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 37 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 Resource Management Mechanism of WBAN for Wireless USB Support", an IEEE 802.15.6 wireless body area networks (WBAN) medium access control protocol is to support a wireless USB (WUSB) application as a protocol adaptation layer (PAL). However, current WBAN protocol still does not have well-defined QoS mapping and resource allocation mechanisms to support multimedia streams with requested QoS parameters. To solve this problem, Authors proposed a novel Resource Management Mechanism (RMM). The proposed method provides fair and adaptive QoS provisioning to isochronous streams according to current traffic loads and their requested QoS parameters through executing a satisfaction of QoS algorithm at WUSB/WBAN host.

Paper "Smart Elderly Home Monitoring System with an Android Phone" designed and developed a smart elderly home monitoring system (SEHMS). An Android-based smart phone with 3-axial accelerometer is used as the telehealth device which could detect a fall of the carrier. The smart phone is then connected to the monitoring system by using the TCP/IP networking method via Wi-Fi. A graphical user interface (GUI) is developed as the monitoring system which exhibits the information gathered from the system. In addition, the concept of a remote panic button has been tested and implemented in this project by using the same android based smart phone. With the developed system, elderly and chronically ill patients could stay independently in their own home with care facilities and secure in the knowledge that they are being monitored.

The paper "Task Model and Task Ontology based on Mobile Users' Generic Activities for Task-Oriented Tourist Information Service" considered the construction of a task model and task ontology based on mobile users' generic activities for a task-oriented tourist information service. This paper introduces 1) a generic task model based on travelers' needs and generic activities before and during trips, which model accounts for generic tasks and task processes; 2) a task ontology based on the generic task model, and 3) a task-ontology-based Task-Oriented Tourist Information Service (TOTIS). Using the generic task model and the task ontology, task-oriented menu can be constructed automatically by means simply users' selections and context-awareness. Additionally, compared with the existing domain-oriented services, the TOTIS can facilitate more flexible searching of tourist information and make real-time determinations with context-awareness.

The paper "Efficient Cluster Organization Method of Zigbee Nodes" deals with the Zigbee communication, based on PHY and MAC of IEEE 802.15.4 standards that is a

communication technology to connect local wireless nodes and provides high stability and transfer rate due to data communication with low power. Zigbee is commonly organized with one coordinator and more than one node, as the basic service area and this network is referred to as PAN. In the nodes away from coordinator in one PAN, the signal strength is weak causing the network a shortage of low performance and inefficient use of resources due to transferring delay and increasing delay time and thus cannot conduct seamless communication. This study suggests the grouping method, that makes it possible to perform wide range data transferring depending on the node signal strength in Zigbee node and analyzes the suggested algorithm through simulation.

The Author of "Power and Performance Analysis of Smart Devices" presents a discussion that the spreading use of Smartphones stimulates growth of mobile computing. However, mobile computing through smartphones poses challenges due to its intrinsic nature of battery capacity, constraints of wireless networks and performance limitation of devices. Most users want their smartphones to be more powerful and high throughput, at the same time, small and light. This research provides the analysis of smartphone in terms of power and performance under two different point of views. Since most smartphones have various components, Author develop a queuing model for power analysis so that we can analyze the power dissipation on different components and analyze battery lifetime with different usage behaviors.

Paper "An Improved Website Structure Optimizing Algorithm" states that the improved algorithm selects expected locations (for adding navigation links) in backtracks set at the point of the earlier and the less backtracks, which avoids effectively negative impact to the accuracy of the overall analysis by the long access sequence. The experimental results show that the improved algorithm can find expected pages effectively, thus can achieve the target of adjustment and reorganization of website.

In the paper "An Indoor Golf Simulator for Continuous Golf Games", Authors proposes an indoor golf simulator that allows a player to pause a game at any time and resume it at any place. The proposed simulator applies data synchronization techniques in ubiquitous environments. The simulator consists of PC consoles, a proxy server, and a player data server. The PC console client uses a XML-based communication protocol to send information about the game to the player data server via the proxy server. The communication protocol supports DS (Data Synchronization) operations between the PC console client and the player data server. Located between the PC console client and the player data server, the proxy server receives game information from the PC console client and sends the information to the player data server, and vice versa. When the player data server authenticates the player, the proxy server establishes a new communication session and manages the session until the game is either terminated or suspended. The player data server authenticates the player and keeps his or her latest game information for later use (*e.g.*, to resume the game).

