Foreword and Editorial

International Journal of Smart Home

We are very happy to publish this issue of an International Journal of Smart Home by Science and Engineering Research Support soCiety.

This issue contains 39 articles. Achieving such a high quality of papers would have been impossible without the huge work that was undertaken by the Editorial Board members and External Reviewers. We take this opportunity to thank them for their great support and cooperation.

In the paper "A Dual Channel Allocation Scheme for WiMedia Networks", proposed a Dual Channel Allocation (DCA) Scheme for UWB (Ultra Wide Band) with D-MAC (Distributed Medium Access Control) to avoid DRP conflicts by providing a cooperative relay transmission scheme and demonstrate its performance improvements via simulation results.

Paper "A Reselection-based Energy Efficient Routing Algorithm for Wireless Sensor Networks" projected a Reselection-based Energy Efficient Routing Algorithm (REERA) for WSNs, which determines proper cluster size based on the distance to the base station. After all clusters are formed, cluster heads can be reselected according to the ratio of residual energy of each node to their distance from base station. Simulation results show that our proposed algorithm can be more efficient in saving energy consumption and prolonging lifetime of WSNs than traditional LEACH algorithm.

The paper "A Practical Indoor Position Estimation by Using a Laptop Computer Equipped With Sensors" suggested a practical indoor positioning scheme that effectively locates a pedestrian holding a laptop computer equipped with two commonly used sensors and the performance of proposed scheme is evaluated with experiments for a simple path as well as a real route in indoor of general building at university. According to the experiment results, the positioning error was less than 1m in simple path, while the average error was 1.61m for a real route.

The paper "Secure and Efficient Communication Method in Rogue Access Point Environments" proposes a method to exchange SSL session keys through more secure 3G networks to be used in WiFi networks in order to prevent such spills. In the proposed method, only those session keys to be used in SSLs are exchanged through 3G networks, and the remaining application data is transferred through WiFi networks. Therefore, attacks by rogue APs can be prevented with sufficient use of the speedy and efficient WiFi networks.

The Author of “The usage of automation system in smart home to provide a sus-tainable indoor environment: a content analysis in Web 1.0” reviews the advantages of home automation smart home in Hong Kong and Australia from industry perspective with the help of content analysis.

Paper “A Study on Super Resolution Estimation Accuracy Method of DOA using Signal Model Errors Effects” introduced a new direction of arrival estimation method using effects of model errors and sensitivity analysis. Two subspace are used to form a signal space whose phase shift between the reference signal and its effects of model error signal. Since a desired signal is obtained after interference rejection through correction effects of model error, the effect of channel interference on the estimation is significantly reduced. The proposed method in the number of signal sources detectable is not bounded by the number of antenna elements used. Through simulation, it shows that the proposed method offers significantly improved estimation resolution and accuracy relative to existing method.

In the paper “Estimation of Relative Self-Localization for Indoor Mobile Robot and Its Error Analysis”, proposed a relative self-localization estimation algorithm based on relative locations and orientation changes of image features. It also analyze errors caused by a variety of factors to estimate the relative self-localization of a mobile robot and discuss a few techniques to remove them. The proposed relative self-localization algorithm is based on the facts that the global orientation and location of image features are not altered by changing of images. It shows that the proposed algorithm is valuable through some simulation examples.

The paper “Simple Programming Language for Creating a Simulation Environment with Mobile Robots” recommends a simple programming language that is a kind of functional concise script for creating a simulation environment with mobile robots as a 3D software toolkit for education. Most robotics simulation toolkits require professional knowledge regarding development language and their APIs, and these prerequisites present a significant obstacle in implementing robotics simulations. In order to resolve these problems, it adopted a functional concise script composed of simplified service commands and minimum options to build a simulation environment.

The paper “A Novel LTE-Advanced Carrier Aggregation with Higher Throughput” presents a novel LTE-Advanced depending on carrier aggregation to get better performance of the system; the simulation is applied with 8X8 Multiple Input Multiple Output (MIMO) LTE-Advanced using different modulation techniques such as: QPSK, 64QAM (Quadrature amplitude modulation) in order to determine the higher throughput to depend it in design; the maximum throughput result is based on assuming 64QAM data modulation, maximum bandwidth 120 MHz and 5/6 code rates.

The Authors of “A study on LED lights dimming control for BEMS based on detection people staying” discussed a new framework to robustly and efficiently to detect people staying and going out based on background subtraction and foreground analysis with complement of tracking to reduce false positives. In the proposed system, the foreground is modeled by Adaptive Gaussian mixtures. In order to handle complex situations, several improvements are implemented for quick lighting change adaptation, shadow removal, fragment reduction, and keeping a stable update rate for video streams with different frame rates.

