

# 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 & Engineering Research Support soCietY.

This issue contains 25 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.

Paper “Internet of Things Management Mode and Multi-dimensionally Collaborative Evaluation Method for Agricultural Product Logistics Service” aims at group incentive and alliance scale of collaborative logistics alliance. It defines the connotation of collaborative logistics alliance based on theories related to domestic and overseas logistics alliance and it establishes group incentive model under single alliance leader and multiple alliance leaders based on double layer principal-agent theory. Solution shows that, in group incentive model of logistics alliance, incentive coefficient under one alliance leader enterprise is the same as that under alliance leader decision-making system containing several enterprises. Group scale of logistics alliance can be determined when certainty equivalent wealth of alliance leader decision-making system and alliance member enterprise is equal to their respective retained income.

In the paper “Bluetooth-Tracing RSSI Sampling Method as Basic Technology of Indoor Localization for Smart Homes”, in recent years, smart homes have become the center of interest for IT companies and construction companies and various types of smart homes have been made currently available on the market. Yet, these equipment are costly and it is not easy to convert existing equipment for smart home application as they may require additional resources which could also inflict much costs. The extra costs involving the remodeling of existing housing structure and installment of new equipments can be avoided by using advanced wireless technologies. As an example, this paper proposes an indoor localization system that adopts Bluetooth technology and uses RSSI values for localization. Researchers have configured a system where the central control device will recognize all other devices or equipments in the system, communicate with each other, and respond to the commands or the information provided. However, despite the efforts of many researchers, existing RSSI-based indoor localization systems do not show a satisfactory level of accuracy such that they have devised a system that traces the trend in the RSSI samples. The RSSI sampling algorithm uses Delta values obtained from the Delta sampling process to improve system accuracy and to lower the costs. The analysis results led us to believe that their algorithm has a reduced localization error rate by 12%-point compared to the algorithm that used raw sampling method.

The study “Research of Shanghai Cruise Industry Chain Distribution of Benefits”, based on the Shanghai cruise industry research, this cruise industry chain has problems with balance. Game theory was used and imbalance mainly due to lack of shipbuilding enterprises and proprietary cruises, and also because foreign cruise companies dominate Shanghai cruise industry chain. Learning from the successful experience of foreign cruise homeports’ development, the paper considers transferring the chain’s dominant right to the port enterprise gradually. Using Shapley Model to solve benefits distribution of cruise industry chain dominated by port companies. The profits distribution ratio of cruise

companies, port companies and service supporting enterprises is  $\frac{13}{48} : \frac{47}{96} : \frac{23}{96}$ . Nash Model was also used to study the benefits distribution of industry chain whose member companies are equal. Modeling results show that Shapley Model corresponds with the requirements of benefit maximization. Finally, a validation analysis was done and proved that only the cruise industry chain led by homeport that can maximize the economic benefits.

The paper “Application of Product Package Design in Safe Cold-Chain Food Logistics” states that in order to realize non-contact test of commodity over-package, a commodity over-package test system based on grating projection was designed. First obtain the three-dimensional point cloud of an object using one projector and two high-resolution cameras, then extract the bounding box of object point cloud to obtain algorithm, calculate the volume of bounding box and point cloud, and at last, test whether commodity package is over or not according to volume fraction and voidage.

In the article “Study of the Construction of a System to Investigate Actual Parking Conditions using a Smartphone”, the demand for parking surveys has increased significantly. Despite the increased demand for parking surveys, however, there has been little research and technological developments. Existing parking surveys are carried out by inspectors recording the vehicle license numbers on paper and showing their approximate location on a map. This method is time consuming and it is difficult to ensure the accuracy of the location data. In addition, it has the problem of the additional cost and time to computerize the survey data. Therefore, this study evaluated a parking survey method utilizing a smartphone to overcome the limitations of existing parking surveys. First, the essential items in a parking survey were identified and defined. Based on this, a smartphone application was developed for parking surveys. Using the developed application, a system was constructed to collect the parking survey data, and the necessary software to analyze and express the collected data was developed. If the results of this study can be applied to various parking surveys, then it is expected to be effective in reducing the social costs through more efficient parking surveys and prevent unnecessary duplicated surveys by the efficient management of parking survey data. Furthermore, through the tabulation and visualization of data through maps, it is expected to help understand more comprehensively and three-dimensionally the actual parking situation in the targeted survey area.

