

# 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 31 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 “Nonlinear Analysis Chaotic Characteristics of Leak Signal of Pipeline based on Reconstructed Phase Space” used nonlinear analysis to study the possibility of chaotic behavior of pipeline pressure signal. Based on real-time data of pipeline leak monitoring system, oil pipeline pressure signals have been verified to be chaotic system by analyzing the chaotic characteristic of pressure time series. Six typical measured data of pipeline pressure are selected and reconstructed to the higher phase space. And then the largest Lyapunov exponent of each data is calculated to test and verify the chaotic characteristics of the pressure signal. For pipeline leakage fault diagnosis, the approximate entropy (ApEn) has been applied to extract the nonlinear and chaotic characteristics. By calculating the ApEn of normal, operation and leakage signals, the results indicate that the value ranges of three kinds of signals are above 0.35, below 0.025, and from 0.025 to 0.35. And the identification rate of pipeline leakage has been reached 90.0% only based on ApEn, which provide more effective basis for the classification and identification of chaotic characteristics of the pressure signal.

The paper “A Proposal of Emergency Rescue Location (ERL) using Optimization of Inertial Measurement Unit (IMU) based Pedestrian Simultaneously Localization and Mapping (SLAM)”, proposed a new ERL based on an Inertial Measurement Unit (IMU). In the proposed ERL, an IMU is used to retrieve location information from inside the building. To conclude, they illustrate out proposed solution for indoor environmental set-up.

In the study “An Enterprise Application Development Framework Which Changes According to Need – SmartADF”, while there are a majority of enterprises using the J2EE technological structure design and solutions, it is difficult to fulfill the requirements in the complex and various, multi-point and wide-spread business implementation level by relying solely on object and interface oriented technology. SmartADF (Smart Application Develop Framework-Java) is a rapid application development framework. It is a framework suitable for developing the enterprise applications software based on J2EE framework. It adopts a strict hierarchical design. Hence, different levels of developers can find the right level to work. The use of interface coupling between the layers could be realized. It has been proved by the practice result that SmartADF provides a more abundant set of components and technical specifications to develop fast, stable and efficient enterprise applications compared with the traditional J2EE development framework, which improves the efficiency of developers.

The paper “Middleware Technology Research and Interface Design Based on Internet of Things” firstly introduces the research background of IoT and middleware technology. Then three main middleware access scenes are analyzed in IoT system, which is

determined by the sensing device functions. Lastly, this paper defines the middleware interface, and proposes the interface design method. The middleware interface is classified into three categories: device side interface, application side interface and middleware management interface, in which device side interface defines the data transmission method between the device layer and the platform layer; application side interface defines the middleware opening resources and services between the application layer and the platform layer; and middleware management interface is mainly for devices and middleware management functions. It indicates the message interaction process, and separates different message information, thus improving the data transmission efficiency and enhancing the services open ability of IoT system.

The paper “Greenhouse Management Framework based on Localization Using RGPSi and AoA” proposed the concept of the smart greenhouse control framework with the help of localization algorithm. The proposed smart greenhouse framework consists of the data aggregator with the database, the environment control part and the crop growth status control part. The data aggregator has been equipped with the various sensors to measure the data for crop growth. The sensors have ability of communication and calculation of location of target. As a localization algorithm, RGPSi is used. RGPSi uses the iteration algorithm similar to the GPS algorithm, but utilize the ratio of signal strengths instead of absolute strengths. To improve the accuracy of the localization, the method of AOA(angle of arrival) of signal will be added. The environment control part has the role to generate the control signals for the greenhouse to operate properly for satisfying the goal. Information for the status of crop growth is generated from the growth control part. With the help of the goal function two parts will be interacting each other and have fed back the sensed data from the greenhouse.

Paper “Based on the Internet of Street Lamp Illumination by Automatic Control System” designed a model based on Internet of street lamp illumination by automatic control system. Based on intensity of illumination, and traffic noise, the information such as temperature and humidity automatic data collection and information processing, the system sets the corresponding weights of each measurement parameter, through the corresponding algorithm to judge the different road and weather conditions, make the corresponding instruction, realize adjustment function of intelligent street lamp illumination in different road and weather conditions. Through the light body GPS technology, fast fault detection and location, the complexity and cost of the artificial maintenance is greatly reduced.

In the paper “A RFID Based Automatic Attendance System in Educational Institutions of Nigeria”, as a result of the challenges of the manual method of taking attendance in schools and colleges in Nigeria, an automated attendance system needs to be adopted. The challenges include difficulty in keeping the attendance list over a long period of time, unnecessary time wastage during writing or signing, improper documentation, students forgetting to write or sign the attendance paper, lecturers forgetting the attendance list in the classroom, students writing or signing illegally for an absentee among others. This paper implements Radio frequency identification (RFID) automatic attendance system in Nigeria educational institutions which provides the functionalities of registering students, recording attendance, making decision on the eligibility of a student to sit for an examination in a course and other functions. This work eradicates the deficiencies associated with the manual attendance system with an automated approach implemented through Radio frequency identification (RFID) technology. The case study is Federal University of Technology, Akure, Nigeria.

