impact

We are planing 2 short keynotes (10 min each) to spark ideas, one from research, one from industry. For the research perspective we plan to invite a researcher with cognitive science or neuro-science background. We are in talks with J!NS, a Japanese glasses maker, to give one of the keynotes and supply MEME prototypes,[1] smart eye wear able to recognize eye movements to all workshop attendees for an additional fee.

Presentations

[1] https://www.jins-jp.com/jinsmeme/en/

The workshop will start with an introduction and the keynotes to the workshop topic (9:00-9:30), followed by short introductory presentations to get familiar with the participants and the topics they are working on. Authors will get 5 minutes to present their work keeping 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 (9:30-10:00 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 technologies that augment the human mind, we will create an affinity diagram 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 between around twenty to thirty participants at the workshop (including the workshop organizers); a slight increase to last year, as we are working on expanding the research community (see also new co-organizers). We expect that workshop participants will submit a position paper on the topic of the workshop.

SUBMISSION

Workshop candidates are asked to hand in a position paper (no longer than 4 pages in the ACM SIGCHI Extended Abstracts format) to the organizers outlining their research and link to the workshop theme. In addition to describing their work candidates will be asked to write about challenges and opportunities they see for technology that augments the human mind, in order to prepare the candidates the workshop theme. Participants will be selected on the basis of the relevance of their work and interests and familiarity with the WAHM workshop topics.

IMPORTANT DATES

- Workshop submission deadline: July 14 2015
- Feedback to authors: July 21 2015
- Camera ready version: August 04 2015
- Workshop at Ubicomp 2014: September 7/8 2015

These are tentative dates and will be aligned with Ubicomp 2015 early bird registration deadline.

PUBLICITY PLAN

A website will be established for the workshop. The workshop will be advertised in a number of mailing lists (Ubicomp, CHI, Lancaster Ubicomp, BCS-HCI, Italian HCI, NordiCHI, German HCI, EUSSET, and Australian HCI). The workshop will be promoted via Facebook and Twitter.

The workshop organizers will contact their peers who published on topics related to the workshops themes. We will also go through the last three years proceedings of conferences that have similar or matching interests, e.g., Communities and Technologies, UbiComp, Pervasive, CHI, CSCW, and DIS in order to promote the workshop and invite authors who published on similar topics.

ORGANIZERS

Kai Kunze: Kai Kunze works as an associate professor at Keio Media Design, Keio University. Beforehand, he held an assistant professorship at Osaka Prefecture University. 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.

Tilman Dingler: 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. Before starting his PhD, Tilman was developing software for *TinyCo* and *Yahoo!*.

Niels Henze: is assistant professor for Socio-Cognitive Systems in the Institute for Visualization and Interactive Systems and the SimTech Cluster for Simulation Technology at the University of Stuttgart. He received awards from different conferences including CHI and MobileHCI. He is interested in large-scale human subject studies, improvement of interactive systems through models of human behavior, and smart attention management.

Koichi Kise: is a professor in the Department of Computer Science and Intelligent Systems at Osaka Prefecture University. From 2000 to 2001, he was a visiting professor at German Research Center for Artificial Intelligence (DFKI), Germany. He received awards including the best paper award of IEICE in 2008, the IAPR/ICDAR best paper awards in 2007 and 2013, the IAPR Nakano award in 2010, the ICFHR best paper award in 2010 and the ACPR best paper award in 2011. He works as the chair of the IAPR technical committee 11 (reading systems) and a member of the IAPR conferences and meetings committee. His major research activities are in analysis, recognition and retrieval of documents, images and activities.

Yoichi Sato: is a professor at Institute of Industrial Science, the University of Tokyo, jointly affiliated with the Graduate School of Interdisciplinary Information Studies and Graduate School of Information Science and Technology. He received the BSE degree from the University of Tokyo in 1990, and the MS and PhD degrees in robotics from the School of Computer Science, Carnegie Mellon University, Pittsburgh, Pennsylvania, in 1993 and 1997 respectively.

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