

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 29 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 “Analysis of Seasonal Fluctuation based on X-12-ARIMA -- A case Study of Su Ning Electric Appliance”, the sales data sequence of the enterprise often has the seasonal effect, this paper uses X-12-ARIMA method to analyze the enterprise sales data, to eliminate the influence of the seasonal fluctuation, and provide support for the enterprise. Supply and demand is the survival and development of every enterprise, a company's sales in a certain extent, the company's production and business activities, and business sales data will show the development and change of economic time series, but the seasonal factors of production will be more, so the study of enterprise sales data seasonal changes, the following will be a clear understanding of seasonal fluctuations in corporate sales data.

The paper entitled “A Study on the BIPV System for Energy Saving According to the Passive Envelope Design” states that the BIPV system among the envelope technology elements of passive design has the advantage of utilizing solar photovoltaic energy and enhancing the design, so relevant studies are being carried out continuously as part of a complex system. Therefore, the purpose of this study is to review the façade design of the BIPV system through the current application cases by considering the BIPV system that can be applied to the building envelope in terms of energy saving through the analysis of passive design applied element technologies as an envelope technology for energy saving.

In the study “Design of FBG Demodulation System Based on Arrayed Waveguide Grating”, the characteristics of AWG are used and based on previous studies. Using an array waveguide grating fiber Bragg grating (FBG) demodulation method, and the mathematical model of FBG is set up in theory. With the simulation analysis, the linear relationship between the AWG dual channel optical power ratio and the FBG central wavelength is obtained. The linear relationship was verified by experiments.

The paper “The Design of the Household Solar Power Generation System and its Economic Evaluation” presents the design of household solar power system. According to the local weather conditions, environment and the demand of the household electricity load. This paper presents how to select the devices according the actual condition. It includes how to choose the model of the inverter, how to determine the battery capacity, how to determine the solar panel module and the construction requirements. Finally, this paper make an economic assessment for this power generation. This economic assessment is about the PR, NPV and the discounted payback period.

The purpose of the study “Analysis of the Interrelation between Urban Transitional Patterns and Urban Programs” is to analyze the interrelation between urban transition and urban programs based on changing patterns in urban data. The study aim is to identify the inherent characteristics of urban transition due to specific urban program implemented in

the target area by comparing the changing patterns in urban data before and after implementing the urban program. The analyzed target area is the Clinton/Chelsea district in Manhattan, New York City, and the urban programs are special purpose districts (SPD) designated within the target area. The number of new construction and alteration projects and their floor areas in each SPD from the urban data is used as physical urban indicators which provide the basis of analysis. Analyzing changes in physical indicator over time before and after SPD designation, allows identifying changes in transition patterns caused by the designation and proposing analogous interpretations of the analysis results. The study provides grounds for more effective urban program and successful urban projects by improving the predictability of the impact of urban programs.

In the paper “Research on the Mine Personnel Localization Algorithm based on the Background of Weak Signal”, for the mine complex physical environment, signal will weaken in the transmission process, it is difficult to guarantee the accuracy of the mine personnel positioning, this paper proposed a RSSI algorithm combined with weighted centroid localization algorithm to achieve improved operations at the mine location algorithm; Making use of communication technology wireless sensor network to improve the traditional positioning algorithm effectively, and then the data collected in the information loop of the process, makes the final collected data tend to the theoretical value, thereby improving the positioning accuracy, ensure the operational safety of underground personnel; Finally through the simulation experiment showed that the localization accuracy of the optimized positioning algorithm is more precise, less amount of calculation, suitable for weak signal under the mine personnel positioning.

Authors of the paper “An Ingenious Multiple Communicator Concept for Next Generation Smart Metering Communication System” propose and study a self-switching network concept known as an ingenious multiple communicator mechanism which can be applied to energy provider’s smart metering device. They outline reasons why such multiple connections networks are required through real case study scenarios and key components that drive towards such concept. They have gathered actual measurement values for a particular network and identified in what situation this is most suitable and applicable. They have come out with the basic system model for this multiple communicator. They also observed that a less fluctuating and similar pattern of network performance helps to design better network predictive analytics function. Finally numerical examples and analysis of the results are presented.

In the article “Study on Stabilit of Surrounding Rock in Deep Tunnel and It’s Support Design in Donghai Mine”, in order to control the deformation of surrounding rock in deep mine and study the corresponding patterns, the determination of its mechanics parameters and property, numerical simulation and the design of support scheme on the surrounding rock in fifth mining area of Donghai mine are conducive to the study of effective control of deformation and failure. By analyzing the characteristics of deformation and failure of surrounding rock, its regularity and corresponding reasons are finally found— high stress make rock soft and lead to the large deformation of surrounding rock, which inevitably contribute to the broken roof and heaved floor. In addition, based on the numerical simulation, they further analyze the stress distribution and deformation characteristics of surrounding rock and proposed the anchor- injection - net – cable, the double support scheme. They also came up with the whole sealing and coordinated supporter for the fracturing roadway of large deformation, especially in the intersection roadways, witch undoubtedly is beneficial to the research of deformation mechanism and control of surrounding rock in deep mine.

