The Spaces In-between: Seamful vs. Seamless Interactions [UbiComp 2005 Workshop CFP]

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ABSTRACT

This workshop will explore issues related to the design of ubiquitous computing environments that include multi-surface, multi-display, and multi-device infrastructure. The goal of the workshop is to explore the question of how system designers might best address the issue of gaps between the different technological components with respect to end users and their interactions in these spaces. In essence, should the 'design space' between the devices be removed to create seamless interactions, or should it be retained, exposed or even made explicit, for a more seamful interaction experience? We will bring together a group of researchers who share the common vision of a multi-surface, multi-display, multi-device computing environments, but who have varying perspectives on the question of seamful vs. seamless interaction in these environments in order to identify the design tradeoffs and benefits of each. The workshop will include brief presentations from each participant, break out group discussions, and a brainstorming session to develop usage scenarios.

Keywords

Ubiquitous computing, seamful interaction, seamless interaction, explicit interactions, implicit interactions, displays, trust, privacy, awareness, multi-device, cross-device.

1. SUMMARY

Technological advances are moving us into a world of large ubiquitous display surfaces, interspersed with desktop computers, portable laptops, and personal mobile devices. Recent research has focused on interoperability and walk-up ad hoc connection schemes. This workshop will focus on the spaces *between* computational devices, in design terms: the individual differences, incompatibilities and 'losses in translation' that form part of the character of each device. The workshop explores the question of whether they should be removed so as to make a system 'seamless' or, in a more seamful way, made visible, highlighted or even magnified in a design.

Our goal is to bring together researchers with complementary expertise and viewpoints; the various "shareholders" include technologists (emphasis on the enabling hardware/technology), HCI researchers and interaction designers (emphasis on the interaction and experience design involving the technology) and industrial designers. The main goals for this workshop are (1) to review systems from different points along the seamful/seamless spectrum, (2) to identify the design tradeoffs and benefits of seamful and seamless interactions, and (3) enumerate usage scenarios that may serve to drive the design and evaluation of the different approaches.

The scope of interest includes, but is not limited to:

- Interaction techniques
  - + cross-device and intra-device management
  - + implicit and explicit interactions
  - + user-initiated and system-initiated actions
  - + input redirection and opportunistic annexing
- Displays and Devices
  - + novel technologies
  - + large displays
  - + distributed displays
- Privacy issues
  - + awareness vs. anonymity
  - + trust
  - + security
- Applications and sample scenarios
  - + benefits and tradeoffs

2. AUDIENCE

We encourage participation from researchers with a diversity of backgrounds (e.g., hardware, software, and design) but who share the common vision of multi-surface, multi-display, multi-device computing environments. We hope to have a mix of industrial and academic participants. Our current target workshop size is 15-18 people. Due to space limitations we anticipate that only one author per position paper will be able to participate in the workshop. If space permits multiple authors may attend. We will not know our final space constraints and headcount until closer to the conference.

3. FORMAT

The workshop will be highly interactive, and include brief presentations from each participant concerning their work, group break out sessions to discuss and debate the workshop themes in more details, and a brainstorming session to identify compelling usage scenarios to drive the development and evaluation of these systems. To encourage lively discussion, the workshop will be limited to 15-18 people. Position statements of accepted participants will be provided to all participants prior to the workshop in electronic form on the workshop web site: http://inbetween.merl.com.

4. SUBMISSION DETAILS

Interested parties should submit position statements that briefly describe their background, identify their area of expertise, and outline one or more research issue they would like to raise for discussion during the workshop, along with their initial thoughts on the three goals outlined for the workshop. Please discuss any of your previous, current or planned work that addresses these issues. The committee will select participants based on the significance and clarity of the research questions, with an eye towards diversity across disciplines.

Each position paper should be no more than four pages in length and should be in ACM SIGCHI format. Papers should be submitted in PDF format on or before June 24, 2005 to (inbetween@merl.com) with a subject line "Ubicomp 2005 Inbetween Workshop submission."

Position papers of all accepted participants will be posted on the workshop website in August. The workshop website will also contain workshop details (including a program based on the accepted participants), and the results of the workshop.