Paper “Design of Water Quality Measurement Sensor Robot Based on Wireless Communication Environment” designed a sensor robot to recognize location with GPS and control it from a remote place and then transmit the measured water quality information in real time with wireless communication.

The paper “A Study of an Agricultural Ontology Model for an Intelligent Service in a Vertical Farm” premeditated the vertical farm ontology that is defined as the environmental, control factors and relationship between each factor for the crop growth using OWL based on RDF. The defined factors in the vertical farm ontology can be extended continuously, and its knowledge can be shared and reused in a various domains of agricultural environment.

Paper “Indoor Semantic Location Models for Location-Based Services” analyzed some semantic location models based on math and ontology methods including brief description and comparison. It also extracts the characteristics of semantic information in the multilayered location model and depicts their significances for indoor space LBSs. Finally, it discussed the possible directions of semantic location models for indoor space LBSs.

In the paper “A Study on the Real-Time Livestock Monitoring System using Mobile Platform”, proposes a real-time livestock monitoring system that could use a mobile platform to diagnose the livestock’s estrus and livestock diseases in early stages. The proposed system enables users to monitor livestock's biometric and image information, which is collected from sensor nodes and CCTV, via smart phones anytime and anywhere in real time, and abnormal conditions of livestock are determined to inform users about them based on such collected livestock-related information, so that users could quickly cope with livestock’s estrus and livestock diseases. It could provide convenience to users through the proposed system, and detect livestock’s estrus and livestock diseases in advance by livestock information to improve productivity resulting from realizing timely fertilization and to cope with livestock diseases beforehand, so that damage could be minimized.

In the paper “A Study on the Ontology Model for Preventing Livestock Disease Spread”, intends to propose the ontology model which will detect the domestic animal infectious

disease at early stage using context information and prevent the spread of disease. This study thus is aimed at designing the structure of situational awareness system to which ontology-based context model is applied in a bid to provide the service which will prevent the spreading of epidemic as well as apply through the experimental scenario.

The Authors of "A Study on the RFID based Livestock Estrus Detection System" proposed RFID-based estrum detection system on a real-time using RFID tag. The system is to measure the frequency of approaching by cow to ox using RFID tag and when the frequency reached to certain level, it's considered estrum and notifies the users of the data using alarm service. Fertilizing in timely manner after detecting the estrum through this system is expected to improve the productivity and income of the farmers.

Paper "Prototyping an Expert System Shell with the Logic-Based Approach" suggest and demonstrate a different scheme of expert system shell development using a constraint-based paradigm with the ECLiPSe constraint system. Comparisons of the two paradigms have been done in terms of computational time, memory usage, and lines of code. The experimental results reveal that the difference in lines of code of the two paradigms is insignificance, but the constraint-based paradigm uses less memory during execution and provides more concise form of knowledge representation.

The paper "Evaluation of University Students' Utilization of Smartphone" verified the most frequent usage, usual usages and serviceability of smartphone. Also, it verified differences in the most frequent usage and perceived satisfaction to usages of smartphone based on survey data from 135 participants of a four-year university.

In the paper "Creativity Analysis for Smart Specialist of the Ubiquitous Era", investigate the relationships among creativity, intrinsic/extrinsic motivation and creative home environment. For this study there were 127 young children subjects under age five from 10 kindergarten classes. Data gathered were analyzed for the verification of the hypothesis of this subject for using SPSS 18.0 program. The results of this study were as follows: First, there were significant positive relationships between the intrinsic motivation and the creative personality of the young children but there were no statistically significant relations between the intrinsic/extrinsic motivation and the creative thinking ability. Second, the intrinsic-high/extrinsic-high motivation group was higher than any other types of motivation groups in creative personality. Third, there were significant relationships between the creative thinking ability and creative personality with the creative home environment.

The Authors of "Smartphone Application Development using HTML5-based Cross-Platform Framework" presents the HTML5-based cross platform framework which uses PhoneGap and Webkit to support the development of smartphone applications that are written as Web

applications, run locally on the smartphone and can leverage native phone capabilities. This paper also shows the development of a sample smartphone application using the cross platform framework.

Paper “Developing a Gesture Based Remote Human-Robot Interaction System Using Kinect” proposed an application of gesture-based remote human-robot interaction using a Kinect sensor. The gesture recognition method combines depth information with traditional Camshift tracking algorithm by using Kinect and employs HMM in dynamic gesture classification. A Client/Server structured robot teleoperation application system is developed, which provides a favorable function of remotely controlling a dual-arm robot by gestural commands. Experiment results validate the practicability and effectiveness of the application system.