In the Study “Effect of Discharge Location on Temperature Distribution during Electrical Discharge Machining”, the thermal model for EDM process is established using ANSYS software to investigate the temperature field distribution. The model considers more realistic factors such as Gaussian distribution of heat flux, plasma channel radius, latent heat of melting, etc., to agree with actual machining situation. Numerical simulation analysis of the temperature distribution of the two consecutive spark discharges has been carried out considering the relative position relation of discharge location. Based on the numerical simulation, the effect of discharge location on the temperature distribution and material removal volume in pulse discharge process has been analyzed in detail.

Authors of the paper “A Big-Data-Based Urban Flood Defense Decision Support System” present the design and implementation of an urban flood defense decision support system based on big data. The system connects real-time sensor to collect streaming data, and uses a data-driven method that considers temporal and spatial factors to forecast water level in the next 6 hours. Thus, it can provide enough time for the authorities to take pertinent flood protection measures such as evacuation. Their predictive model is a hybrid of linear regression and artificial neural network, and can give early warning of potential flood using the forecast results. The system is implemented on Java EE platform, and integrated with Baidu Maps API to provide a user-friendly interface.

In the paper “Prediction of Solar Global Radiation in Bogotá Colombia Based on Mathematical Models”, nowadays, sub developed countries are presenting a growing tendency of technological implementation based on renewable energy. For which is very common to make meteorological factors predictions, to guarantee a better performance in accord to the climate variability. With this work the validation of the global solar radiation predicting models involving geographic and / or meteorological factors for the city of Bogota DC is made. This validation is based on the comparison of the results from the models with the experimental data and NASA, IDEAM, SWERA, METEONORM, CAR data bases.

Authors of the paper “An Improved DV-Hop Localization Algorithm Against Wormhole Attack in WSN” analyze the effect of the wormhole attack on DV-Hop algorithm, which mainly destroys the network topological structure and shrinks hop count between nodes and expands the localization error. They propose a modified DV-Hop method without additional hardware support against wormhole attacks. Through analyzing the characteristics of the neighboring nodes set of nodes attacked, this method detects wormhole attack, then locates nodes by using an improved DV-Hop algorithm. They show that the scheme can detect wormhole attacker adequately, and the obtained localization accuracy is even better than that of the DV-Hop method without wormhole attacks in most cases.

The research “Urban Landscape Innovative Design and Its Evaluation” classifies landscape design innovation into 9 types: cultural art innovation, functional position innovation, technological and scientific application innovation, space usage innovation, environmental protection innovation, service object innovation, economic efficiency innovation, social development innovation and industry chain innovation. Landscape design innovation is aimed at creating a landscape environment, which can be more in line with the long-term interests of the public. Landscape design innovation can be evaluated from 8 aspects: visual art evaluation, physiological comfort level evaluation, convenience evaluation, resource and environment evaluation, psychological satisfaction degree evaluation, POE evaluation, input-output evaluation, social integration evaluation and life cycle evaluation.

Paper “Development of HCO6 Bluetooth Based Switching Automation of Domestic Electrical Powered Appliances through an Application Software on Android Phone Platform” present Bluetooth based switching automation of domestic electrical powered appliances through application software on android phone platform. The system makes switching boundless within the Bluetooth 10m coverage. The design was done in two major stages: hardware and software. The hardware involved the physical construction of the system while the software was the programming design of the application to suite android phone.

In the study “The Multi-channel Embedded Video Surveillance Alarm System”, the system is used to measure temperatures and monitor by videos in multi-channels. For example, it can be used to care for babies in home while parents go to work. Each room has a baby's body wireless temperature sensor to measure his or her temperature and a webcam. The temperature sensors can transmit the babies' temperatures to the gateway by the wireless multi-channel network. The linux operating system is installed on the gateway. The data base saves each baby's temperature. And the developed software can display all the temperatures on one screen in the form of split-screen or on one's own. In addition, each WIFI wireless camera system is also fixed in the corresponding crib. The camera catches the video and transmits it via the 3g module through the wireless multi-channel network. The H.264 coded video is transmitted to the gateway through the RTP protocol. The collected multi-channel videos are also displayed on the screen of the gateway respectively or simultaneously. In the gateway, the video is captured using FFMPEG solution through the H.264 decoding and the RTP protocol. Each mother can view what the baby is doing and her baby's body temperature by her mobile phone through the WIFI in her company at any time. When the baby is in the abnormal situation, the alarm system is activated automatically. The system can also apply widely in other aspects.

