Embodied Meeting Support: Mobile, Tangible, Senseable Interaction in Smart Environments

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Abstract. The past two years at UbiComp, our workshops on design and usability in next generation conference rooms engendered lively conversations in the community of people working in smart environments. The community is clearly vital and growing. This year we would like to build on the energy from previous workshops while taking on a more interactive and exploratory format. The theme for this workshop is "embodied meeting support" and includes three tracks: mobile interaction, tangible interaction, and sensing in smart environments. We encourage participants to present work that focuses on one track or that attempts to bridge multiple tracks.

Keywords: Meeting rooms, mobile interaction, tangible interaction, sensing, ubiquitous computing, smart conference rooms, meeting support, rich media, context-aware computing, collaboration, knowledge management, multimedia, tele-conferencing, active learning, interactive furniture.

1 Introduction

The theme for this workshop is "embodied meeting support." Meetings are critical to organizations and, if participants are engaged, can encourage knowledge transfer and retention [19]. We posit that meetings can be more engaging if they are embodied, *i.e.* "grounded in and emerging out of everyday, mundane experience" [8]. This approach implies supporting a wide range of human physical abilities as well as emerging practices. It furthermore requires relaxing the notion of meeting support from a particular panoply of conferencing and annotation technologies to more broadly any set of tools that enable synchronous communication amongst a group as well as tools that can help compensate for differences between different people's situations. Importantly, discerning the success of such tools will likely require nontraditional metrics and evaluation methodologies [24]. To help frame potential contributions, we separate the workshop into three areas: mobile interaction, tangible interaction, and sensing. We encourage participants to present work that focuses on one track or that attempts to bridge multiple tracks.

Mobile interaction Increasingly distributed work processes along with the ubiquity of mobile devices provide motivation and means for mobile meeting support. But what does it mean to be in a meeting while mobile? Mobile users face higher demands on their attention and thus it may be difficult for them to maintain the level of awareness necessary to follow a meeting in real time [21]. By the same token, it can be difficult for non-mobile participants to understand the disposition of a mobile user [7]. However, systems should not merely make allowances for mobile participants but also allow them to contribute in ways non-mobile participants are not able to. Submissions in this category might address the following questions: How do people who are mobile contribute to a meeting? How can they interact seamlessly with other mobile users as well as participants in augmented environments? How can systems support mobile meeting participants who may be distributing their attention across multiple activities? What is

the right level of awareness to convey between mobile participants and those in augmented environments? How can a system support activities unique to mobile users, such as data capture in the field? How can systems stay user-friendly while dealing with firewall, security and bandwidth issues introduced by involving mobile participants?

Tangible interaction Meeting support systems have typically focused on support for auditory and visual communication. However, recent research in *e.g.* tangible computing makes possible tools that are more representative of the way people naturally interact with artifacts in the world [14, 11]. This opens the door for new forms of input but also potentially a more complete representation of distributed participants and objects in their different modalities. Submissions in this category might address the following questions: How can a system make use of tangible controls for meeting support? How can a system represent the physicality of participants across sites? How can an environment be designed to encourage spontaneous and diverse interactions? Contributions may also deal with simple but yet unsolved issues such as sharing live drawing, CAD, PowerPoint embedded video clips.

Sensing In order to support fluid communication and promote rapid recovery from conversational breakdowns it is necessary to convey a rich representation of participants' context. To achieve this, it is important that a system supporting group collaboration be able to collect and convey a wide spectrum of information [4], while still providing mechanisms for participants to reveal and potentially alter sensing policies [16]. Furthermore, a system may need to resolve conflicting policies between meeting sites and participants. Submissions in this category might address the following questions: In what ways can information sensed implicitly about meeting participants be used to augment awareness or in some other way support participants *in situ*? What are the appropriate interfaces or mechanisms to access captured information? What is the right information to capture and how should it be modeled? What straightforward methods can be employed to regulate privacy settings on sensed data?

2 Workshop goals and activities

Goals In this workshop, we hope to develop a better shared understanding of how people can usefully interact with the technologies at the intersection of mobile and tangible media in a meting environment; create interesting and unique documents on our topic, including a workshop report with sub-sections devoted to the primary themes and, we hope, a collaborative report to be published in an appropriate journal; and assess interest/appropriateness for creating an ongoing set of collaborations and/or workshops around Embodied meeting support offers a new way to look at the many research issues surrounding the new generation of smart conference rooms. One challenge here is to strike an effective balance between new kinds of meeting support and functionality (which include multiple displays, new interfaces, rich media systems, new uploading/access/security systems, robust mobile integration design and architecture).