In the Paper “Design and Implementation of Remote Measurement System for Smart Plug Test-bed”, describes the development of remote measurement system for smart plug test-bed using the internet. Currently, various remote and virtual laboratories are introduced using the multimedia technologies but the Internet based remote test-bed using the electrical power measurement hardware system is not present. In this paper, it developed the remote electrical power measurement system for smart plug test-bed by combining the GPIB program which controls the hardware with the web programming which controls the internet. The high power load and programmable AC power source were considered as the measurement devices. The client program includes the user-interface and IP camera which carry out power measurement and report remotely. Several electrical measurements were set up to verify the test process. It has been found that the virtual measurements are feasible and valid.

The Authors of “A study on the effect that V.M.D(Visual Merchandising Design) in store has on purchasing products” studied brand perception and effect of V.M.D displayed in the stores, on customers, and thereby to present the concepts of V.M.D, suitable for display in the stores, which can be used continuously in the future.

Paper “Indoor LED Light Switch with Step-by-Step Illumination Reduction” described the dimming controller to solve problems in conventional dimming system. Also, it presents experimental results that show proposed dimming controller is valid.

The paper “Design of a Microcontroller based Fan Motor Controller for Smart Home Environment” presents a design of a microcontroller based motor controller with heat sensor which is used to vary the speed of a motor in a smart home. The discussion includes the design of a controller that varies the speeds of the motor with respect to the ambient temperature in a smart home environment. The controller is embedded as an addition to a stand fan. A phase control method is selected to be implemented in this design. The power delivery to the motor is controlled by the firing angle of a Triac where it controls the AC power supply. With the firing time controlled by the Triac, the input power to the motor can

be controlled accordingly. In addition, a hand-clap circuit is also introduced which acts as a switch to activate or deactivate the motor.

Paper "A Study on the Planning of U-Riverfront Town with M2M Technology" aims to create the U-City generation based on the future M2M technology, which has recently been evolved. To this end, it introduce the concept of 'u-Riverfront' along Sincheon River flowing through the center of Daegu to create the future urban waterfront space and propose a urban regeneration method through natural connection to the adjacent old towns. To achieve this 'u-Riverfront' considering city generation, first, it needs to improve the facility management along the current riverside, since pedestrians are less accessible to this area in terms of connection with adjacent areas. Second, it needs to induce the IT infrastructures to the public city planning facilities in order to build infrastructures for urban restoration and development projects. Third, it needs to provide citizens who use this Sincheon River with various portal service, culture, amenity, and security to lead to a substantial activation of waterfront.

In the paper "Optimization of Scheduling for Home Appliances in Conjunction with Renewable and Energy Storage Resources", proposed an optimization algorithm, which can provide a schedule plan for the home appliance usages. In order to minimize the average electricity price based on the time-varying electricity price in conjunction with the peak hourly load, which decides the capacity of the electric supply facilities, it establish a mixed integer linear programming problem considering various energy consumption patterns of home appliances. In addition, a photovoltaic system and energy storage are added to the residential side to achieve further efficient schedule plans. By measuring the power consumptions of the home appliances with respect to the time, it constructed the power consumption patterns of each appliance and numerically analyzed the performance of our algorithm by using a real time-varying electricity price and the solar cell power profile obtained through a mathematical model.

In the paper "Design and Implementation of the WIPI-to-Windows Mobile Automatic Game Content Converter System", Authors analyzed the game contents of the existing mobile platform, WIPI (Wireless Internet Platform for Interoperability). Then a resource converter, a source translator and a platform mapping engine will be implemented in order to convert the game contents for use on a smart phone platform, Windows Mobile. A mobile game contents converter system has enabled contents to be transferred into smart phone platforms within a short time, so that the time and money it takes to launch services for different mobile communication companies can be reduced.

The Authors of "Implementing Smart Homes with Open Source Solutions" discussed an approach with emerging open source solutions. The core of the proposed open source system is Arduino platform. A module for performing functions to implement smart homes also proposed in this paper. It is a typical cyber physical system and consists of input, output and energy monitoring functions. The detail of this module is presented and discussed.

Paper “Development of Multi Agent for Adapting Convergence Applications” presents a mobile agent for convergence applications model. The model supports the flexible and extensible application specific convergence applications measures required by mobile computers and devices in distributed system. It gives a full description of mobile agent and its migration modes, after discussing the possible convergence applications, the model is explained at length and security analysis is also given in the way of collaboration requirements, mobility requirements and execution requirements.

The paper “Analytical Approach of An Extended Seamless Proxy-based Handoff Scheme in IP-Based Heterogeneous Mobile Networks” proposed a SePH (Seamless Proxy based Handoff) using PMIPv6-based proxy model, which is able to improve the performance of handoff in NGWN. The SePH can efficiently support seamless and IP-based mobility, by reducing the search process. The performance results show that our proposed scheme outperforms in terms of Quality of Service (QoS), such as throughput, handoff latency, packet loss, and signaling overhead, comparing to the existing schemes.

