PeTRE - Workshop on Pervasive Technologies in Retail Environments

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Abstract
The main goal of this workshop is to explore how pervasive technologies can be integrated into today's brick and mortar retail environments to enhance the overall retail experience. Therefore we want to bring together researchers and industry partners to explore not only customer orientated technologies and services but also how those technologies can be used to increase the effectiveness and productivity and with that enhance the retailers profits.

Author Keywords
Retail Environments, Smart Spaces, Public Displays, Mobile Interaction, Localisation, RFID, NFC

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

General Terms
Design, Human Factors, Algorithms

Workshop Topics and Research Questions
With convenience of home-delivery, quick access to information, and full transparency of prices put, and convenience of home delivery, eCommerce puts the business models of today's brick and mortar retail stores under threat. They will have to change drastically in order to justify the costs and combine the

advantages of physical store layouts with the convenience of digital information and services [7]. New experiences are demanded and necessary to retain and attract new customers. Shopping has become one of the most popular leisure time activities in economically advanced countries. People no longer only go shopping when they need something: the experience of shopping is becoming more important. The integration of the most ubiquitous computing device, the customers' mobile phone into this experience of shopping has already become reality [1]. It enables new forms of business concepts and new channels through which retailers can reach their customers and sell their products [4]. Smartphone apps focusing on shopping are being increasingly adopted, e.g. ShopSavvy, Barcoo, Scandit, My2Cents, CodeCheck. Consumers use these mostly barcode-scanning-based apps to compare prices, being informed about new special offering or they consult friends to get their advice for certain products. Retail environments have special requirements, which need to be taken into account when designing mobile applications that alleviate shopping regardless if the customer is in a hurry or loafing around [7]. From shopping lists to in-store navigation, the variety of available mobile shopping applications is huge, but the users' and retailers' benefit are yet to be understood [9]. With the current increase in commercially available head mounted displays such as the Brother AIRScouter, Oakley Airwave and the forthcoming Google Glass, new possibilities for mobile augmented reality apps will arise in the retail sector as well.

But mobile devices are only the first step, future brick and mortar retail stores will be smart spaces with integrated display networks, fully equipped with radio frequency [5] technologies, such as RFID or NFC, that will allow to locate every customer and every product [8]. This transformation yields new challenges as well as new opportunities, such as easy to use and deeply integrated services always available at the shopping cart [6]. With ubiquitous tracking systems available retailers will be able to analyze the customer flow and detect flaws in the shop design. Furthermore they can also manage their workface more effectively. The data that will be generated by these future sensing-capabilities of smart retail spaces will be enormous. Already today the amount of data that retailers gather is increasing and often not exploited. In contrast to many other real life situations like e.g. locomotion, no algorithms exist that try to establish activity recognition in retail environments. Big Data in such environments will generate tremendous opportunities to identify customer intentions and will allow to adapt the environment to their needs and desires.

Furthermore with increasing miniaturization, capabilities and reliability of robotic technologies the utilization as a shop clerk for example to restock shelves will be possible in the near future. Especially drones such as Multicopters keep a high potential to be introduced into future brick and mortar stores. Besides using them as security cameras [2] that can capture every spot of the market, they could also be employed as shopping assistants guiding customers or detect out of shelf events of products.

Also, given the diverse and heterogeneous nature of pervasive computing technologies today, where island solutions not only exist in different domains, but even within the domain of retail, there are numerous pervasive computing application silos that are hardly interoperable. One challenge of transferring pervasive computing technologies for retail out of the research laboratories into industry adopted realities, is therefore

to provide standardized architectural reference models and best practices in order for Pervasive Technologies in Retail Environments to gain momentum and wide adoption in the business realities of the future. Applying results from Initiatives such as [3] to the domain of retail will thus be a concern of the workshop.

The workshop is a continuation of the Mobile Interaction in Retail Environments (MIRE11) Workshop held in conjunction with MobileHCI 2011. By today several distinguished research groups exist that solely focus on the topic of pervasive computing in future retail environments. Also complete laboratories that try to fabricate these future retail experiences have been established in the last years. A few examples are the SAP Future Retail Center, the Innovative Retail Laboratory or the Metro Future Store. The goal of this workshop is going beyond today's state-of-the-art and generate an understanding on how pervasive technology can be integrated in retail environments to create new shopping experiences and enhanced services. The workshop specifically addresses the following research questions: (1) What are the unique properties and affordances of retail environments that can be tackled by pervasive technologies? (2) How can consumers be supported in their decision making process? (3) How can brick and mortar retailers benefit from mechanisms of eCommerce and pervasive computing? (4) How can social media add to the retailer-consumer relationship? (5) How may future retail address the challenges of full price transparency, informed consumers, diminishing margins, emotionalization of the shopping experience and emerging automated ways of delivery? (6) How can we develop interoperable technological foundations and architectures for future augmented retail stores that help proliferating pervasive computing approaches and gain widespread adoption among retailers?