The paper "Filter Size and Color Pattern Investigation for Yamanaka Patterned Color Filter Array" deals with the digital cameras that utilize a CFA to take the colors of the scene. The downsampled versions of the red, green, and blue parts are obtained, and an upsampling of those three colors is needed to restore a full representation of the CFA image. This paper studies on Yamanaka patterned CFA.

The paper "Construction of Cognitive Radio Based Emergency Communication System and Application Scenario Analysis" present Cognitive Radio (CR) which can optimize system

objects by dynamically assigning network resource and adjusting network operations in terms of network environments and conditions. So CR technology is very suitable for building emergency communication system to improve resource utilization ratio and enhancing dependability and availability of communication services apparently. In this paper, background requirements of constructing cognitive radio based emergency communication systems are expatiated and technical traits of CR are introduced. Then, network architecture and model of cognitive emergency communication system are proposed.

The Authors of "A Design of VCM (Vessel Communication Manager) Improving Communication Efficiency and Security with ARP (Azimuth based Routing Protocol) and NATF (Network Attack Traceback Facility) for Vessel Networking" proposed a VCM (Vessel Communication Manager) which is consists of ARP (Azimuth based Routing Protocol) and NATF (Network Attack Traceback Facility). The ARP can transmit accident information from a source to a headquarter rapidly and accurately by using Azimuths. It designs the Ac-RREQ message that appends an azimuth, a cumulation S/N, and a standby packet count field to the exiting RREQ message and the Ac-RREP message that appends an azimuth and a cumulation S/N field to the existing RREP message. It adjusts the transmission scope of the Ac-RREQ message with azimuths and decides the optimal path by judging the priority of Ac-RREP with the standby packet count and the cumulation S/N.

Paper "Smart Home Security System Using Multiple ANFIS" analyzes that many smart home devices provide home automation technology, but the smart home security system offers many benefits that can ensure the safety of the homeowner. Thus, Security has been an important issue in the smart home applications. Home security has two aspects, inside and outside. Inside security covers the concept of securing home from threats like fire, *etc.*, whereas, outside security is meant to secure home against any burglar/intruder, *etc.* This study is aimed to provide an intelligent solution for home security that takes decision dynamically using the pervasive devices. In particular, smart home security can be regarded as a process with multiple outputs. In this study, to deal with nonlinear outputs, the system is modeled by multiple ANFIS, and the optimization of multiple outputs is formulated as a multiple objective decision making.

The paper "Mixed Reality System for Virtual Interior Design" proposed a mixed reality system for virtual interior design. The mixed reality technology is a concept covering augmented reality that shows graphic objects integrated to a real environment. This paper describes design of a virtual interior design system that can change and display building inside interior design using mixed reality technologies in a ubiquitous computing environment. The virtual interior design system proposed in this study consists of a hardware platform that can receive and process data from various sensors and a virtual interior design application that displays interior design based on the processed information. The system proposed in this paper will develop into services to the extent which can be directly used in the field if subsequent studies are carried out.

Paper "The Centralized Containment Strategy and Mathematical Modeling Analysis" first discusses the research situations of Internet worm prevention technology by system vulnerability to solve worm propagate in the network system; then the concept and the execution mechanism of containment system are given; the Centralized Containment Model based on the active containment scenarios and the worm propagation model under these

scenarios are presented afterwards; and finally the research trends in this area are also addressed.

