

# IUI 2012 2nd Workshop on Location Awareness for Mixed and Dual Reality (LaMDa'12)

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### ABSTRACT

The workshop explores the interactions between location awareness and Dual/Mixed Reality in smart environments and the impact on culture and society. The main scope of this workshop is: How can the Dual Reality paradigm be used to improve applications in smart environments and which new possibilities are opened up by these paradigms? This includes positioning methods and location-based services using the DR paradigm, such as navigation services and group interaction services (location-based social signal processing). The workshop is also open to discuss sensor and actuator technologies that may help to realize the synchronization of the virtual and real world.

The main scope of this workshop is: How can the Dual Reality paradigm be used to improve location-based and socially-aware services and other applications in smart environments?

### Author Keywords

Dual Reality; Mixed Reality; Positioning; Location-Based Services; Social Anthropology

### ACM Classification Keywords

H.5.2 Information Interfaces and Presentation: User Interfaces; H.5.3 Information Interfaces and Presentation: Group and Organization Interfaces

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IUI'12, February 14–17, 2012, Lisbon, Portugal.

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### MOTIVATION AND OBJECTIVES OF THE WORKSHOP:

Dual Reality (DR) and Mixed Reality (MR) gained a lot of interest over the last years, as both concepts enable the development of new applications and new intuitive user interfaces. To represent the current real-world state in a virtual model and to bring changes from the virtual world into the real world, both worlds have to be synchronized, so that each action in the real world has an effect on the virtual model and vice versa. This concept is referred to as Dual Reality (DR). Using the sensors of smart environments, recognized actions can be used for adapting the current state of the virtual model and effectors can be used to bring changes in the virtual world into the real world. Location awareness and positioning of users as well as objects where identified as an important *enabling technology* during the first LaMDa workshop, which was held in conjunction with IUI 2011. On the other hand, a synchronous virtual representation of the real world could also help to improve the accuracy of such real world positioning systems.

Generally, many applications already use virtual representations of the real world, which are restricted, or modeled according to the application's needs. For example, a navigation system uses a map to indicate the position of the user; a steerable projector needs a three-dimensional model to find appropriate presentation areas and to be able to accomplish distortion-free projections. Assuming that a synchronized virtual model of the real world exists, many applications could use that model to gain the required representation. Moreover, a virtual model can also be used for simulation and it is valuable for development and testing. Some applications, for example a product finder in a retail environment, need up-to-date information about recent changes in the real world, e.g. relocation of products by customers or staff. Even simulation results from the virtual world could have a benefit on the real world by proactively transmitting the relevant changes into the real world. For example, a simulation

might yield to the conclusion that assigning more staff to the cashiers will lead to optimized queue behavior.

Since DR also offers interfaces from the virtual world to the real one, information measured and calculated in the virtuality can be used to adapt assistant systems in the real world. For instance, if the system calculates in the virtual model that a user cannot see a specific product from his or her current position because it is hidden behind a bigger one, it can adapt the assistant system in the real world. A further example of the interoperability of the virtual and real world is a scenario in which a shopper may consult a friend in the virtual world or in the real world.

In many cases, services and applications depend both on the social context and on the location context. Since positioning methods are crucial for location-based services and DR or MR systems, one focus will be on indoor and outdoor positioning methods. The social context requires detection and representation of the social situation gained through Social Signal Processing.

In regards to the location context, a wide variety of indoor positioning technologies have been proposed in the literature ranging from tag-based systems (e.g., RFID) to radio wave technologies (e.g., WLAN or ultrawideband). The aforementioned technologies vary in accuracy (ranging from a few meters to centimeters) and in the deployment costs. The development of different technologies has been mainly motivated by the trade-off between positioning accuracy and deployment costs, but from the application and user perspective, the main issues typically are whether the positioning accuracy is sufficiently good for the target application and whether the positioning errors are predictable and consistent in different areas. As part of the workshop, we discuss how accurate indoor positioning has to be for different applications and if/how the accuracy can be enhanced using a detailed virtual model in the sense of DR and MR.

As for the social context, people are often part of a group like family, colleagues or friends. The social group may exist in the real world, in the virtual world or in both of them. Interaction with group mates should be based on the group structure, the group members' locations and orientations, the proximity, the social characteristics of the group, etc. The situational awareness requires social signal sensing, processing, representation and visualization.

Another interesting aspect is the impact DR and MR technology could have on society in general. This includes questions about privacy issues as well as changes in the communication behavior, as can already be observed by the impact of email, Facebook, Twitter and the like.

The first LaMDa workshop was rated as very interesting and inspiring by the participants. This was mainly due to the moderated discussion-blocks that were held in the middle and at the end of the workshop. During these discussions, a mindmap was created by the participants, which aimed to put the different contributions into context and to identify similarities as well as synergy potential. We will continue to do this during this iteration of the workshop. Another highly

rated aspect was the contribution and participation of Sally Applin and Michael Fischer, two anthropologists, who gave an interesting new point of view on social aspects of Dual Reality and introduced the concept of PolySocial Reality. Their contribution to LaMDa was even discussed by Bruce Sterling, a science fiction novelist and one of the founders of the cyberpunk genre, on the Wired magazine 'beyond the beyond' blog. With Sally Applin being an organizer in the second LaMDa Workshop will broaden this interdisciplinary approach.