The study “Analysis of Corrosion-induced Expansive Stress and Internal Cracking of Concrete under Considering Cover Thickness” states that after considering the actual dimension of reinforced concrete structure, the thickness and geometrical boundary condition of concrete cover, the model of corrosion-induced expansion can be simplified as a plane model of semi-infinite body. Through theoretical analysis, formulas are got to calculate corrosion-induced expansive stress of concrete cover. The results shows that: the corrosion-induced crack originated on the interface between concrete and the corrosion layer, if initial cracking is not in vertical direction to the surface of concrete cover, cracks along the rebar induced by the uplift and horizontal tension stress on the surface of the concrete cover may occur from its outer to inner, it also presents that the anti-rust ability of reinforced concrete structures could be improved by increasing the thickness of concrete cover, raising the grade of concrete, and increasing the diameter of rebar. Compared with the existing literatures, the precision of the theoretical solutions is verified.

In the article “Study on Indoor Temperature Variation Depending on External Type Light Shelf Angle” , among natural light systems, the light shelf, which reflects external natural light and introduces the light deep into the indoor space, has been studied and applied in

various areas, as its efficiency is well recognized. However, previous studies related to the light shelf have been limited to simple variables such as light shelf angle, width, height, and reflection rate in a specific environment or lighting energy, and the change of the thermal environment due to the reflection by a light shelf and the heating and energy consumption caused by the change have not been investigated. Therefore, the present study was conducted as a fundamental study focusing on temperature change in an indoor space depending on the installation of a light shelf and the variables of a light shelf. The following results were obtained from the present study. 1) The average temperature when the angle of a light shelf was  $0^\circ$  and  $10^\circ$  was lower than when no light shelf was installed. This indicates that the introduction of light by light shelf reflection was decreased as a shade was formed by the light shelf. 2) The indoor temperature with a light shelf having a light shelf angle of  $30^\circ$  was higher than that without an installed light shelf, which may be because more light was introduced by the reflection on the light shelf. The optimum light shelf angle of  $30^\circ$  found in previous studies may be inappropriate since the energy consumption for cooling is increased, which should be taken into account in the design of a light shelf. Future studies may need to be conducted on the evaluation of light shelf performance with respect to the light and cooling and heating energy consumption depending on the variation of indoor space temperature.

Paper “Research on Urban Traffic Optimal Path Planning Method based on Improved Genetic Algorithm” states that the traditional genetic algorithm randomly selects nodes in two chromosomes for crossover operation, which may result in individuals of disconnected or loop circuit and lead to issues as meaningless crossover operations. In order to increase the diversity of the population and prevent the occurrence of premature mutation algorithm which might cause local convergence, this essay presents a new urban traffic optimal path planning method. Initialized from the improvement of population genetic algorithm, it designs the fitness function and optimizes crossover and mutation operators so that the optimal or near-optimal solution can be quickly figured out. Moreover, the Matlab software simulation test exhibits the feasibility and effectiveness of the method.

In the article “A Multicast Routing Algorithm Based on Prior Objective Nodes”, the minimum Steiner tree problem is an NP-complete problem in multicast routing algorithms. In this paper, an improved algorithm called the prior nodes minimum cost path heuristic (PNMPH) algorithm is presented according to the shortage of the minimum cost path heuristic (MPH) algorithm, in which some paths that pass through prior destination nodes are selected first. It partly shares links in the network and decreases the cost of the multicast routing tree. It is also closer to the optimal solution with the time complexity  $O(n^3)$ .