In the study “Spatial Heterogeneity of Soil Mite Community and its Spatial Relationship with Environmental Factors in Maoer Mountains”, Maoer Mountain National Forest Ecological Station is located in Heilongjiang Province. By using the statistical spatial analysis method, which showed that the soil mites community and species richness of mites spatial heterogeneity. Also, which is illustrated that the spatial effect relationship with the environmental factors. The results of crossvariogram and simple Mantel test showed that positive relationships between soil mite communities, specific mite species and environmental factors were detected. Among the environmental factors, soil pH showed significant affects on spatial heterogeneity of soil mite species in both years. When considering the relationships between soil mite species, positive correlations and specific mite species were also observed. Spatial heterogeneities of soil mite communities and most of the soil mite species were regulated by structured factors, in which environmental variables might be important drivers. Thus, it is implied that abundances of soil mite community and most of the soil mite species showed aggregated spatially heterogeneity, and significant relationship between such heterogeneity and environmental factors were detected.

The paper “Global Anomaly Crowd Behavior Detection Using Crowd Behavior Feature Vector” proposes a novel method by increasing the dimension of feature vector to increase the information content so as to improve the recognition accuracy. That is to say the crowd dynamic information and crowd density information will be combined together to form a higher dimension of feature vectors, which is named as the crowd behavior feature vector in this paper to improve the robustness of the algorithm. Finally, Support Vector Machines (SVM) is adopted to detect the abnormal events using the crowd behavior feature vector. This work utilizes the Local Binary Pattern Co-Occurrence

Matrix (LBPCM) for crowd density estimation to ensure the excellent accuracy. At the same time, it adopts high accuracy optical flow histograms of the orientation of interaction force to extract the crowd dynamic information (HOIF). After verification, they discovered this algorithm not only can get the good discrimination on the benchmark dataset UMN, but also can achieve the pretty high recognition rate about the web dataset.

The research paper “Solar Street Light Controller for Harsh Environments”, at present, solar street light controller has the issues of unscientific discharge policy widely. Especially in the bad weather conditions, such as cold, Continuous rainy days etc. because of the weather conditions not considered comprehensive, causing the system can't be targeted scientifically discharge, thereby making the system operating time is shorter. To solve this problem, the subject has a more depth research, adding the ambient temperature, rainy weather which having a greater impact on the system to the study, Proposed a solutions of based on improved BP neural network algorithm which depending on the temperature, weather conditions and other factors to determine the discharge power of system to achieve the purposes of maximum energy saving. Finally, the simulation experiment shows that the controller compared with the traditional controller can better cope with the severe environment. It has a strong practical value.

The study “Research into the Personalized Digital Signage Display Contents Information through a Short Distance Indoor Positioning” researched into the position determination methods which enable a motion scheduling based on the location of people using position determination technology and provide individualized display contents according to the demands for an ‘interaction’ through bilateral communication, control, responsiveness, personalization and participation. This research outcome is not only expected to enable the utilization and effective delivery of cultural contents beyond the time and space but to elevate a usefulness value of an individual tourism content.

In the paper “Study on Main Road Capacity Influenced by Harbor Style Bus Stop”, Harbor-style bus stops have large capacity, little influence on the main road, which is also safe and convenient for passengers to get aboard or getting off. However, the capacity of main road was reduced when buses arriving or departing the bus stops. Based on the analysis of procedure of bus arriving and departing the harbor station, with the combination of queuing theory with gap theory, they analyzed the influence of harbor style bus stop on main road capacity, which is studied by normal and spillover scenarios.

Authors of the paper “Threats Analysis, Requirements and Considerations for Secure Internet of Things” provides analysis of new security threats, caused by open-platform of Internet of Things (IoT) and interconnectivities among various smart devices and sensors via the Internet, and requirements and scenarios for establishing standards and secure IoT service.

In the article “A Simplified Synchronous Pulse-Width Modulation Method for Three-level Inverter of High-speed Train”, The synchronous Pulse-Width Modulation (PWM) is quite complex for three-level neutral point-clamped (NPC) inverter. A simple central 60° synchronous modulation method is presented in this paper for three-level NPC inverter used in the multi-mode PWM strategy. For the fundamental voltage command, the switching angle could be real-time calculated based on this modulation method with different carrier frequency ratios. The switching strategy between these modes is discussed for multi-mode PWM. According to this method, a simulation model of the drive system with three-level inverter and induction motor is built.