5. IMPORTANT DATES

Submission Deadline: June 24, 2005 (extended from June 17)

Acceptance Notification: July 25, 2005

Upload Final Version: August 19, 2005

Workshop: September 11, 2005

6. SAMPLE SCENARIOS

As part of the workshop we will brainstorm different usage and application scenarios to illustrate when seamless interactions are most appropriate, when seamful interactions are most appropriate, and when both are needed.

We hope to identify and enumerate the considerations that will most help designers choose where along the spectrum they want their systems to fall. For example, when is it appropriate for a user to trust the devices in a multi-device environment? Seamless interaction presumes that users trust devices completely with their information. However, that trust may not be justified; devices may capture information and use it maliciously. In practice users may want to modify the components, content, and behavior of interfaces when interacting across multiple devices. Security is closely related to the issue of trust – the more seamless an interface, the greater the risk to the security of the user's device (and by extension the user's information).

The development of a good set of usage scenarios will also help to create a specification or requirement for the technological support needed to support these systems as well. For example, how can a system support seamless connection and association when different devices have different form factors of input, display output, network capabilities? What technologies are available today, and what technologies need to be developed?

More generally we wish to address the question of whether we can design and build a gradient of levels of seamful/seamless systems and identify gaps in today's technologies that prevent, or at least make it difficult, to support the range of possibilities along the spectrum.

The following two sample scenarios are meant as starting points for our discussions, to give prospective participants an idea of the domains and issues we hope to explore. Part of the workshop goals are to develop a broader set of examples, and to make their design choices explicit. Both should aid future development ubiquitous computing environments, systems and applications.

Sample Scenario 1: *PDA Interactions with a Ubiquitous Environment* Imagine a ubiquitous computing environment in which all the surfaces are interactive – walls, tables, kiosks, windows and so forth. As a user walks around in such an interaction space with her PDA, she can use it as an input device to interact with other devices and content in the environment. Should the (ubiquitous) system keep track of which other interactive surfaces she is close to? As she walks up close to a table, should the associated connection between her PDA and a device in the environment, say a table be made automatically for her so that a swipe of her stylus on her PDA on an image will 'move' the image onto the table? Or should there be an explicit action on her part to initiate a "linking" between her PDA and the table? Each approach has implications for privacy, awareness and interaction. After that, should her PDA stylus input be redirected onto the tabletop? When she "leaves" the table (walks away or powers off her device), should the table automatically 'wipe' away here content, leaving no indication or memory of her being ever there? Or should she make a conscious decision as to whether to leave or delete her content, and take an explicit action to do so? The choices a designer makes in the above scenario will create and support different usage domains, user experience and applications.

Sample Scenario 2: *Accessing Your Content and How to Divide an Interface* In this example, we once again have a multi-device ubiquitous computing environment. This time, however, the user wishes to access her own content – she has her cell phone with her email on it. Although she can interact with her email on her own device, she wishes to exploit one of the devices available in the space. She might want to divide the interface to her email client across her cell phone (a trusted device) and a device in the local environment in different ways depending on how much she trusts the other device. At home or in her office, for example, she could transfer it completely, as she fully trusts the other device. In a more public setting that she (mostly) trusted, she might transfer the inbox, but use her cell phone to approve requests (e.g., read email, compose email). A number of other possibilities exist – she could initiate transfer of a single message from the cell phone, read and reply on the other device, allow composing messages on the other device, but not transfer headers and remove all contact information from the body if replying to an existing message, and so on. Another consideration is the visibility of the other device she wishes to use. Is it a desktop (traditionally a

single-user device) or a larger (and more public) wall display? She may choose to display different content based on the size and accessibility of the other device and its display. The interactions here represent a more seamful interface, in which the user initiates the division of the interface based on the environment at hand.

7. COMMITTEE

Position papers will be evaluated by the committee below. Committee members are encouraged to submit their own position papers.