In the paper "Development of the HEMP Propagation Analysis and Optimal Shelter Design, Simulation Tool "KTI HEMP CORD"", Authors presents a discussion on High Altitudes Electro-Magnetic Pulse (HEMP) caused by nuclear bomb explosion that had been tested during last 1960-1975 by the USA, Russia and other countries. But all of related simulation tools and documents are strongly classified and impossible to use it even, thus IEC and ITU had published the related standards and recommended its protection against HEMP and HPEM. Also, Middle East countries and Far East countries including South Korea are directly vulnerable against HEMP threat. KTI had developed the HEMP simulation and optimal shelter design tool named by "KTI HEMP CORD".

In the paper "Improve Method on DOA Estimation Accuracy of Signal Subspace Sensitivity Based on Mutual Coupling Matrix", Authors discuss the performance of the DOA algorithm and many other high resolution methods that degrades severely with the high correlated multipath signals encountered in target low angle tracking. DOA estimation error is overcome by deriving new version of the effects model error and sensitivity analysis on subspace methods. An improved algorithm for DOA estimation of coherent signal is proposed. This algorithm has based on the structure of mutual coupling matrix of uniform linear array and effects model error sensitivity analysis. The performance of these two approaches is then compared with that of the well-known MUSIC algorithm using spatial smoothing.

The Authors of "A Study on the Context Service Model for Livestock Estrus Detection" proposes a context service model to detect the livestock estrus using the activity information of livestock. The proposed context service model is to define the hierarchical context which could be used for livestock farm domain and make it contextual using activity information of livestock so as to provide the users with intelligent livestock estrus detection context service. The optimum fertilization time of livestock understand by providing intelligent livestock estrus detection context service to user through the proposed context service model. The livestock farmers will enhance the productivity and competitiveness of the livestock.

Paper "Software Implementation and Comprehensive Performance of Uplink Channel on Mobile 4th Generation Technology" states that according to the further increase of demand on high data rates in wireless communications systems, the 4th generation (4G) of mobile telecommunication networks have been introduced by 3GPP (3rd Generation Partnership Project). These systems have adopted orthogonal frequency division multiplexing access (OFDMA) for downlink physical layer and single carrier frequency division multiple access (SCFDMA) for uplink physical layer. In this paper, SC-FDMA is simulated and analyzed for all the parameters and for various modulation index of phase shift keying. This research also focused on the calculation of Peak-to-Average Power Ratio (PAPR) for SC-FDMA.

The paper "Ratiometric GPS Iteration Localization Method Combined with the Angle of Arrival Measurement" states that most of the localization algorithms have performed localization utilizing absolute point-to-point distance estimates. If the sensor network is not cooperative, there's no information about the strength of the original signal so that the location of a target node is hard to be found. It allows ratiometric location algorithm to be proposed. GPS algorithm give accurate location of unknown node, however it needs the absolute distance between the nodes. Ratiometric GPS iteration (RGPSi) localization method

combines GPS and ratiometric algorithm for utilizing the benefits of two algorithms. RGPSi algorithm results in a little more position error and longer iteration than GPS algorithm. Authors introduce the method that helps ratiometric GPS iteration algorithm to be more accurate and reduce the iteration numbers through the angle of arrival localization algorithm. Not to add computation complexity to the RGPSi algorithm, nonlinear angle to location relationship is made linear.

In the paper "The Effect of Switch Triggering Offset and Switch on-time Duration on Harvested Power in Synchronized Switch Harvesting on Inductor", through SPICE simulation, different piezoelectric harvester interface circuits are demonstrated and compared. In synchronized switch harvesting on inductor interface, the inductor's quality factors are very important on calculating the harvested power so that the power from SSHIs depending on the inductor's Q is calculated. Especially, parallel SSHI shows the optimal output voltage to harvest the maximum power varies according to the Q severely. Switch triggering offset and switch on time duration are very interest in calculating the power in SSHI. So, the simulations of the effect of these factors on SSHI's power are performed. It is conformed that switch triggering offset has more impact on the s-SSHI than p-SSHI. The switch on-time duration is more important in case of the p-SSHI. p-SSHI shows when the on-time duration becomes more than 1.3 times or less than 0.7 times of exact duration time, the harvested power gets zero. s-SSHI reveals the characteristics that when less than 1.5 times exact on-time duration, the harvested power varies significantly with the on-time duration, however larger than 1.5 times exact on-time duration has scarcely influenced on the harvested power.

