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Ubiquitous Intelligence and Computing

**Third International Conference, UIC 2006
Wuhan, China, September 2006
Proceedings**

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Preface

Welcome to the proceedings of the Third International Conference on Ubiquitous Intelligence and Computing (UIC 2006), Building Smart Worlds on Real and Cyber Spaces, which was held in Wuhan and Three Gorges, China, September 3-6, 2006.

Following ubiquitous computers, networks, information, services, etc., is road towards a smart world (SW) created on both real and cyber spaces. A SW is mainly characterized by ubiquitous intelligence (UI) or computational intelligence pervasive in the physical world, filled with ubiquitous intelligent or smart things that are capable of computing, communicating, and behaving smartly with some intelligence. One of the profound implications of such ubiquitous smart things is that various kinds and levels of intelligence will exist ubiquitously in everyday objects, environments, systems and even ourselves, and possibly be extended from man-made to natural things. "UbiComp" or "percomp" can be regarded as the computing of all these intelligent/smart things/u-things, that are essential elements and components of the SW.

A smart thing can be endowed with different levels of intelligence, and may be context-aware, active, interactive, reactive, proactive, assistive, adaptive, automated, sentient, perceptual, cognitive, autonomic and/or thinking. Intelligent/smart things is an emerging research field covering many disciplines. A series of grand challenges exist to move from the ubiquitous world with universal services of any means/place/time to the SW of trustworthy services with the right means/place/time. UIC 2006 was a successor of the Second International Symposium on Ubiquitous Intelligence and Smart Worlds (UISW 2005) held in Japan, December, 2005, which succeeded the First International Workshop on Ubiquitous Smart Worlds (USW 2005) held in Taiwan, March, 2005.

The UIC 2006 conference provided a forum for engineers and scientists in academia, industry, and government to exchange ideas and experiences in developing intelligent/smart objects, environments, and systems as well as to discuss various personal/social/physical issues faced by UI and SWs.

There was a very large number of paper submissions (382), representing 25 countries and regions, not only from Asia and the Pacific, but also from Europe, and North and South America. All submissions were reviewed by at least three Program or Technical Committee members or external reviewers. It was extremely difficult to select the presentations for the conference because there were so many excellent and interesting submissions. In order to allocate as many papers as possible and keep the high quality of the conference, we finally decided to accept 117 papers for presentations, reflecting a 30% acceptance rate. We believe that all of these papers and topics not only provided novel ideas, new results, work in progress and state-of-the-art techniques in this field but also

stimulated the future research activities in the area of ubiquitous intelligence and computing.

The exciting program for this conference was the result of the hard and excellent work of many others, such as Program and Technical Committee members, external reviewers and Publication Chairs under a very tight schedule. We are also grateful to the members of the Local Organizing Committee for supporting us in handling so many organizational tasks, and to the keynote speakers for accepting to come to the conference with enthusiasm. Last but not least, we hope you enjoy the conference program, and the beautiful attractions of Three Gorges, China.

August 2006

Jianhua Ma, Hai Jin, Laurence T. Yang
Jeffrey J.P. Tsai, Victor Callaghan

Zhaohui Wu, Albert Zomaya
UIC 2006 Steering, General and Program Chairs

Organization

UIC 2006 was organized and sponsored by Huazhong University of Science & Technology (HUST), co-sponsored by the National Science Foundation of China, 863, ChinaGrid, and International Federation for Information Processing (IFIP). It was held in cooperation with the IEEE Computer Society and *Lecture Notes in Computer Science* (LNCS) of Springer.

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Ubiquitous Intelligence and Computing

4th International Conference, UIC 2007
Hong Kong, China, July 2007
Proceedings

Preface

This volume contains the proceedings of UIC 2007, the 4th International Conference on Ubiquitous Intelligence and Computing: Building Smart Worlds in Real and Cyber Spaces. The conference was held in Hong Kong, July 11-13, 2007. The event was the fourth meeting of this conference series. USW 2005 (1st International Workshop on Ubiquitous Smart World), held in March 2005 in Taiwan, was the first event in the series. This event was followed by UISW 2005 (2nd International Symposium on Ubiquitous Intelligence and Smart Worlds) held in December 2005 in Japan, and by UIC 2006 (3rd International Conference on Ubiquitous Intelligence and Computing: Building Smart Worlds in Real and Cyber Spaces) held in September 2006 in Wuhan and Three Gorges, China.

Ubiquitous computers, networks and information are paving the road towards a smart world in which computational intelligence is distributed throughout the physical environment to provide trustworthy and relevant services to people. This ubiquitous intelligence will change the computing landscape because it will enable new breeds of applications and systems to be developed; the realm of computing possibilities will be significantly extended. By embedding digital intelligence in everyday objects, our workplaces, our homes and even ourselves, many tasks and processes could be simplified, made more efficient, safer and more enjoyable. Ubiquitous computing, or pervasive computing, composes these many "smart things/u-things" to create the environments that underpin the smart world. A smart thing can be endowed with different levels of intelligence and may be context-aware, active, interactive, reactive, proactive, assistive, adaptive, automated, sentient, perceptual, cognitive, autonomic and/or thinking. The field of intelligent/smart things is an emerging research field that covers many disciplines. A series of grand challenges exist to move from the world of ubiquitous computing with universal services of any means/place/time to the smart world of trustworthy services with the right means/place/time.

The UIC 2007 conference offered a forum for researchers to exchange ideas and experiences in developing intelligent/smart objects, environments, and systems. This year, the technical program of UIC drew from a very large number of submissions: 463 papers submitted from 26 countries representing four regions — Asia Pacific, Europe, North and South America. Each accepted paper was reviewed (as a full paper) by at least three reviewers, coordinated by the international Program Committee. The Program Committee accepted 119 papers out of 463 submissions, resulting in an acceptance rate of 25.7%.

The accepted papers cover a wide range of research topics that were grouped into nine conference tracks: smart objects and embedded systems, smart spaces/environments/services, ad-hoc and intelligent networks, sensor networks, pervasive communication and mobile systems, context-aware applications and

intelligent computing, and security/safety/privacy. In addition to the refereed papers, the proceedings include Tosiyasu L. Kuni's keynote address on "Autonomic and Trusted Computing for Ubiquitous Intelligence," and an invited paper from Norio Shiratori on "Symbiotic Computing: Concept, Architecture and Its Applications." We believe that the conference not only presented novel and interesting ideas but also will stimulate future research in the area of ubiquitous intelligence and computing.

Organization of conferences with a large number of submissions requires a lot of hard work and dedication from many people. We would like to take this opportunity to thank the numerous people whose work made this conference possible and ensured its high quality. We wish to thank the authors of submitted papers, as they contributed to the conference technical program. We wish to express our deepest gratitude to the Program Vice Chairs, Antonio Maña Gomez, Marius Portmann, Zhijun Wang, and Daqing Zhang, for their hard work and commitment to quality when helping with paper selection. We would also like to thank all Program Committee members and external reviewers for their excellent job in the paper review process, the Advisory Committee for their continuous advice, and Stephen S. Yau for organizing a panel on "Future Trends of Autonomic and Ubiquitous Computing." We are also in debt to Bin Xiao for the conference local arrangements, to the Publicity Chairs for advertising the conference, to Lin Chen and other people from the Local Organizing Committee for managing registration and other conference organization-related tasks, and to Hong Kong Polytechnic University for hosting the conference. We are also grateful to Tony Li Xu and Liu Yang for their hard work on managing both the conference Web site and the conference management system, and for their help with editing the UIC proceedings.

July 2007

Jadwiga Indulska
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