Kathy Ryall, MERL (USA)
Ravin Balakrishnan, University of Toronto (Canada)
Matthew Chalmers, University of Glasgow (UK)
Scott Klemmer, Stanford University (USA)
Kumiyo Nakakoji, University of Tokyo (Japan)
Jeff Pierce, Georgia Institute of Technology (USA)
Chia Shen, MERL (USA)

Kathy Ryall is Principal Technical Staff at Mitsubishi Electric Research Labs (MERL). Her current research is on the design and implementation of interfaces and interaction techniques to support multi-user collaboration on shared surfaces. She currently leads the DiamondTouch project, developing the infrastructure for MERL's multi-user, multi-touch technology, and coordinating collaborations with external groups. Her research interests and activities span the HCI and information visualization domains, with recent projects such as UbiTable, HuGS, and Intelligent Multi-Dimensional Data Summarization. The common thread across her work is to explore systems in which the interface acts as a medium for people and computers to work together on solving problems, rather than as a means for people to control computers. She has developed systems for a variety of tasks in the computer graphics and graphic design domains, along with multi-user interactive tabletop applications.

Ravin Balakrishnan is an Assistant Professor at the Department of Computer Science, University of Toronto, where he co-directs the Dynamic Graphics Project (DGP) laboratory. He is also a member of the Knowledge Media Design Institute (KMDI). His research interests are in Human Computer Interaction (HCI) and Interactive Computer Graphics, with a current focus on innovative interaction techniques, interfaces for next generation displays, information visualization, interfaces for animation and 3D modeling, sketch-based interfaces, ambient and pervasive computing, and empirical evaluation of user interfaces including associated metrics and predictive models of human performance. He currently holds the Bell University Laboratories Assistant Professorship in HCI at the University of Toronto, and is the recipient of a Premier's Research Excellence Award.

Matthew Chalmers is a Reader in Computing Science at the University of Glasgow. He is a Principal Investigator in Equator, a UK EPSRC interdisciplinary research collaboration. His research investigates social/perceptual issues both on the system side, in visualisation, collaborative filtering and ubiquitous computing, and on the theoretical side, relating contemporary semiology/philosophy to computational representation. He was intern at Xerox PARC and then worked at Xerox EuroPARC on early 'active badge' systems and information visualisation tools. He ran an infovis research group at UBS Ubilab, in Zurich, and then stopped off for a fellowship in Japan while en route to U. Glasgow. He was an associate chair for ACM CHI, is on the editorial board for the Information Visualization book series from Springer Verlag, is an associate editor for J. Information Visualization, and is on perhaps too many other paper committees in the areas of information visualization, CSCW, information retrieval, and ubiquitous/pervasive computing.

Scott Klemmer is an Assistant Professor of Computer Science at Stanford University, where he co-directs the Human-Computer Interaction Group. He received a dual BA in Art-Semiotics and Computer Science from Brown University in 1999, and an MS and PhD in Computer Science from UC Berkeley in 2001 and 2004 respectively. His research addresses tangible user interfaces and user interface software tools. Several of his research systems have had commercial impact: the SUEDE speech design tool has been used and extended by dozens of companies; The Designers' Outpost system for vision-based capture of walls inspired product features at SMART Technologies; and the handheld Books with Voices system helped fuel advanced development at Ricoh Innovations.

Kumiyo Nakakoji is a Full Professor at the Research Center for Advanced Science and Technology, University of Tokyo, Japan. Her current research interests include the knowledge interaction design framework for the development of interactive systems for creative knowledge work, and for supporting collective creativity. Her latest project focuses on an interaction design framework for incremental presentation of interaction histories within a real world.

Jeff Pierce is an Assistant Professor in the College of Computing at Georgia Tech. He is the director of the Personal Information Environments research group, and co-director of the Adaptive Personalized Information Environments lab. Dr. Pierce's research focuses on exploring how to support and augment users' work practices as they shift from working with a single personal computer to interacting across a heterogeneous collection of computing devices. Dr. Pierce's recent publications on seamful and seamless interaction include a discussion of the opportunities and challenges for opportunistic annexing and an investigation of authentication mechanisms for annexing devices.

Chia Shen is a Senior Research Scientist and Associate Director at the MERL Research Lab (www.merl.com/people/shen). Her current research focuses on shared interactive surfaces, visualization groupware and multi-device environments. Her most recent research projects include DiamondSpin, UbiTable and PDH (Personal Digital Historian). Previously, Chia Shen has lead the MidART research project which has been successfully incorporated into several large distributed industrial plant control systems. MidART is a real-time middleware for applications where humans need to interact, control and monitor instruments and devices in a network environment through computer interfaces.

8. CONTACTS

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Workshop Website	**http://inbetween.merl.com/**