PREFACE

Recent Trends in Digital Convergence Information System

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Welcome to this special issue of the Wireless Personal Communications journal on recent trends in digital convergence information systems. The main goal behind the initiation of this special issue is to create a timely host be the vehicle for publishing selected research papers from academia and practitioners in different industries on this emerging topic. With the advancements in convergence technology, interactive multimedia communications, context awareness, and the proliferation of low cost compact sensing and computing devices, great attention is being paid to the study, development and deployment of digital convergence information systems in various sectors of the society such as healthcare, e-commerce, critical infrastructures, etc.. In healthcare, digital convergence information systems have the potential for lengthening life expectancy and most importantly improving Quality of Life (QoL). For these reasons and also to reduce healthcare costs (e.g., providing smarter healthcare to the elderly at home in an increasingly aging society), many governments worldwide, working with research centers and the industry, are to promoting the development of test projects for on- and off-line digital convergence-based health information systems. The industry has acknowledged their great potentials and is heavily investing in the development not only products that are enabling digital convergence information systems but also in the provisioning of digital convergence services for people as a business [1–3]. This special issue covers some of the hottest topics in digital convergence information systems, including: Personal

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computing for convergence systems; Personal and content protection; Ubiquitous computing for digital convergence; Software infrastructure, middleware and frameworks; Mobile computing for future communication systems; Agent technology in convergence information systems; Convergence system in smart health, telemedicine; Innovative applications of digital convergence information; Cooperative design in digital convergence environments; Artificial intelligence methodologies for convergence information. Specifically:

The paper by Ahn and Kim [4] introduces specific structures, like the lattice aspect ratio of windows, and discusses their value ranges, so the vortex air layer induced by natural convection flow prevents thermal loss of a room to the outside air, and consequently reducing energy consumption. The paper by Lee and Lee [5] introduces a step-node technique to provide a safe route for sensing data. To illustrate, the authors propose a safe route for ensuring the safety of firefighters. Performance evaluation is based on hop count for propagating sensing data from source to destination in the sensing network under normal and faulty processes.

The paper by Oh and Chung [6] improves speech detection using equivalent rectangular bandwidth (ERB) feature extraction. The features are extracted using an ERB filter bank cestrum, and a learning model following the acoustic one is constructed to improve speech recognition rate. The paper by Jo et al. [7] proposes an integrated smart education system. The latter is designed in the form of a structured plug-in for an integrated and expandable system, and can be customized according to user needs (government, enterprise, or school).

The paper by Ahn et al. [8] describes a toolkit for automating the evaluation of clinical decision support systems in the management of diabetes mellitus and hypertension in order to achieve speed, reliability, and freedom from human mistakes. The paper by Roh and Lee [9] investigates the variables that enable the measurement of attention and the development of tangible games to improve children attention. In particular, four variables are validated as usable to measure and assess attention through games and a 3D tangible game that improves children's attention level is developed.

The paper by Pattanamekar et al. [10] proposes an estimation approach for a commodity origin–destination (OD) matrix by using a sample commodity OD matrix from a commodity flow survey and a mode-specific OD matrices obtained from transportation records of freight carriers. The results show that the model is able to produce an acceptable commodity OD matrix, implying that the proposed approach is applicable to a real-world problem. The paper by Hong and Han [11] presents a secure and cost-efficient routing protocol for wireless sensor networks (WSNs) combining media access control (MAC) address-based authentication and a function to filter out low performance WSN members with low maintenance.

The paper by Li et al. [12] introduces an efficient method to leverage user interests and location information to support data dissemination in wireless ad hoc networks. Compared with existing methods, the proposed data dissemination reduces unnecessary data transmissions without requiring high network management overhead. The paper by Choi and Kang [13] describes a prototype automatic control system for vehicle sensors by applying a brain–computer interface (BCI) to a vehicle system for remote sensor control. The proposed BCI-based automatic control system can be applied to short-range transport models for assisting disabled users, and thereby improving their QOL.

The paper by Jeong et al. [14] introduces an attribute-based patient access control protocol to minimize violation of a patient's privacy using the patient's information saved in a smart phone in an emergency healthcare situation. The proposed protocol, to prevent the exposure of a patient's sensitive information to a third party, encodes the information with a signature key hashed by a random number created by the ubiquitous healthcare service center and the patient. The paper by Lee and Song [15] proposes a neural network using the cosine modulated

symmetric exponential function, which is a non-monotonic function that can emulate spline networks by approximating polynomials and step functions.

The paper by Bae [16] proposes a security protocol that adheres to formal verification, including safety, deadlock, and livelock verifications, and uses the Casper Suite and Failures Divergence Refinement tools for validation. The paper by Kang et al. [17] introduces a real-time tracking and recognition system for interactive telemedicine health services using detection applied to posture recognition in telemedicine. Accordingly, a detected hand or finger can be used to implement a non-contact mouse, machine-to-machine (M2M) communication. This technology is valuable for controlling telemedicine health devices such as a pedometer health information reader, a glucose-monitoring device, or a blood pressure gauge.

The paper by Sodgerel et al. [18] presents a hand gesture recognition method using concentric coordinate information through image processing. The paper by Yang and Lee [19] proposes a method based on objective information to evaluate the impact on well-being as an indicator of QOL and which therefore can be utilized to promote the distribution of healthcare management resources.

The paper by Oh et al. [20] introduces a frequent-pattern network and a new method for discovering frequent patterns through the approximation of frequency counting on the network. The frequent-pattern network, where vertices and edges represent summarized information of transaction data, provides a user-centered environment based on the process of continuously mining frequent patterns. The paper by Wang et al. [21] introduces, analyzes, and compares the characteristics and important factors in adopting healthcare applications for present and potential customers. The authors argue that the results of this study can be used as baseline data for the development, supplementation, and operation of healthcare applications that reflect user requirements. The paper by Park et al. [22] proposes an almost blank subframe scheduling technique for interference mitigation under an M2M-based medical wireless body area network (WBAN). An implementation of an use case scenario with a medical WBAN and a distributed structure to recognize the effects on a WBAN device's processing volume is also provided.

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