The Authors of "Cross-Layer QoS Architecture with Multipath Routing in Wireless Multimedia Sensor Networks" proposes a multipath routing algorithm using cross-layer architecture in wireless multimedia sensor networks (WMSNs) to provide QoS guaranteed delivery of data. When the algorithm proposed in this study establishes the path from source to destination node, it takes into account a distance to sink node, and energy level and link quality of neighbor nodes. It also specifies a service quality pattern and a service quality level depending on traffic pattern. By doing this, the proposed algorithm can realize a differentiated service with QoS guaranteed data transmission. This algorithm also enables to use multiple paths when delivering data. It helps to alleviate a power consumption concentration that happens at particular set of nodes along the frequently selected route. Concentrated power consumption can cause another problem, that is, route reconfiguration due to routing failure.

Paper "A Modified Denoise Approach for UCA DOA Estimation in Low SNR Case" states that when the uniform circular array (UCA) is used to estimate the direction-of-arrival (DOA) of the coherent sources, it is necessary to transform the UCA data to the interpolated uniform linear array (ULA) data. Thus, the transformed array data can be applied to the spatial processing algorithm for the coherent sources such as the forward-backward smoothing algorithm. To select a more robust transformation matrix, a modified denoise approach for UCA estimation in low SNR case is proposed in this paper. First, a denoise method is investigated to maximize the SNR in the process of the interpolated transformation. The pseudo signal to noise ratio (PSNR) obtained from the eigenvalues of the forward-backward smoothing virtual covariance matrix estimate is used as the parameter of this maximization problem. Second, a modified maximization problem and its solution are presented to obtain more accurate estimates.

In the Paper "A k-Nearest Neighbor Search Algorithm for Enhancing Data Privacy in Outsourced Spatial Databases", with the advancement of cloud computing technologies and the propagation of location-based services, research on outsourced spatial databases has been spotlighted. Therefore, the traditional spatial databases owners want to outsource their resources to a service provider so that they can reduce cost for storage and management. However, the issue of privacy preservation is crucial in spatial database outsourcing since user location data is sensitive against unauthorized accesses. Existing privacy-preserving query processing algorithms encrypt spatial database and perform a query on encrypted data. Nevertheless, the existing algorithms may reveal the original database from encrypted database and the query processing algorithms fall short in offering query processing on road networks. This paper proposed a privacy-preserving query processing algorithm which performs on encrypted spatial database. A new node-anchor index is designed to reduce unnecessary network expansions for retrieving k-nearest neighbor (k-NN) objects from a query point.

The Authors of "An Intelligent Bus Status Informing Scheme Exploiting Smartphone Application" proposed an intelligent bus status informing scheme based on smartphone application to increase convenience of public bus system by providing the seating capacity and number of passengers of the coming buses to waiting persons at the bus stop. The proposed scheme not only provides a real-time information of the number of passengers in the bus, also helps people to know whether the coming bus is crowed or not in advance. With this information, therefore, people who are waiting at the next stops can avoid the crowded situation and the safety accidents and also can select alternative transportations, which make the bus system run more quickly and efficiently.

Paper "A Novel Template Weighted Match Degree Algorithm for Optical Character Recognition" introduces template matching algorithm, and put forward an improved template matching algorithm which based on the weighted matching degree. After the completion of the pre-processing of input characters, the algorithm uses the moving match of the standard character template with respect to image character template. What's more, in terms of calculating matching rate, a method of weighted matching degree has been used.