In the paper “A Study on Development of Dry Floor Heating System for Applying to Apartment Buildings of Korea”, a kind of dry floor element (dry heat storage floor heating block) was developed for applying it to some kinds of residential buildings in Korea and the applicability of the element to some thermal environments and apartment buildings was evaluated. In the aspect of thermal environments, the heat sinking and recuperation capacities of the existing wet floor system and the dry one for which a dry heat storage floor heating block is applied were compared. And the applicability of the block to apartment buildings was evaluated by analyzing the strength and the floor impact noise levels. As the results from a thermal environment analysis, it was analyzed that the heat sinking capacity of a dry floor structure which applies a dry heat storage floor heating block is inferior to a wet floor structure by a little, but the heat sinking capacity of a dry floor structure is higher than that of a wet one. In addition, since the average strain and the residual one were 0.21mm and 0.13mm respectively and the lightweight and

heavyweight floor impact noise levels were 39dB and 54dB respectively as the results from a local compression test, it was analyzed that the dry floor structure satisfies the Korean Industrial Standards (KS).

The paper “A New Positioning Scheme Exploiting RSS Difference of Arrival in Indoor Environments” states that the three basic properties of radio signal, such as received signal strength (RSS), time of flight, and angle of arrival, are commonly used in estimation of distance for positioning of a target. Among them, the positioning technique based on RSS attracts much more interests of researchers due to its high feasibility in realization. However, the performance of the conventional positioning scheme based on RSS is significantly degraded than that of TOA or fingerprinting scheme because of error components from multipath and shadowing effects. In this paper, the RSS-based positioning scheme, which defines RSS difference of arrival (RDOA) likewise time difference of arrival (TDOA) to mitigate error components, is proposed and its performance of position estimation is experimentally analyzed in indoor environments. The performance of the proposed RDOA scheme is compared with that of conventional scheme likewise TOA scheme with respect to the fixed AP selection case, the base AP changing case, and the adaptive AP selection case, respectively. According to the experiment results, it is shown that a high accuracy in position estimation also can be achieved with the RDOA scheme compared to the conventional scheme likewise TOA, while the RDOA scheme can provide less standard deviation than the conventional scheme.

Paper “Research of Traffic Statistics in Hospital Outpatient Clinic based on Face Detection”, currently the traffic data of hospital outpatient clinic mainly comes from the hospital management information system, so that the phrase of statistics can only begin after the registration of patients, which lags to a certain extent. This paper firstly makes pre-treatment to the images, and then makes face detection and counting with YCrCb color space algorithm to reflect the traffic of clinic in real time. It is revealed after experiments that, it can help the hospital timely respond to some unpredictable clinic peaks, improve the satisfaction degree of the patients to the hospital, and increase the hospital's economic and social benefits.

Paper “Optimal Operation of Tri-Generation Microgrids Considering Demand Uncertainties” proposed a robust optimization-based modeling for optimal operation of tri-generation microgrids. Uncertainty in cooling, heat, and power demands and worst-case realizations of uncertainties are considered. Initially, a deterministic problem is formulated which is then transformed into a min-max robust counterpart. Finally, a tractable robust counterpart is formulated by using the dual of the inner sub-problem. The formulated model is capable of providing feasible solutions for all possible realizations of uncertainties in energy demands (within the uncertainty bounds). The final tractable robust counterpart is simulated in CPLEX and various uncertainty cases are simulated.

In the study “Smart Classroom and Multimedia Network Teaching Platform Application in College Physical Education Teaching” , with the development of information technology, multimedia teaching has become the main trend of college teaching. At the same time, cloud computing can dynamically allocate computing resources according to the number of users, as well as the complexity of the application. In this paper, the author analyzes multimedia network teaching platform application in college physical education teaching based on cloud computing. Through the questionnaire survey, the results show that the use rate of multimedia teaching in physical education is 75.6%. And multimedia technology has a positive impact on physical education, especially in teaching concept (47.56%), teaching environment (39.02%), teaching content (50%) and innovative

methods (63.41%). In conclusion, modern educational technology has a profound influence on the teachers' teaching, and has a great significance to the whole teaching process.

