

Foreword and Editorial

International Journal of Smart Home

We are very happy to publish this issue of International Journal of Smart Home by Science and 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.

The paper “Study on the Method of Closed Loop Control for Gas Engine” develops an adoptive control method based on electronic control. According to the verification, the method can improve the efficiency of the CNG engine. It can be shown the validity of the adoptive method

Paper “Matlab Guidance Based Smart Gas Leakage Detection and Security System Using Analog to Digital Technique” develops and demonstrates an analog to digital conversion (ADC) technique based an electronic device which is used to detect gas leakage using mechanical sensors at households, industries, vehicles, gas stations etc. where detection of gas leakage is an important issue to avoid any uncertainty. The device consists of a processing section which takes input, processes it and provides output. Corresponding to this output, it starts exhaust fan and light emitting diode (LED) is on, if concentration of gas exceeds a certain level, starts buzzer (alarm), switch off the gas power supply and notifies the consumer by sending an alert message through the monitoring computer. The gas concentration level for a particular operational area will be stored in Matlab “Database Explorer Tool” in order to get an overview of gas status of this area for future analysis such as probability to take accident and so on.

In the paper “Fisher Linear Discriminant Method for Forest Fire Risk Points on Transmission Line”, a Fisher discriminant analysis method was put forward based on multivariate statistical analysis to assess the status of forest fire risk points. Firstly, impact factors on forest fire were defined. Secondly, the correlation between impact factors and the stability of fire risk point was analyzed with the historical material of forest fire. Next, multidimensional variables of the stability of fire risk point were turned into one-dimensional variables by projection method. Finally, the distances between one-dimensional variables were calculated and used to discriminate the status of stability of fire risk points. In a case in Shanxi province, this method has been verified.

The paper entitled “Design of Chemical Industrial Park Integrated Information Management Platform Based on Cloud Computing and IOT (The Internet of Things) Technologies” realizes an integrated information management platform based on currently advanced cloud computing and IOT (The Internet of Things) technologies, so as for integrated management of chemical industrial parks. This thesis designs the architectural structure of said integrated information management platform, expounds the roles and realization approaches of the basic support platform and the business service platform, analyzes the principles and methods for realization of regionally coordinate emergency management operation mechanism based on the information management platform, that of IOT architecture technology and that of RFID and Wireless Sensor

Network (WSN), and discusses that the standard unification of heterogeneous data under cloud computing is realized by means of multi-source data integration middleware. The said platform can accomplish the whole-process, real-time and dynamic follow-up and control of chemicals and hazardous materials and also provide effective service for users' decision-making by mining and analyzing tremendous data of a chemical industrial park with Agent-middleware technology. The information management platform is capable of assessing the safety factors of chemical enterprises at peacetime, giving necessary warning before accidents and offering effective technical support for rescue via expert system, emergency plan system, monitoring system and positioning system. The realization of chemical industrial park integrated information management platform based on cloud computing and IOT technologies will greatly improve the management level of chemical industrial parks, intensify surveillance, achieve information resource sharing and lower the probability of accident occurrence.

Paper "Uncertainty, Corporate Governance and Investor Protection" confirms that the uncertainty is positive correlation to the cost of equity capital, the board monitoring is negative correlation to the latter. More importantly, the relationship between the board monitoring and the cost of equity capital will become less significant when the uncertainty the company facing is increasing, which means that the uncertainty will weaken governance efficiency.

The research paper entitled "Research of Forest Fire Smoke Recognition Method Based on Gray Bit Plane Technology" applies the separation principle of the physical contradictions in TRIZ into the simulation of forest fire smoke and propose a forest fire smoke recognition algorithm based on gray bit-plane(short in FFSGBP) to change the problem of identifying the smoke into the analysis on the bit-plane images. To get eight images of moving smoke, the separation process on smoke moving images is necessary; use high-diagram image (the 7th,the 8th image) to extract contours, and extract the contour of the remaining images in the same position. Superimpose the information extracted, get the smoke model. By adding motion operators to the original image, they could simulate the motion of discrete smoke better, by using mean filter, they could reduce the influence of noise, and it can improve the reliability of the experiments.