Authors of the paper “Evaluating Wealth Management Centers in the Pearl River Delta by Using Principal Component Analysis” create an evaluation index system for assessing the development level of WMCs in cities in the PRD; they develop this system by selecting 20 indicators including gross regional production (GDP). Subsequently, they use panel data from 2010 to 2013 of nine cities in the PRD to evaluate the financial competitiveness of each of these cities through principal component analysis (PCA); they further analyze the pioneering roles of Guangzhou and Shenzhen in establishing WMCs in the PRD. The numerical analysis results reveal that Shenzhen and Guangzhou rank first and second, respectively, regarding financial competitiveness in the PRD, indicating that the two cities play a leading role in the establishment of WMCs in the PRD.

In the study “Moving Object Detection Based on Improved ViBe Algorithm”, an improved ViBe background subtraction algorithm is proposed for dealing with ghost problem during the process of moving object detection. The ghost areas in image can be detected based on the theory that the histogram distributions of ghost areas have similarity distribution characteristics. However, the histogram distributions of real moving objects change with the real objects moving. The influence of ghost areas on moving object detection is eliminated. The improved ViBe, the original ViBe and the Gauss mixture model are compared and analyzed, The results show that the improved ViBe can effectively eliminate ghost areas, and has high real-time.

Authors of the study “The Improvement and Evaluation of the Implementation Ability for Deriving Timing Constraints Context in Service-Oriented Home Network” propose a method to collectively manage the information of a pre-existing context of HNS in this paper, by which the developer can create high-level timing constraints context more easily than before. As a case study, they implement Enter-Leave context and TV Left On context, and execute an evaluation to prove the effectiveness of this proposal.

The paper “Design and Implementation of a TV Schedule Editor for Internet TV Systems” introduces their design and implementation of an editor with which Internet TV staff can create and modify TV schedules. This editor allows authorized staff to retrieve contents by accessing the content management system and to send a created schedule to the broadcast management system. They apply the Microsoft Solution Framework/Component Design (MSF/CD) principle in their development. Their design of database and classes and experimental results are discussed in this paper. Most of local governments are running their own Internet TV systems in order to provide regional news and information of local products, festivals, events, weather, and points of interest to citizens and tourists. With their editor TV schedules can be efficiently created.

In the enhanced CP method proposed in the paper “A Low-cost IMU/GNSS Cooperative Positioning Method for VANETs in the Urban Environments”, vehicles communicate their GPS measurements and inertial measurement unit (IMU) data, and each vehicle fuses local GPS and IMU measurements and those of the neighbours. Experimental results show that the new tight integration CP method can enhance the relative positioning in low GPS coverage environment, such as in very dense urban areas and tunnels.

In the paper “Implementation of Textile Air Conditioning Intelligent Monitoring System Based on Internet of Things”, the traditional textile enterprise air conditioning system has deficiency such as temperature and humidity adjusting by manual work, low degree of automation, information management relative lagging and large error. According to the information management needs of modern textile, this paper design temperature and humidity monitoring system based on internet of things. The system is composed of three parts of remote monitoring subsystem, database subsystem and local monitoring

subsystem. The system uses CC-LINK field bus, GPRS communication and computer network, and can control data remotely and on site. Combined with the characteristics of textile temperature and humidity, humidity priority control strategy is presented, and adaptive fuzzy-PID algorithm is adopted to tune the PID parameters on line.

The study “Research on Traffic Congestion Mathematical Model in Traffic Signal Control System” establishes the traffic state probability model under snow-ice condition on artery, and puts forward the corresponding parameters calibration method and model evaluation method; finally, using traffic flow survey data under snow-ice condition on Huanghe road and Hongqi street in a city to analysis and forecast traffic state, put forward traffic state prewarning index, and combining the analysis results, present the corresponding traffic management strategy and guidance suggestion.

In the paper “Wireless Remote Water Meter Design of Automatic Meter Reading System”, the analysis on the scheme confirmation, the development of management software was carried out, and the integrated design of the system based on GPRS was studied. The general planning and the technical requirements on the user’s water consumption detecting system was also put forward, based on the S3C2440 chip.

The paper “Evaluating Construction Cost of Green Building Based on Life-cycle Cost Analysis: An empirical analysis from Nanjing, China” analyze the construction cost of green building based on life-cycle cost method, and try to find out the key factors that affect the cost. Through the empirical analysis, the results prove that there are six main factors that influence the cost of green building, such as green building technology, policy support, project positioning, construction technology, building materials prices and local conditions. On this basis, we put forward relevant policy suggestions.

The study “Agent Based Intelligent Traffic Management System for Smart Cities” implement an intelligent-agent traffic model that controls the amount of time a light runs green for, based on the number of cars (density) standing in the light. The performance of traffic systems is greatly dependent on their ability to react to changing traffic patterns and different situations. On traditional traffic systems, the lights run green for fixed intervals of time no matter what the density of the traffic is.

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