In the paper "IACTS: A Novel Indoor Active Camera Tracking System", an active camera tracking system (ACTS) is comprised of a camera that can rotate automatically toward an object of interest so the object remains within the camera's field of view. To rotate the camera toward an object, the camera needs to detect the object's location. Detecting an object's location can be achieved using image processing techniques. However, conventional image processing techniques require expensive calculations in addition to expensive hardware, which in turn limits the video frame processing speed. In this paper, they propose an effective ACTS to monitor and track objects automatically with high accuracy. The proposed approach automatically initializes the object to be tracked using an absolute difference motion detection technique. To track the object correctly, the minimum output sum of squared error (MOSSE) adaptive correlation tracker is applied to provide an accurate and fast visual tracking. They also implemented an accurate scale estimation for the visual tracking technique that detects the scale changes of the object. Additionally, the proposed ACTS uses a closed loop controller to control the pan-tilt speed of the system. By combining these techniques, the proposed ACTS can provide accurate tracking with smooth rotation.

Paper "Design of Agricultural Product Safety Traceability System based on Things EPC Standard" states that the main purpose of traceability system can be recorded and stored goods in the supply process-related information, when quality problems arise, it is possible to quickly and efficiently traced part of the problem and implement targeted rescue measures, if necessary, product recalls, thus to ensure product quality and safety and consumer's right to know. In this paper, the core technology of agricultural products traceability system conducted in-depth research. This paper shows complete traceability of agricultural EPC standards-based platform for the development of various agricultural products circulation of information transparency display, repeatedly received praise at the exhibition meeting. Platform integration of a number of enterprise product data, meet the supervision of consumers' right to know information on the circulation of agricultural products, businesses and governments to track the quality of agricultural products, but also to promote China to solve the problem of agricultural products provides a new channel.

Paper "A Nonlinear Multiple-target Coverage Protocol Based on Data Integration of Wireless Sensor Networks" proposes a multi-target k-coverage preservation protocol. First of all, establish the affiliation between the sensor nodes and target nodes through the network model, present a method to compute the coverage expected value of the monitoring area; secondly, in the network energy conversion, using scheduling mechanism in sensor nodes to attain the network energy balance, and achieve different network coverage quality through different nodes energy conversion.

The article "Introducing Weighted Fingerprint Indoor Positioning" states that the deployment of a fingerprint positioning method consists of an offline phase and a real-time phase. During the offline phase, a fingerprint database is built. This process is tedious and time consuming. Even so, the majority of WiFi-based indoor positioning methods implemented in practical indoor location-based service (ILBS) systems are the fingerprint method, because this method is accurate enough, whereas other WiFi-based indoor positioning methods are too inaccurate. During the real-time phase, the fingerprint method obtains a test fingerprint (a set of WiFi signals collected at that moment).

In the study “Household Appliance Product Appearance Design with Feedback of User Experience”, Household appliance product design is a big trend in current industrial design circle. Reverse engineering is one of the most common CAID means in modern industrial design. In order to support reusing product appearance design knowledge, this paper proposes the model used for resolving innovative product appearance case. According to the three stages of aesthetics impression, semantic judgment and symbol contact experienced by users to cognize product, this paper divides the product into three kinds of appearance innovative types of formal aesthetics, usage mode and cultural fashion. By utilizing taxonomy principle and appearance design innovative process, this paper sets up three kinds of appearance innovative types corresponding to design knowledge frame model used for extracting and reusing appearance innovative design knowledge. Such model is applied to setting up product innovative case library, helping designer search and apply previous successful cases and realizing user-centered product development. Through the use of such database by designer, this paper shows its effectiveness.

Paper “Research Status and Trend Analysis on Context-Aware Application (2005-2014)” states that recently, context-aware application has been one of the hottest researching fields in the domain of business intelligence. By reviewing the progress of context-aware application in these years, this paper proposes a four-layer classification framework and gives an analysis and comparison to the concept and theory, context-aware computing and typical application which are related to context-aware application. It also summarizes their characteristics and effects from the point of practical use. Lastly, some discussions and suggestions were given to emphasize the difficulty of current application conditions.

