Editorial Message: Special Track on Ubiquitous Computing

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ABSTRACT

Ubiquitous computing places humans in the center of environments saturated with computing and wireless communications capabilities, yet gracefully integrated, so that technology recedes in the background of everyday activities. The ubiquitous computing world then, is a world largely defined by applications. But such applications present an altogether new set of requirements. The special track on ubiquitous computing applications, first introduced in ACM SAC 2004, provides a forum for the discussion of all types of ubiquitous computing applications and related specialized infrastructures built for the deployment of targeted applications. Individual papers place applications within their use context and introduce novel and appropriate interaction paradigms while at the same time addressing related technical and business aspects and consequently identify novel opportunities or constraints.

1. INTRODUCTION AND RATIONALE

Ubiquitous computing places humans in the center of environments saturated with computing and wireless communications capabilities, yet gracefully integrated, so that technology recedes in the background of everyday activities. Indeed, the vision of an activated world is action oriented and rather than dictates, it follows and enhances human behavior. This vision of seamless cohabitation of the world by humans and computers was first discussed in Mark Weiser's article "The Computer for the 21st Century," where it was stated that "the most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it".

The ubiquitous computing world then, is a world largely defined by applications. But such applications present an altogether new set of requirements: they are developed at the many layers of the physical world, that is they may be global, environmental, spatial, personal, handheld, wearable or embedded; they may be personal or social; they may be made up of any of a number of components coordinated centrally or built as a distributed and decentralized architecture, autonomous or un-affiliated; they may vary on their degree of physical integration as well as their integration with existing information infrastructures; they may show spontaneous behavior; they may create an ambient intelligence landscape; and last but not least they may be embedded, pervasive or mobile. Thus, from a computer science perspective many see ubiquitous computing as primarily a systems engineering problem.

On the other hand, ubiquitous computing successes to date have come into the spotlight primarily through implementations of applications: Stanford's iroom, HP Labs' Cooltown, University of Washington's Labscape, the EU funded MyGrocer retail application, Georgia Tech's Aware House, UC San Diego's Active Campus and Lancaster University's GUIDE are some of the applications that have paved the way for ubiquitous computing. Hence, we assert that research through prototype implementation constitutes an important alternative to ubiquitous computing development following a systems engineering approach.

Following this discussion, it appears appropriate that this track on ubiquitous computing applications should:

- Showcase the state of the art of ubiquitous computing applications.
- Provide a forum for researchers to present prototype ubiquitous computing applications.
- Identify the limitations of current technologies to support ubiquitous computing infrastructures.
- Explore how applications create new research directions in ubiquitous infrastructure and technology.
- Promote the concept of research through experimentation with ubiquitous computing applications.
- Develop a set of applications that can be used to benchmark the efficiency and the effectiveness of ubiquitous computing infrastructures.
- Identify the social implications of the deployment and of the widespread use of ubiquitous computing applications.

Unlike other conferences that take a systems engineering point of view for the development of ubiquitous computing, which often presupposes the development of global infrastructures, in this track we opt for a more experimental, explorative approach. Indeed, application-driven research has been the foundation of excellent research contributions from the computer science community. We believe that this research philosophy is essential for the ubiquitous computing community.

Moreover, ubiquitous computing is fundamentally interdisciplinary and has to negotiate a balance between different research communities. We believe that especially at this point in the development of the ubiquitous computing research agenda, applications offer the potential to provide key breakthroughs and identify requirements.

Moreover, one of the main problems with ubiquitous computing research today is in identifying suitable criteria for the evaluation of novel systems since "traditional" criteria are often unsuitable and fail to produce useful results or just cannot be easily applied. For example, guaranteed performance levels may not be crucial when human-scale latencies dominate system response and define requirements. Moreover, scalability is frequently not a concern especially for systems deployed in restricted localities, for example in an auditorium or a building rather than an entire corporation. On the other hand, fault tolerance is still important, but primarily from the point of view of the user experience as well as from its effects on the behavior of the system. Similarly, extensibility, programmability and maintainability come to the forefront when they do not become critical for systems that have to withstand change and survive for a long time or be subject to ongoing evolution. We believe that only the study of ubiquitous computing applications can offer suitable insights for the development of viable evaluation criteria.

Last but not least, we believe that the vision of ubiquitous computing is fundamentally one of applications while ubiquitous infrastructure disappears in the background. Thus, the success or failure of ubiquitous computing as the next generation of viable technology depends primarily on the design and implementation of appropriate applications. We hope that with this track ACM SAC can act as a catalyst in highlighting the prominent role of applications in ubiquitous computing.

2. UC TRACK OVERVIEW

The special track on ubiquitous computing attracted 19 paper submissions, 7 of which where accepted for inclusion to the program, an acceptance rate of 37 per cent. Submissions varied greatly in terms of applications areas, many of which are new to ubiquitous computing literature. Harrington and Cahill discuss information management issues for data gathered from sensors deployed throughout a road network in the context of intelligent transport management. They develop a context-aware route profiling application intended for use by road management authorities in the Republic of Ireland. Bardram reports on the application of context-aware computing for medical work in hospitals. In particular, he presents the design of a context-aware pill container and a context-aware hospital bed, both of which reacts and adapts according to what is happening in their context. Serif, Gulliver and Ghinea develop a framework to examine the 3-way interaction between use of equipment, user perceptual quality and quality of service in the context of pervasive infotainment service provision. Lampe, Strassner and Fleisch find that aircraft maintenance is an area where ubiquitous computing offers distinct advantages due to the extensive requirements regarding quality, safety, and documentation as well as high costs for having aircrafts idle during maintenance demand for an efficient execution of the process. Seigneur and Jensen present a scheme and a prototype implementation that mitigates this loss of privacy without forbidding the use of trust for electronic payment services in ubicomp systems. Pratistha and Zaslavsky employ an adaptable, dynamic, nomadic and resource-aware web service framework, which allows web services to react as a result of run-time requirements and poor-performance of hosts. Fujinami, Yamabe and Nakajima discuss the Context Distillery, a system that enables an application developer to obtain context information from sensors incrementally without taking account of descriptive information, meta-context information and Take me with you!, which demonstrates the capability of physical and virtual space integration. Last but not least, Berfield, Beaver and Chrysanthis discuss iPA, an intelligent personal assistant which uses profile and context filtering to provide advanced services to the end user.

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4. REFERENCES

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