#### **WORKSHOP TOPICS**

The workshop explores the interactions between location awareness and Dual/Mixed Reality in smart environments and the impact on culture and society. The main scope of this workshop is: How can the Dual Reality paradigm be used to improve applications in smart environments and which new possibilities are opened up by these paradigms? This includes positioning methods and location-based services using the DR paradigm, such as navigation services and group interaction services (location-based social signal processing). The workshop is also open to discuss sensor and actuator technologies that may help to realize the synchronization of the virtual and real world.

#### **POTENTIAL PARTICIPANTS AND WORKSHOP ATTRACTION:**

The workshop invites submissions of position papers that address one or more of the target research questions. Each paper will be peer-reviewed by at least two members of the international program committee (potential members listed at the end of the proposal). The workshop proceedings, which comprise of the accepted papers together with summaries of the discussions at the workshop, will be published by the Cluster of Excellence for Multimodal Computing & Interaction, Saarbrücken. Depending on the number and quality of submissions, selected papers might develop into a special issue of a suitable journal, such as IEEE Pervasive Computing.

We expect to have between 20 and 30 participants from academia and industry. Potential participants will be attracted by disseminating the call for papers to relevant mailing lists and research groups. Relevant mailing lists for disseminating the call for papers include IUI announcements, the User Modeling mailing list, Ubicomp announcements and SIGCHI announcements.

#### **FORMAT**

The workshop is planned as full-day and sessions will be centered around specific research questions. Each session will start with short presentations of position papers (10 to 15 min each) and the presentations will be followed by an interactive discussion phase that attempts to identify open issues and potential future directions for the corresponding research question. During each session, one of the workshop organizers will act as a moderator for the discussions and another will record the outcomes of the discussion. The discussion notes will be reviewed at the end of the workshop and the final, revised notes will be made publicly available on the workshop web page.

More specifically, the workshop will address the following research questions:

- **Location:** What level of accuracy is required for location-based services in smart environments? How can a detailed virtual model help to improve real world positioning systems?
- **Mixed and Dual Reality:** How can Mixed or Dual Reality paradigms be used to enhance applications? Which new possibilities are opened up through the paradigms?
- **Group interactions:** What kind of information and interfaces are useful for supporting interactions between group members in location-enhanced Dual or Mixed Reality applications?
- **Social Anthropology:** What impact could Mixed or Dual Reality have on the communication behavior and other social/anthropological aspects?

## ORGANIZATION

### Sally Applin

Sally A. Applin is a Ph.D. Candidate at the University of Kent at Canterbury, UK, in the Centre for Social Anthropology and Computing (CSAC). She holds a Masters degree from the graduate Interactive Telecommunications Program (NYU/ITP) within New York University's Tisch School of the Arts, and a BA in Conceptual Design from San Francisco State University. Sally has had a 20 year career in the science museum design, computer software, telecommunications, and product design/definition industries working as a Senior UX Designer, Ethnographic Researcher and Senior Consultant. Sally is a founding member of AnthroPunk and is currently researching the impact of technology on culture, and the consequent inverse: specifically the reifications of Virtual Space in Personal Space.

### Eyal Dim

Eyal Dim is a researcher at the University of Haifa. He is currently working on his PhD thesis on the topic "Exploring the Potential of Social Signal Processing Technology for Supporting Leisure Activities: the Museum Group Visit Experience", which deals with indoor sensors and processing methods for detection and analysis of group social context.

### Gerrit Kahl

Gerrit Kahl is a researcher at the German Research Center for Artificial Intelligence (DFKI) in Saarbrücken. He is also working at the Innovative Retail Laboratory, a living lab representing an instrumented shopping environment. He is currently working on his PhD thesis on the topic "Applying the Dual Reality Paradigm to Instrumented Shopping Environments". In this context, he is studying the visualization of simulator in- and outputs in a virtual model.

### Petteri Nurmi

Petteri Nurmi is a researcher at the Helsinki Institute for Information Technology HIIT. He has studied computer science at the University of Helsinki, where he obtained a M.Sc. in 2006 and a Ph.D. in 2009. Currently, he is the co-leader of the Adaptive Computing research group at HIIT. His research interests focus on intelligent mobile systems, including personalization, context recognition and novel interaction techniques. He has published over 40 scientific articles and served as a reviewer and program committee member for several conferences and journals. He was the workshop co-chair for Pervasive 2010 and he is a program committee member for IUI 2011. He has previously participated in the organization of four workshops, most recently the Pervasive User Modeling and Personalization workshop held at the UMAP 2010 conference.

**Teemu Pulkkinen** Teemu Pulkkinen is a project researcher at the Helsinki Institute for Information Technology HIIT. He has studied computer science at the University of Helsinki, where he received his M.Sc. in 2010. His research has focused on indoor positioning systems, as well as the design of a cohesive and easy-to-use framework for ubiquitous positioning.

### Tim Schwartz

Tim Schwartz is a researcher at DFKI (German Research Center for Artificial Intelligence) and is associated to the Cluster of Excellence for Multimodal Computing and Interaction at the Saarland University. His main research interests lie in the field of indoor positioning methods, which follow the 'Always Best Positioned' paradigm.