The paper "Effect of Enhancing Learning through Annotation Similarity and Recommendation System" presents a discussion that with the use of smart mobile devices, learning opportunities have been greatly increased in education. Especially, digital textbooks are the new primary digital instructional resource for elementary and middle schools. The use of electronic textbooks in a mobile learning environment assists collaborative learning and increases access to educational resources. Learners are now able to share their bookmarks, notes and highlights both on and off campus. These annotation features can lead to enhanced learning effect for students. Digital textbooks still face several hurdles as the value of using electronic textbooks for students remains unclear. Major reasons limiting the uptake of digital textbooks include usability and design issues. One of the most important features in education is interaction between resources and students such as annotating or highlighting. To enhance value of digital textbooks, Authors designed a prototype note-taking interface reflecting students learning pattern and self-directed learning. The interface and functionality were defined in order to support touch-based annotation input and cooperative learning. It has been implemented a touch-based device for smart education environment.

Paper "Research in Estimation of Temperature for Power Battery Based on Back Propagation Neural Network" states that in dealing with the increment in environment pollution and source consumption, research has focused on the application of renewable energy source. Batteries, especially power batteries, which has great prospects in the fields, are among the attention. Rechargeable batteries are widely used in many electrical systems to store and deliver energy. However, there is a wide variety of Power Batteries and they have different weak Points. In order to develop and apply battery in a more efficient and appropriate method, their response to various operating conditions must be understood. Knowing the battery temperature variation in electric vehicles (EVs) is very important issue. Temperature depends on ambient temperature, charging current and charging time. Recently neural networks have been successful used for power system applications. In the literature, there are many neural networks for power system applications. However, Back Propagation (BP) has demonstrated better capabilities. This paper presents neural network for temperature estimation of power batteries. The main contribution of this paper is consideration of non-uniform temperature field and the temperature effect in batteries.

In the paper "Development of Agricultural Cooperatives for Revitalization of the Rural Community – Focused on the Case Study of 'Sunkist'", Cooperatives are a fairly new form of economic system in Korea compared to the western nations, yet, it has caught many attentions since the Fundamental Cooperative Act was enacted in 2011. Korea, once a very traditional community-based society, used to develop similar systems such as dooreh and poomasi. Thus, cooperatives have been astonishingly gaining popularity in various aspects recently although the relevant laws were prone to hastily implementing lacking a complete study on the effects. In this context, this study premises that cooperatives can play a critical role in developing especially the rural areas by giving their members more elaborate services supplementing any setbacks caused by Capitalism and creating jobs as well as providing social welfare and amenity. For a case study, Sunkist is chosen to suggest as a role model of the farmers' cooperatives.

In the paper "A Keyword Filters Method for Spam via Maximum Independent Sets", Authors discusses that in order to evade the keyword filtering, the spammers insert comments into e-mails, such as unusual symbols # or ※, to divide some keywords. In the paper, one keyword filters method for spam via maximum independent sets is presented, and the main contents include: (1) build a matching relation matrix algorithm to help us to improve the performance of maximal independent sets; (2) develop a judgmental criterion according to the matching relation matrix algorithm. (3) design a behavior recognition technology, which can detect and reject the email which receiving.

The Authors of "The Implementation of Smart Home System Based on 3G and ZigBee in Wireless Network Systems" presents a discussion that currently the smart home system is mainly used in a number of upscale communities and has not been widely used for ordinary people. As we all know, the smart home controller integrally stores a large number of audio, video, image information. It requires a high-speed and real-time network which can make it possible to let mobile phones become a control terminal. The purpose of this paper is to improve the performance of the control network in current smart home system, and to design the controller module which is used ARM server as our home controller processor. The autonomous control and reconstruction can be realized both by home controller gateway and wireless network nodes, the most basic and important unit, which is the ZigBee wireless network module in those home appliances. Wireless module communicates with the wireless

gateway normally, at the same time, connects with the mobile terminals to remotely monitor the 3G mobile phones.

Paper "Design of Obstacle Avoidance System for Mobile Robot using Fuzzy Logic Systems" states that there were many reports about an obstacle avoidance of a mobile robot. This paper designed a fuzzy logic system and proposed an obstacle avoidance algorithm for a path planning in unknown environment for a mobile robot. The ultrasonic sensors are employed for detecting the distance to obstacles and their positions. An angular velocity control for left and right wheels is implemented by a fuzzy logic system. Another new rule table has been proposed that is induced from the consideration of the distance to obstacles and the angle between the robot and the goal.