Workshop Plan

Before the Workshop

In order to ensure a maximum exposure, the call for papers will be distributed in several research communities, including those of Ubiquitous and Pervasive Computing, ecommerce and retail business research, HCI, mobile interaction, and the IoT communities. Furthermore, we will setup a webpage for the workshop and use Twitter, LinkedIn and Facebook to inform about scope, CfP, organizers, reviewers and organizational issues.
We aim for a one-day workshop with a selection of 15-20 active workshop participants selected based on their submitted papers (up to 4 pages) that are either case studies or research contributions outlining new insights. The submissions will be peer-reviewed by at least two reviewers from an international PC. The following individuals have already agreed to serve in the international program committee: Felix von Reischach (ETH Zurich), Florian Alt (University of Stuttgart), Joerg Mueller (T-Labs), Frederic Thiesse (University of Würzburg), Patrick Olivier (Newcastle University), Manfred Tschegili (University of Salzburg), Ralf Jung (Innovative Retail Laboratory), Sebastian Boring (University of Copenhagen), Sven Gehring (DFKI), Martin Fiedler (SAP)

15 min	Welcome and introduction
1 hour	Session: Location sensing and interpretation for retail environments
	mid-morning break
1 hour	Session: Infrastructure combining eCommerce with brick and mortar stores concepts
	lunch break
1 hour	Session: Pervasive public displays and human product interaction.
1 hour	Session: Business Models and Social Impact
	mid-afternoon break
1 hour	Break out group discussions
45 min	Towards a road map for pervasive technologies in retail: conclusions, wrap-up from working group results

Figure 1: The provisional workshop schedule. The discussions will be followed by a wrap-up session in which a roadmap for the future of pervasive technologies in retail environments will be drafted.

At the Workshop

The workshop will be organized in distinct sessions of paper presentations and working group discussions based on the topics called for. A provisional schedule for the workshop can be seen in Figure 1. To promote the exchange of ideas, a dedicated discussant will be appointed for each paper. This person will receive the text of the paper in advance, with the task of preparing comments and questions and moderating the discussion. Accepted papers will be edited for print and online publication in a proceedings document available for reference at the workshop day.

After the Workshop

All position statements, slides, discussion results, etc. will be published on the workshop website and relevant online platforms (such as Slideshare and Flickr). The proceedings will also be made available via the ACM Digital Library as offered by the conference organizers. We intend to publish selected workshop contributions in a special issue of a journal such as the Journal of Personal and Ubiquitous Computing. In addition to the proceedings, the workshop participants will be encouraged to join the PeTRE mailing list, which serves as a forum for exchanging information in the area of the workshop topic

Organizers Background

Markus Löchtefeld is a researcher at the German Research Center for Artificial Intelligence (DFKI). As part of the Innovative Retail Laboratory he is working on mobile interaction techniques in retail environments. His main research focuses on new interaction techniques for mobile projection interfaces.

Petteri Nurmi is a researcher at the Helsinki Institute for Information Technology. He is co-leading the Adaptive Computing research group. His research focuses on the intersection between user modeling, ubiquitous computing and HCI. As part of his current work, he is exploring how mobile devices can be used to assist customers in grocery shopping. He has published 40+ papers in international journals, conferences and scientific workshops. He was the workshop co-chair for Pervasive 2010.

Florian Michahelles directs research about internet of things focusing both on mobile commerce innovations for consumers and global standards for supply-chain optimization as part of the Auto-ID Labs network. Michahelles has published 100+ papers in international journals, conferences and scientific workshops. He has been program chair of several international conferences, such as IoT, MUM, and Mobiquitous.

Carsten Magerkurth is a research manager at SAP Research based in Zurich, Switzerland. He has conducted several research projects in the area of mobile computing and retail and is associated with the Future Retail Center, SAP's living lab in the area of innovations in retail and logistics. His main research focus is on Human Computer Interaction in Smart Environments.

Antonio Krüger is a Professor at Saarland University and is the scientific director of the Innovative Retail Laboratory, which is part of the German Research Center for Artificial Intelligence (DFKI).

Patrik Floréen is a University Lecturer in Computer Science at University of Helsinki since 2003. He leads

the Adaptive Computing research group founded in 2003, lately together with Dr. Petteri Nurmi. He is member of the Joint Pervasive-UbiComp Steering Committee. Floréen was Director of HIIT in 2009-10 and Interim Helsinki Node Director for EIT ICT Labs in 2010 and is now Vice-Director of HIIT until 2015.

Preliminary Call for Papers

The workshop on Pervasive Technologies in Retail Environments (PeTRE) is the continuation of MIRE 2011 (held at MobileHCI 2011) and provides a established forum for researchers from academy and industry exploring how pervasive technologies can be embedded into retail environments to create new shopping experiences and services. The goals of the workshop are to

- discuss the integration of pervasive technologies into retailing;
- construct a roadmap for future integration of pervasive technologies in retailing and
- strengthen and extend the community of this rapidly developing field.

We invite both case studies discussing real-world deployments as well as original research contributions in one of the following topic areas:

- mobile applications for retail contexts,
- location sensing and customer flow analysis
- pervasive public displays
- personalization and user/customer modeling for the retail domain
- human product interaction
- infrastructure standards
- integration and interaction with robots and drones
- infrastructure combining eCommerce with brick and mortar stores
- social media in the retail context,
- business models and social impact.

Papers should be formatted following the SIGCHI archival format and should not exceed 4 pages in length. Participants will be selected based on the submissions and each paper will be peer-reviewed by at least two members of the international program committee. Papers should be submitted via EasyChair. Authors of accepted papers are required to register both for the workshop and the main conference. Accepted papers will be included in the proceedings of the workshop and published in the ACM Digital Library.

The workshop is formatted into six sessions. The first four sessions consist of paper presentations with room for extended discussions. The paper sessions will be followed by breakout group discussions. The final session wraps-up the group discussions and constructs a roadmap for pervasive retail.

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