The paper entitled "Biomass Pyrolysis Fuel Research of the Technology about Heating Through Heat-carrier" introduces several kinds of biomass pyrolysis fuel technology about heating through heat-carrier, and then leads to a design of a fine temperature control device through analysis and comparison to keep the initial temperature difference within ± 10 °C for the carrier in main reactor so that it can satisfy the temperature demand of biomass pyrolysis and promote the industrialization of biomass pyrolysis fuel.

The thesis "Evaluating Sustainable Urbanization and Coordinated Development---A case study of Liaoning in China" introduces a hybrid combined weight method-McKinsey Matrix for evaluating the sustainable of urbanization. The values of development index and coordination index are calculated by combined weight method. The GE matrix can assist in assessing sustainable urbanization performance by locating the urbanization state point. A case study of urbanization in Liaoning in China demonstrates the process of using the evaluation method. The result indicates that the development of urbanization in Liaoning is better. The values of the coordination index between economic, environments, social, public service and livelihood is enhancing conspicuously. The case study reveals that the method is an effective tool in helping policy makers understand the performance and formulate suitable strategies for guiding urbanization towards better sustainability.

The aim of paper “ZigBee Network Tree Routing Algorithm based on Energy Balance” is to establish a network layer path of energy efficiency, reliable data forwarding mechanism of formation and prolong achieve network lifecycle. Aiming at non-optimal and some nodes may be depleted prematurely because the business is too large battery energy issues ZigBee network routing tree routing algorithm, an improved routing algorithm for ZigBee network tree. Achieve network load balancing, saving overall energy consumption of the network, and maximize the lifetime of the network.

Authors of the paper “Automatic Traffic Accident Detection Based on the Internet of Things and Support Vector Machine” focus on the traffic accident detection in the IoT platform. Specifically, they propose an overall framework of intelligent transportation. Then, for traffic accident detection, they proposed a Support Vector Machine (SVM) modified by Ant Colony Algorithm (ACA) as the solution. They conduct experiments on real world traffic data to predict 7 types of traffic accidents.

In the research paper “Control Algorithm of Static Loading Test for Wind Turbine Blades Based on Fuzzy Theory”, in the process of full-scale static loading test of wind turbine blades, the loading forces all had relatively strong coupling effect, which seriously affected the accuracy of the test result. In order to eliminate this effect, firstly, a vertical static loading device for 10MW wind turbine blades was established and the coupling rule of loading force was obtained. Then, a control algorithm was put forward based on fuzzy theory. This algorithm took the error of loading force, error's change rate as the input variables and the opening degree of proportional valve as the output variable. A control strategy based on this algorithm was constructed. In the end, the static device took the max flapwise of aeroblade5.0-62 wind turbine blade as example to conduct loading test. The result suggested the algorithm in this paper could ensure that the loading forces on five nodes always kept uniform changing and the control errors were respectively less than $\pm 2\text{KN}$, $\pm 2\text{KN}$, $\pm 2\text{KN}$, $\pm 2\text{KN}$ and $\pm 1\text{KN}$. When in the 100% phase, the loading force could be finely maintained at the set value.

The paper “The Research on the Load Prediction for Ice Storage System Based on Rough Set” proposes that the SVM (support vector machine) combined with rough set is used for the load prediction of ice storage system. The simulation results proved that it opens a new avenue in load forecasting. SVM based on RS method is a promising alternative approach for cooling load prediction in a building.

The paper “Teaching and Practice Innovation of Embedded System Design Course Based on Proteus and Keil-electronic Stopwatch as an Example” aims at the status quo that theory is divorced from practice in embedded systems teaching process. A new theory teaching method is proposed that using Proteus as hardware simulation environment and Keil as software design environment. With this new method, in the teaching process, the hardware circuit can be simulated by the software environment. The joint use of Proteus and Keil in Embedded System Design Course teaching is clarified by an example of the design of electronic stopwatch which is using GPIO and timer in ARM7. This instance illustrates the flow and application methods about the joint application of Proteus and Keil in embedded system course teaching and practical application detailedly. By this method, it can stimulated students' interest in learning, and enhance the students' understanding of the principles and application of Embedded System Design. Thereby using this method can also improve the embedded system experiment teaching effect.

