Making Our Environments Intelligent

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The Fourth International Conference on Intelligent Environments was held July 21-22, 2008, at the University of Washington campus in Seattle, Washington. This conference focuses on the theme of intelligent environments, in which smart homes, smart workplaces, and other spaces with which humans interact take on the role of intelligent agents. The conference aims at contributing to the realization of the ambient intelligence vision, where physical space becomes augmented with computation, communication and digital content, thus transcending the limits of direct human perception.

Developments in the field of Intelligent Environments span the globe. As an indication of the wide-spread interest in the field, the IE conference hosted delegates from twenty-five countries around the world. In addition, papers showed the relevance of diverse fields including information and computer science, materials engineering, artificial intelligence, architecture, health care, sociology, design, networking, and intelligent agents, in both research labs and in industry.

This issue of the Journal of Pervasive and Mobile Computing highlights the top work that was presented at the 2008 Intelligent Environments conference. We have selected six papers that offer breakthroughs in designing, interacting with, and making use of intelligent environments. In the first paper, titled *Ambient intelligence platform using multi-agent system and mobile ubiquitous hardware*, Wang et al. describe a middleware platform that offers new levels of flexibility for adding and redefining pervasive computing and intelligent enviornment components. Their platform, which is built on the JADE environment, facilitates fast integration of new and different control algorithms, device networks, and user interfaces, and has been evaluated for its real-time and offline control performance.

In the second paper, *Ontology-based modeling of dynamic ubiquitous computing applications as evolving activity spheres*, Seremeti et al. introduce the notion of an activity sphere to model pervasive computing applications. In this approach, activity spheres are used to capture and store task information including the activity, its context, its agents, and its resources. State transitions for these tasks are modeled based on Discrete Event Systems and controlled using Supervisory Control Theory.

Because much of the emphasis in the field of intelligent environments is on adapting the environment to its users, less attention has been given to personalizing the way in which collected information is displayed for the user. In the third paper, *Designing an extensible architecture for personalized ambient information*, Elsholz et al. abstract over interface modalities such as visual, auditory, and haptic information. They communicate information to a user in an ambient way by abstracting output facilities and ensure privacy by personalizing the way users are notified of important information. The improvement of such personalized interfaces applied to a real-world task was measured based on the information's usefulness, relevance, accessibility, unobtrusiveness, interface understandability, and aesthetics.

One of the highest-demand applications of intelligent environments is at-home health monitoring. In the fourth paper, *Assessing behavioral rhythms and trends in everyday life for the older generation*, Virone describes algorithms for analyzing and visualizing CARs, or circadian activity rhythms. Not only can users get a visual sense of their behavioral patterns, but the algorithms automatically detect anomalies and behavioral drifts which provide baseline information on behavioral sterotypes for specific chronic pathologies.

The last two papers in this issue present novel applications for intelligent environment systems that not only expand the realm of intelligent environment uses but also offer novel algorithmic contributions for pervasive and ubiquitous computing. In their paper, *Game-based e-retailing in GOLEM agent environments*, Bromuri et al. combine social interaction facilitation with semantic web technologies to offer an on-demand, personalized shopping experience. In the last paper, *Design and evaluation of smart sensing components in a volcanic monitoring sensor network*, Peng et al. describe the design of a sensor network that supports remote monitoring, is highly configurable, and is robust in harsh environments. Their network was tested at Mount St. Helen's and has been continuously collecting information at that site.

The papers in this issue reflect the variety of research challenges that are faced in the area of intelligent environments. However, these papers also demonstrate the successes that the field has realized and the impact that the research can and will have on our everyday lives.