The research entitled “Method to Design and Analyze an Interactive Product Based on Design Elements for Creating an IoT-based Service” aims to build a method to design and analyze IoT-based interactive products based on new design elements. they commence by exploring the related literature and cases, in order to extract new design elements. Through these explorations, they construct considerable elements for effectively designing an IoT-based service. In order to prove the validity of the elements, they analyze cases of an IoT-based service with the new design elements. Through this, they build a method to design and analyze IoT-based interactive products based on four essential controllable factors of an IoT-based interactive system. This research contributes to a design method to enable designers to fully explore and better understand interactive products.

Authors of the paper “A Comprehensive Morphological Hybrid Filter Considering Symmetry Maintained” present a comprehensive morphological hybrid filter considering symmetry maintained, based on composited the morphological hybrid filters and the generalized morphological hybrid filters. The filter improved filtering performance from two aspects: morphological operate mode and optimization of structure elements. It can eliminate the gray values deviation of the images and have the double advantage of the two-path dual filters. Simulation results show that the new hybrid filter can effectively remove the noise in the image while maintaining the image details. Compared with the other morphological hybrid filters, the images filtered by the new filter may have a higher peak signal-to-noise ratio (PSNR) and a smaller mean square error (MSE).

The paper “A Study on the Sharing Economy Apartments and It’s Ubiquitous Monitoring System” is to study of the sharing economy that is based on Collaborative Consumption by trying to rent or borrow the tangible and intangible asset, which promotes the spirit of intercommunity. It has appeared as the new concept of economy which is compared with the capitalistic economy originated from mass production and consumption based on the

materialism. Preventing the potential crimes and the disaster which may be caused from the frugidity of safety and the lack of communication among the neighbors, and its management with the unit of apartment cluster has emerged. This study suggested monitoring system of sharing economic apartment online platform called "ACMP(Apartment Continuity Management Planning)" as a key idea of the sharing economy. This study also proposes a new model of the innovative ubiquitous based monitoring system for the smart apartments adopting sharing economy system.

In the study "A New Modeling and Analysis Approach Based on State-Space Averaging for Converters", 4-quadrant converters (4QCs) have been widely applied in power active VAR and harmonic compensators, FACTS, electric drive systems, and a variety of other applications. The state-space averaging model is usually quite facile and suitable for converter topologies with only two switch states, like half-bridge 4QC units. When directly used in topologies with multiple switch states, however, the modeling method becomes overly complicated. Due to this, plus the fact that multi-phase PWM 4QCs and even other varieties of converters are mostly multi-unit-symmetrical, a novel method is necessary. By researching the inner link between multi-phase topologies and half-bridge units, including inter-phase symmetry configurations, and control relations, this paper proposes a general unified modeling approach for application to multi-phase 4QCs. A series of conclusions are derived, alongside theoretical analysis of the model. The validity of the model and its theory is confirmed using single-phase and three-phase 4QCs and their numerical simulating waveforms as special cases. The proposed method may also extend to the modeling, analysis, and general research of other varieties of converter topologies.

In the study "Fire Location for High and Large-Span Space Buildings based on Binocular Stereo Vision", to meet the demand for the early location of fire in large-span space buildings, an accurate fire location method is proposed based on machine vision technology. A nonlinear implicit camera calibration method is proposed by combining an improved particle swarm optimization (PSO) method with least squares support vector machine (LS-SVM) to solve the problem that it is difficult to establish accurate mathematical models for traditional nonlinear explicit camera calibration. The matched pixel coordinates of images collected by cameras are used as input, and the output is the world coordinates. The IPSO is used to search the optimal parameters of LS-SVM regression model to increase the convergence speed and improve the generalization ability of LS-SVM. The spatial location of fire is achieved by three-dimensional reconstruction. The proposed method is applied to fire location for high and large buildings, and experimental results show that the method is effective, fast and accurate.

In this study "Smart Home IP-based U-Healthcare Monitoring System using Mobile Technologies" a smart home IP-based U-Healthcare monitoring system using mobile technologies is develop a pervasive architecture for U-Healthcare monitoring, services management system, and preventive medicine. The IP based Mobile and Home u-Healthcare system employ wearable wireless bio-sensors to gather medical data, which is then transmitted using RFID technology to the user's device, typically a smart phone or a PDA, and directs this information to a local proxy server.

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**Editor of the October Issue on  
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