In the research “Performance Analysis of the Home M2M Cooperative Networks”, Based on decode-and-forward (DF) relaying scheme, the exact closed-form expression of the outage probability (OP) for the home mobile-to-mobile (M2M) cooperative networks over

N-Nakagami fading channels is derived in this paper. Then the OP performance under different conditions is evaluated through numerical simulations. The numerical simulation results coincide with the theoretical results well, and the accuracy of the theoretical results is verified.

The paper “Sentiment Orientation Identification under Q&A Community based on Two-level Conditions Random Field Improved by Particle Swarm Optimization Algorithm” proposes a new method based on two-level conditional random field improved by particle swarm optimization algorithm for emotion tendency recognition under Q&A community. The proposed method adopts particle swarm optimization algorithm to train two-level conditional random field model, and applies the trained conditional random field model to recognize emotion orientation of question-answer pairs in Q&A community. Experiments were performed on Yahoo! Answers data set and results show that the proposed two-level conditions random field improved by particle swarm optimization algorithm has a higher precision rate, recall rate and F1 value at the micro average and macro average aspects compared with Hidden Markov Model, Max-Entropy Markov Model, Support Vector Machine and traditional condition random domain model, which prove the proposed two-level conditions random field improved by particle swarm optimization algorithm is a more effective method to recognize emotion orientation of question-answer pairs in Q&A community.

Paper “Research on the Improved DV-HOP Localization Algorithm in WSN” analyzes the problems in current DV-HOP algorithm, takes the received signal RSS as a reference standard through the weighted centroid algorithm, effectively reduces the localization errors, and adopts the improved two-dimensional hyperbola algorithm in the distance estimation to make the estimated distance more accurate.

In the research paper “Application of Android Mobile Platform in Remote Medical Monitoring System”, due to the actual demand of remote medical monitoring system, the overall framework of remote medical monitoring system which based on the Internet of things technology and cloud computing technology is designed. Put forward the application solutions of Android mobile terminal equipment in this system, and discusses the development methods of different types of the Android mobile terminal. First, the overall framework of remote medical monitoring system is introduced. Second, the development of data communication method of Android Bluetooth BLE and HTTP is discussed in detail, which is based on the Android framework. The Internet of Things and cloud computing technologies together to build a remote medical monitoring system. Android mobile terminal development on the medical applications of data processing centers and medical data display applications.

In the study entitled “An Improved DMRS Design Scheme of LTE-Advanced Uplink, the 3rd Generation Partnership Project (3GPP) Long Term Evolution (LTE) uplink supports only a single antenna transmission. However, in order to improve the uplink spectrum efficiency, support multiple antenna transmission in LTE-Advanced. Meanwhile, taking into account backwards compatibility for LTE. LTE-Advanced De-Modulation Reference Signal (DMRS) needs to be designed [1]. According to requirement of LTE-Advanced uplink pilot design, introducing orthogonal cover code (OCC) as a supplement, analysis and study of the current problems, proposes a Circular Shift (CS), Group/Sequence Hopping (GSH) and the OCC joint instructions method of pilot design. Finally, simulation and analysis of the performance of this scheme. Results show that this scheme can meet LTE- Advanced demand for pilot design well.

Paper “Design of Single-Feed Multi-Beam Reflectarray Using Iterative Fourier Techniques”, presented a comprehensive and systematic study on the design of single-feed multi-beam reflectarray antenna is presented in this paper. The traditional direct design method, called aperture field superposition method, is investigated first. It is demonstrated that although this method can generate a multi-beam pattern, it cannot provide satisfactory performances, mainly because of high side lobe level, gain loss and beam deviation. The iterative Fourier technique is then applied to optimize the performances of the multi-beam reflectarray antenna. The required mask and cost function for multi-beam design and the flow of the iterative Fourier techniques are represented. Finally, a Ku-band four beam reflectarray with a single feed is designed using the iterative Fourier techniques and the radiation performances are analyzed and compared with that of single beam, as reference case, and multiple beam designed by aperture field superposition.

