Ubiquitous Computing in the Real World

George Roussos
Birkbeck College, University of London

Shin'ichi Konomi
University of Colorado at Boulder

Ubiquitous computing places humans in the centre of environments saturated with computing and wireless communications capacity 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 dictate, it follows and enhances human capabilities.

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, social, handheld, wearable or embedded; they may be made up of any number of components coordinated centrally, built as a distributed and decentralised architecture, autonomous, autonomic 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 behaviour; they may create an ambient intelligence landscape; and last but not least they may be embedded, pervasive or mobile.

Yet, while academics have found a new Holy Grail to chase, ubiquitous computing has arrived in the real world. Applications are appearing everywhere and are already having a real impact on everyday life:

- Two of the largest supermarket chains, Metro in Europe and Wal-Mart in the US, are implementing RFID-based automatic identification of products in their supply chain and are considering implementations of consumer applications in retail.
- The RFID-based contactless Oyster card used by the London Underground and the Suica card in Tokyo's urban railway system are employed to identify, authenticate and track people wirelessly as they use these systems. Recent work on the Oyster system aims to extend use of the card to include payment in a variety of retail locations, following the success of the Octopus system in Hong-Kong.
- Physical object identification and numbering systems are actively deployed: in Europe and the US, EPCglobal is implementing their physical to digital lookup service based on the Electronic Product Code (EPC), Object Naming Service (OML) and Product Markup Language (PML) on top of the Verisign Network. In Japan, the Ubiquitous ID Center is deploying similar numbering and lookup services with the active participation of China and Korea.
- The Rion-Antirion bridge in Greece, the longest hanging bridge in the world, supports a fully embedded system of sensors and actuators that monitor every aspect of its structure including the effects of earthquakes.

- Fairchild-Dornier and Volskwagen employ ubiquitous computing technologies to track all tools and their users in its aircraft and rail maintenance business respectively.

For this special issue we solicit contributions that map and report on such developments, and highlight the effects of bringing ubiquitous computing to the real world:

- What are the limitations of ubiquitous systems implementation in the real world in terms of economics, regulation, business realities and market situation and can the cost be justified?
- Which systems can work outside the laboratory? Are the available infrastructures able to cater for the massive data flows created by auto-identification for example? What are the actual systems architectures that have been proven to effectively support the required workloads?
- When ubiquitous systems are deployed what are the changes that bring to people's lives? What changes are effected in people's private lives at a personal and family level and what are the changes to social etiquette?
- Is the ubiquitous computing world a utopia, which can never be reached because reality is messy? Can the vision of computing for all turn into a nightmare of surveillance and no privacy?
- Can we reverse decades of technology as conqueror to achieve "calm technology"?
- And above all, is the ubiquitous computing world a world which people seem happy to live in?

We are especially interested in systems that attempt to balance the different, frequently contradicting requirements of a real application environment, for example by catering to identified social needs while addressing specific regulatory constraints. In this, we take a particularly broad view of the terms "ubiquitous computing" as highlighted by the cases discussed above.

This special issue aims to benefit both practitioners and academics with diverse backgrounds, from technologists to social scientists. It aims to collect in single place early experiences with real world implementations of ubiquitous computing systems and help develop a consensus regarding successful practice as well as to identify critical research questions for taking ubiquitous computing into the real world.

Important Dates

Submission date: 15 January 2006
Final copy due following review: 1 May 2006
Publication date: Summer 2006

Please submit manuscripts, or address enquiries as to the suitability of submissions, to the special issue editors at g.roussos@bbk.ac.uk and konomi@colorado.edu.