In the paper “Performance Improvement for 3D HDTV Service using Block LDPC Codes”, projected more advanced ATSC transmission schemes that use higher modulation such as 16-QAM and concatenated RS code and block LDPC codes. Compared with conventional ATSC system and the modified ATSC system in [3], the proposed system has about 2.97dB and 1.12dB SNR gain at the payload data rate of 19.44Mbps compared with the existing ATSC system and the modified ATSC system [3]. Also, the proposed scheme requires only 1.05dB power increase for the 3D HDTV service, which is reasonable SNR increase value and applicable to the advanced 3D high definition broadcasting realization in limited 6MHz bandwidth.

The Author of “Assessing Engineering Drawings through Automated Assessment: Discussing Mechanism to Award Marks” discussed case scenarios of ED in comparison to the answer scheme and how the awarding system should work in different scenarios. In order to develop these rules, it has created a simple module capable on reading simple circle or group of circle drawings. It will have several test cases of different drawings and conduct our study from these samples. The paper concludes with results of the experimentation and recommendations driven from the results.

Paper “Asymptotic Performance Optimization of Manycore Architectures under Process Variation” developed an asymptotic analysis model for better understanding the performance characteristics of manycore processor architectures using Amdahl’s law under process variation in order to foresee their performance impact for a given workload characteristics (e.g. available parallelism). Through the asymptotic analysis based on the models proposed in this paper, it can make the architectural design decisions such as "the number of cores" and

"core size", and further it can probe the possible research direction of optimizing the performance of manycore architectures at the future of high process variation era.

In the Paper “Interaction Control Based on Vision for AR Interface of Smart Phone”, proposes methods for detecting and tracking moving body parts such as the eyes, lips, and hands to enable natural interaction with smart phone platforms. These methods allow the user to interact with virtual objects that are displayed on the smart phone. The demonstrated methods address current problems involving delayed detection time and unreliable tracking in markerless-based augmented reality applications. Our suggestions may serve to advance interaction control in smart phone augmented reality and serve as a platform for interface development.

Paper “Implementation of a WLAN DMX server based on NDIS WLAN miniport driver” presents a new server system for a wireless LAN DMX to enhance diverse LED lighting effects. In order to enhance the capability to send DMX packets to the large number of DMX client devices, a new WDMX server system is proposed based on a NDIS miniport driver. Through the NDIS miniport driver rather than raw TCP/IP socket, the throughput of the server is increased because header sections of TCP/IP stack are removed. Even, the format of Ethernet frame is modified to use a new type of addressing scheme which can address the devices by universe ID and DMX ID value. The implemented server software program which also use thread technology and a flexible data structure can support up to 10,500 DMX channels with the refresh rate of 40msec.

In the Paper “Peak Demand Management in a Smart Community using Coordination Algorithms”, Authors proposed peak demand management techniques for a smart community using different types of coordination mechanisms for coordination of multiple house agents working in the same environment. These algorithms use centralized model, decentralized model, hybrid model and Pareto resource allocation model for resource allocation. It modeled user comfort for the appliance based on user preference, the power reduction capability and the important activities that run around the house associated with that appliance. Moreover, it compares algorithms with respect to their peak reduction capability, overall comfort of the community, simplicity of the algorithm and community involvement and finally able to find the best performing algorithm among them. Our simulation results show that the proposed coordination algorithms can effectively reduce peak demand while maintaining user comfort. It confirms that using our proposed algorithms, the demand for electricity of a smart community can be managed intelligently and sustainably.

The Author of “A Smart Message-scheduling Scheme for Arbitrary Topology PROFINET IRT Networks Applicable to Shipboard Real-time Communications” discussed smart message-scheduling scheme for real-time Ethernet PROFINET IRT networks that can obtain the optimal cycle time while substantially reducing the scheduling time when applied to communication networks in vessels with various messages and update times. Unlike previous

techniques, the proposed scheme has a novel feature that can be applied to networks with arbitrary topology.

In the Paper "A Novel Performance Analysis of the IEEE 802.11 DCF with Hidden Stations", Authors derived an analytical model to compute the non-saturation and saturated throughput of the IEEE 802.11 DCF in the presence of hidden stations for both the basic and RTS/CTS access methods. The proposed model is in good agreement with NS2 simulations in most condition and, thus, can be used to estimate the network throughput. The existing models can be considered as special cases of our model, with zero hidden stations. It intends to continue further our analysis and to simulate such environments to help in the understanding of IEEE 802.11 behavior

July, 2013

Editors of the July Issue on
International Journal of Smart Home