Research presented at this workshop could include shared online or visual/virtual spaces, smart furnishings including tables or walls, media support and tele-conferencing systems of varying complexity [1, 5, 28]. High-end meeting room systems in research often feature several thin, bright display screens (both large and small), along with interactive whiteboards, robotic cameras, and smart remote conferencing systems [9, 10, 15, 17, 27]. A variety of meeting capture and metadata management systems, automatic or not, are focused on capturing different aspects of meetings in different media: to the Web, to one's PDA or phone, or to a company database [23]. Smart spaces and interactive furniture design projects have shown systems embedded in tables, podiums, walls, chairs and even floors and lighting [18, 22, 25]. Finally, research based on actual use of systems is particularly welcome.

Activities One function of this workshop is to collect “lessons learned” from research in embodied interaction to date, and develop a shared definition of ongoing research areas going forward. We’ll begin with brief reviews of and remarks on salient research; a few lightning demos; discussions (alternating

between breakout teams along each track to identify and classify areas of interest, and larger whole-group discussions) and finally proceed to a collation of ideas, charting a roadmap for continued research. The session will also provide a quick "state of the art" overview to participants.

Focus will be on discussion and idea sharing, rather than presentation. However, to establish a basis for conversation, the first part of the workshop will be a round-robin introductory session (a couple of minutes per participant), immediately followed by a subset of invited panels, demonstrations and/or (very) short talks on workshop sub-topics, which will serve as provocations and points of departure for later discussion. The scope of interest includes but is not limited to (in no particular order): mobile devices, tools and applications, tangible interactions, sensing and context awareness, and evaluation metrics and methodologies.

4 Organizers of the workshop

We are a deliberately diverse group, drawing from industry and academia, and from several disciplines (computer science, electrical engineering, business systems, social software, and interactive architecture/design) and cultures (Japan, US, France, Switzerland). All of us have been working in aspects of ubiquitous computing for many years.

Maribeth Back is a senior research scientist at FXPAL and currently heads the Usable Smart Environments project at FXPAL, focused on smart conference rooms. She has expertise in prototyping augmented realities and physical design for embedded systems with complex sensors [2, 3, 20]. As a senior researcher at Xerox PARC she worked on a number of ubicomp/smart environment systems as well as embedded-systems projects at MIT Media Lab and Harvard GSD. **Saadi Lahlou** is a social psychologist who heads the Laboratory of Design for Cognition at EDF R&D, a user laboratory in a large end-user organization where many meetings have been systematically recorded in order to push the state of the art and foster dissemination [3, 13]. He is the coordinator of the rufae (research on user-friendly augmented environments) network: www.rufae.net. **Scott Carter** is a research scientist at FXPAL. His work focuses on tool support for early-stage experimentation with ubiquitous computing applications [6]. He developed several ubicomp technologies, including peripheral displays and capture and access systems, as a doctoral candidate at UC Berkeley. **Jeffrey Huang** is Associate Professor of Architecture and Digital Media at the Harvard University Graduate School of Design. His research focuses on the design of augmented spaces for learning, meeting, brainstorming and other types of everyday social activities. Recent projects include the Swisshouse in Boston, Team Learning Module (TLM), Digital Agora in Washington DC, and Smart Store in Helsinki. [12, 13]. **Masatomi Inagaki**, Fuji Xerox, Japan, is a corporate technology planner in ubiquitous technology area. Currently, his work is focused on designing next-generation workplaces for effective and creative collaboration. He has an MS in system design and management from MIT. **Kazunori Horikiri**, Fuji Xerox, Japan, is an engineer and designer who has expertise in ubiquitous computing and distributed computing. Currently, his work is focused on designing computing-embedded workplaces that enable knowledge workers to achieve effective and creative collaboration.

5 Participation

Selection of workshop participants and presentations will be based on refereed submissions. Authors are invited to submit a 1-2 page position statement describing their interest, experience or ongoing research in the field, and including a brief biography. Position statements should have only one author, and admission to the workshop will be for that person only. Position statements should be sent directly to back@fxpal.com and will be published on the website. Furthermore, we would like to cap the workshop at about 20 participants (including organizers). Both informal queries and the depth of response to previous workshops revealed considerable interest in the topic, and we believe that entry will be competitive. We will strive to attract diverse viewpoints, including people from different cultures,

research areas, and disciplines, while maintaining a cohesive line of inquiry throughout the workshop. We hope to engage people with expertise in tangible interfaces, personal devices, design of smart environments, multimedia communication, ubiquitous display systems, social networks and software; and to draw engineers, researchers, and designers from both industry and academia.

To this end we will create a web site (the proposed URL is http://www.fxpal.com/UbiComp2007) describing the workshop and the research areas of likely interest. The site will be linked from each of our organizations' web sites as well as the UbiComp 2007 site. We will distribute flyers at appropriate related conferences and at sites such as university computer science departments. Each of us will email solicitations to our professional lists, inform our colleagues, and issue personal solicitations for position paper submission to people we believe would make significant contributions to the workshop.

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