The paper "Honey Bee Mating Optimization Technique Based Multi-machine Power System Stabilizer Design" proposed a new approach based on the Honey bee mating optimization (HBMO) technique to tune the parameters of the multi-machine power system stabilizers (PSSs). The honey-bee mating process has been considered as a typical swarm-based approach to optimization, in which the search algorithm is inspired by the process of real honey-bee mating. The PSSs parameters tuning problem is converted to an optimization problem with time domain-based objective function which is solved by a HBMO algorithm. To ensure the robustness of the proposed stabilizers, the design process takes a wide range of operating conditions into account.

In the paper "Delaying Inter-tier Handover in Hierarchical Networks", in hierarchical network where a macro cell includes multiple small scale cells such as micro, femto cells and Wi-Fi hot-spots, preventing unnecessary handover is one of the most important matters due to so many inter-tier handovers. From the observation that there are many temporary visitors who stay in a small scale cell with short residence time, some recent handover schemes propose to delay the handover from macro to small scale cell to prevent unnecessary handovers made by those temporary visitors. Using such a conservative admission policy can prevent temporary visitor being handed over to small cell so that the number of inter-tier handovers can be significantly decreased.

The Author of "Diversity of Mobile Distribution Systems" presents that modeling of domain-dependent aspects is a key prerequisite for the design of software for mobile applications. Most mobile applications include a more or less advanced model of selected aspects of the domain in which they are used. This paper discusses the creation of such a model and its relevance for technical design of a mobile application. Conventional approaches to modeling of context focus either on the application domain or the problem domain. These approaches are presented and their relevance for technical design of software for mobile systems is discussed. The paper also discuss from an empirical study where a methodology that combines both of these approaches was introduced and employed for modeling of the domain-dependent aspects that were relevant for the design of a software component in a mobile applications. The empirical study was conducted in two companies that produce software for mobile applications.

Paper "Study on the Application of Ant Colony Algorithm in the Route of Internet of Things" discusses that in the routing processing of Internet of things, network traffic distribution changes constantly, network links and nodes will also fail randomly or some new nodes will be added; the autocatalytic and positive feedback mechanism of the ant colony

algorithm conforms to the characteristics of the route searching. This paper uses ant colony algorithm to search route; uses the broadcast signaling, which is featured with the random multi-sending and the short life cycle, to overcome the problem of more network nodes and more variable network structure.

In the Paper "Enhanced Synchronizing Packet Coalescing Mechanism for Improving Energy Efficiency in Ethernet Switch", an enhanced synchronizing packet coalescing mechanism is proposed which improves energy efficiency in small Ethernet switch with basis on EEE specification. This mechanism is designed to predict traffic characteristic for active period by measuring incoming traffic amount during certain period. Once the traffic characteristic is predicted, threshold value would be adjusted to be optimal for the traffic load. Network performance was evaluated through simulation experiment that was performed assuming Poisson distribution traffic and burst traffic pattern respectively.

Paper "Design and Implementation of Secure Control Architecture for Unmanned Aerial Vehicles" describes secure control architecture for UAV control system for multiple operator environments. Multiple access of UAV is necessary because UAV must capture and process various data and UAV's functions become more complex and diverse. From this perspective, UAV control system needs to be secure because new control system will be exposed to multiple operators. To discuss this issue, the paper proposes new control architecture for UAV using RBAC (Roll Based Access Control). Generally, RBAC is applied and contributes to the security of computer systems, thus, we modified RBAC to apply to UAV control system.

In the Paper "Development of an Electronic Ordering and Payment System with Embedded Devices", Authors proposed an electronic ordering and payment system with embedded devices to improve a conventional manned ordering and payment method using a POS system for quick and easy ordering and payment. Embedded devices as thin clients of the proposed system can be placed on each table, and a user can choose a menu and can check his payment from the screen easily. After a user completes an order, the ordering message is transferred to server for preparing the chosen menu at a shop counter or a cooking place in a restaurant. The proposed system also provides various multimedia contents such as advertising information to users during wait time.

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