Authors of the paper “Development of the Rule-Based Inference Engine for the Advanced Context-Awareness” present the rule-based inference engine which uses user profiles to let the system be aware of users’ context much accurately. Since the physical and logical size of the domain is relatively small, they also introduce inference algorithm optimized for limited size of memory space of the system.

In the paper “Smart Home Automation System for Elderly, and Handicapped People using XBee”, smart home automation system is increasingly used due to the wide manufacturer brands and various available technologies. From a social point of view, residents are admitted to smart homes for comfort, luxury, improving quality of live, and for providing security against intrusion and burglars. Secondly, home automation is achieved using a single controller, monitoring and the controlling many interconnected appliances such as lights, power plugs, HVAC system, humidity and temperature sensors, gas, smoke and fire detectors, audio, video and home theater as well as security and emergency systems. Smart homes are cheap, low-power, cost effective, efficient, and realize the automation of a variety of domestic appliances using user-friendly interface as remote control or any other handheld devices. Elderly, handicapped patients, and people with disabilities who have problems with locomotion difficulty can benefit from this smart home to totally operate, with high performance, all appliances and devices from anywhere in the house. When a resident is living alone, the ubiquitous access becomes very important and it is realized by using XBee transceivers that maintain RF wireless communication between the remote control and the master control panel board.

The paper “A Novel Step Counting Algorithm Based on Acceleration and Gravity Sensors of a Smart-Phone” proposed a novel step counting algorithm based on the acceleration and the gravity sensors to enhance the estimation performance regardless of the position of a smart-phone and the motions of a pedestrian likewise walking or running. The effectiveness of the proposed scheme is demonstrated with experiments and the performance of the proposed scheme is compared with those of the conventional schemes. According to the results, the performance of the proposed scheme is enhanced compared to the conventional schemes no matter what the pedestrian is walking or running although the phone is in different places like trouser pocket, shirt pocket and hands.

Authors of the paper “A New Query Integrity Verification Method with Cluster-based Data Transformation in Cloud Computing Environment” propose a privacy-aware query authentication scheme which guarantees the data confidentiality and the query result integrity of sensitive data. To solve the original data leakage problem, the clustering-based data transformation scheme is designed to select anchors based on data distribution. To verify the query result, they propose a query result authentication index that stores an

encrypted signature for each anchor, which is a concatenated hash digest of cluster data. A user compares the verification information with the cluster signatures stored in the verification index. Through performance evaluation, they show that the method outperforms the existing method in terms of query processing time and verification data size.

The research paper “A Directional Cognitive-Radio-Aware MAC Protocol for Cognitive Radio Sensor Networks” proposes a medium access control (MAC) protocol named directional CR-aware MAC (DC-MAC) for CRSNs. To the best of the authors’ knowledge, this is the first work to propose a MAC protocol for CRSNs with directional antennas.

Authors of the paper “Towards an Intelligent Livestock Farm Management using OWL-based Ontology Model” have designed the ontology model to achieve a cost effective livestock farm environment by maintaining safety and quality. The proposed model is built with the situational context aware data by making use of the wireless sensor network (WSN). The concepts of the proposed model are identified after considering all the possibilities with respect to the control services that help to increase the productivity and automation in the livestock farm environment. The health and diet management along with the environmental services are considered as a main service, which is a deniable fact. In addition to these services, uprising and downsizing of stock prices can affect the management behavior in regard to the production services. In order to solve the issue, both the health and diet management plans are monitored and modified automatically with respect to the changes in the stock market. With the proposed ontology model, the information from Internet of Things (IoT) is recomposed as context information, which helps in the understanding of the relationship between the livestock environmental factors.

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**Editors of the April Issue on
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