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INTRODUCTION TO SPECIAL SECTION ON COMPLEX, INTELLIGENT AND SOFTWARE INTENSIVE SYSTEMS IN PERVASIVE COMPUTING ENVIRONMENTS

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1 PREFACE

As a new computing paradigm, pervasive computing aims at providing people with preferred services anytime and anywhere through portable facilities as well as traditional fixed computing devices. To make such attractive vision real, however, many

challenging issues that go much beyond conventional distributed and mobile computing need to be solved. This special section looks for significant contributions and high-quality research results on developing complex, intelligent and software intensive systems in pervasive computing environments in theoretical and practical aspects, especially on reliable broadcast, virtual computing, information classification, indexing and retrieving technologies, security grade assignment, shadow-like task migration, routing protocols, autonomous key management and efficient data storage.

This special issue grew out of selected best papers from the Fourth International Conference on Complex, Intelligent, and Software Intensive Systems (CISIS 2010) and the Fourth International Workshop on Intelligent, Mobile and Internet Services in Ubiquitous Computing (IMIS 2010), held in Kraków, Poland. These events aimed to take up the challenges and to bring together an international community in the area.

The first paper, "Reliable and Efficient way to Broadcast Messages in a Group by Trust-Based Broadcast (TBB) Scheme" from Ailixier Aikebaier, Tomoya Enokido and Makoto Takizawa, proposes a trust-based broadcast (TBB) scheme to improve the messaging reliability in distributed systems. In the TBB, only trustworthy peers are qualified to forward messages. In this way, the transmission fault implied by faults of untrustworthy peers can be reduced.

In the second paper, Shih-Hao Hung, Jeng-Peng Shieh and Chen-Pang Lee propose a framework for "Virtualizing Smartphone Applications to the Cloud", which executes existing applications on a personal virtual phone in the cloud. Their method outperforms over client-server models in the following three aspects. Firstly, virtual phones are actually controlled by their users and the users may avoid sending data to the service providers. Secondly, virtualization and encryption can be employed to protect against eavesdropping from cloud providers and network attackers. Finally, users can suspend the execution of an application on one phone and resume the execution quickly on the other phone based on an innovative application-level checkpointing mechanism.

The next paper entitled "Towards New Classes of Intelligent Cognitive Information Systems for Semantic Pattern Classification" by Marek R. Ogiela and Lidia Ogiela presents two new classes of specialized vision systems called UBIAS and E-UBIAS. Such systems belong to the group of cognitive reasoning systems and are designed for the semantic analysis of visual patterns in the form of medical images. The proposed systems are predecessors of a new generation of intelligent systems dedicated for understanding medical diagnostic visualization and using this data as biometric characteristics.

In the fourth paper entitled "Indexing and Retrieving Photographic Images Using a Combination of Geo-Location and Content-Based Features", Yong-Hwan Lee, Bonam Kim and Heung-Jun Kim propose a method that automatically indexes searches for relevant images using a combination of geo-coded information and content-based visual features. In this method, photographic images are labeled with their corresponding GPS information and UTC (Coordinated Universal Time),

which significantly improves and enhances the retrieval process compared to searches based on visual content alone. Their solution is useful and meaningful to searching and managing large image collections.

In the fifth paper "A Shadow-Like Task Migration Model Based on Context Semantics for Mobile and Pervasive Environments", Feilong Tang, Shui Yu, Minyi Guo and Song Guo investigate how to migrate executing tasks in the shadow-like way to support user-centric pervasive computing. For this purpose, the authors propose a context-sensitive task migration model that recovers program states and rebinds resources for task migrations based on context semantics. Moreover, a task migration framework xMozart was designed and developed based on the proposed model. Another advantage of this work is that it can also support multi-modality I/O interactions, providing users with better experiences.

The sixth paper "Performance Evaluation of MANET Routing Protocols: Simulations and Experiments" examines the effect of mobility and dynamic mobile ad hoc network (MANET) topology. In this paper, Makoto Ikeda, Masahiro Hiyama, Elis Kulla, Leonard Barolli and Makoto Takizawa analyze and compare ad-hoc on demand distance vector (AODV) and the optimized link state routing (OLSR) protocols through their real MANET testbed. Based on the evaluations on the two protocols in terms of three performance metrics, i.e., throughput, number of received packets and hop distance, they found that the AODV has a good performance when the relay node is moving. Also, the AODV protocol provides a flexible and effective routing for indoor environments.

The next paper "Modified Autonomous Key Management Scheme with Reduced Communication/Computing Costs in MANET" from Chu-Hsing Lin, Chen-Yu Lee and Deng-Jyi Chen presents a communication-efficient key management scheme for mobile ad hoc network (MANET). Through systematical study, they found that Shamirs secret sharing in autonomous key management (AKM) to control key hierarchy needs larger message transmission costs. To reduce communication and computation cost, they modify the secret sharing scheme and apply it to AKM.

In the last paper "A Tree-Based Hierarchy Data Storage Framework in a Pervasive Space", Zhuzhong Qian, Ilsun You, Youyou Lu and Sanglu Lu develop a tree-based hierarchy framework to effectively store huge amount of pervasive data. A global algorithm GHS and an online algorithm DHS to dynamically select the host node were presented to integrate data from mobile devices. The effectiveness of these two algorithms was evaluated through both theoretical and experimental analysis.

We would like to thank the authors of above papers published in this special section, and regret that more papers could not be included. We appreciate all reviewers for their time and effort with reviewing assigned papers on time and providing invaluable comments and suggestions for authors for improving their papers. We also want to thank Professor Ladislav Hluchý, Editor-in-Chief of COMPUTING AND INFORMATICS. His generous help and support have made this special section a reality.

Hopefully, this special section will bring forth advancements in science and technology as well as improve practices and applications of intelligent pervasive computing.

Ilsun You received his M. Sc. and Ph. D. degrees in Computer Science from Dankook University, Seoul, South Korea in 1997 and 2002, respectively. From 1997 to 2004, he worked for the THINmultimedia Inc., Internet Security Co., Ltd. and Hanjo Engineering Co., Ltd. as a Research Engineer. Since March 2005, he has been an Assistant Professor in the School of Information Science at the Korean Bible University, South Korea. He has served or is currently serving on the organizing or program committees of international conferences and workshops such as IMIS, CISIS, MobiWorld, MIST and so forth. He is the EiC of Journal of Wireless Mobile Networks, Ubiquitous Computing, and Dependable Applications (JoWUA). He is in the Editorial Board for International Journal of Ad Hoc and Ubiquitous Computing (IJAHUC), Computing and Informatics (CAI), Journal of Computer Systems, Networks, and Communications (IJSH) and Journal of Korean Society for Internet Information (KSII). His main research interests include Internet security, authentication, access control, MIPv6 and ubiquitous computing.

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