In the study “Research on the Rabbit House Temperature Regulation System based on the Internet of Things and Fuzzy PID”, since rabbit house is completely enclosed, then the environmental factors such as temperature, humidity, harmful gas and illumination etc will affect severely the health and the reproductive function of the rabbit. In view of this, it has been one of the important measures to improve the economic benefits of rabbit farming through the manual intervention on the micro-climate in the rabbit house. In this paper, it designs a rabbit house temperature regulation system to adjust the temperature of the rabbit house through the water curtain filtration and negative-pressure ventilation method. Also it utilizes the internet of things technology to implement remote management on the regulation system when the data about the temperature and humidity information in every rabbit house and the harmful gas concentration is uploaded to the background server via wifi connection to the network to enable the poultry feeders to make a real-time observation on the environmental information of the rabbit house in addition to the remote control of the water curtain and the running of the blower on their smart phones. Furthermore, it builds a model for the rabbit house temperature with the application of the fuzzy-PID control algorithm and the variable frequency drive technology to design a controller for the further decline in the system power consumption based on the optimal control. In addition to these, a prototype system has been established to conduct the experimental verification.

Paper “A Technique to Improve Shadow Areas for an Intelligent Facility-Surveillance System” states that owing to recent developments in surveillance-system technology, there is growing interest in the construction of intelligent surveillance systems aimed at public facility management. Intelligent surveillance systems detect abnormal phenomena through monitoring by managers, and require further intelligent analysis of pictures. Such systems may have difficulty analyzing pictures that contain certain barrier elements. Therefore, preprocessing technology is necessary to improve these barrier elements before analysis of the pictures. Barrier elements in surveillance systems aimed at facility management include the unexpected appearance of obstacles or areas of shadow within the facility. Existing research on shadow areas does not make good use of any prior information that the intelligent surveillance system might have. It is mainly concerned with aerial photograph and therefore has limited application to facility management. Accordingly, this study proposes a technique that is suitable for application to facility-surveillance systems to predict and improve shadow areas in picture data.

The study “Remote Monitoring of Heading Rice Growing and Nitrogen Content Based on UAV Images” states that rice heading is the critical stage of the growth of rice, rice plants are relatively large, field canopy, poor resistance, and coincided with the high temperature and rainy weather, pests and diseases are more prone period. Therefore, the use of UAV to monitor the growth status of rice, easy to understand rice growth and nutritional status, in order to achieve high-quality, high yield, efficient purpose. This article is the field experiments under different nitrogen levels, using UAV monitoring multispectral images of rice, by reference remote sensing spectral indices, derived green normalized difference vegetation index (GNDVI) relative to other spectral index is more suitable for rice field biomass inversion modeling. At the same time, this study is based on the inversion model, implemented the rice growing and nitrogen content graded by ISODATA methods in ENVI. Achieved classification on rice growth and nitrogen remote sensing thematic map in ArcGIS, to provide timely and accurate information for rice seedling diagnosis and management decision, has reached the purpose of rice production precise management.

In the paper “A GPS/GSM Based Vehicle Monitoring and Anti-Theft System”, aiming at the requirement of remote monitoring and anti-theft system, a GPS/GSM based mobile phone remote vehicle monitoring and anti-theft system is developed. The system design

contains two parts: hardware part and software part. On the hardware design, the STC89C52 chip is chosen as the main control chip, the u-blox NEO-6M chip is used as the vehicle position information module, and the GTIM900-B chip is adopted as the short message sending module. On the software design of the system, a single-chip microcomputer program, an analog serial port program, a GPS information processing program and a GSM short message sending program are implemented. In addition, the system has developed algorithms, including map displaying algorithm, speech alarming algorithm and short message trapping algorithm. When an abnormal moving distance exceeds 100 meters, the current vehicle position will be identified and displayed on the APP map of the mobile phone in real time for the vehicle owner, and the system will warning the owner that the vehicle has moved by speech alarming. The system is the low-cost, and can be applied extensively on the remote monitoring of personal vehicle and the remote trapping and location of the outside moving subject.

In the article “BSmart: A Service Platform for Rapid Development of Beacon-based Applications”, as of now, BLE beacons are considered as one of the key technology revolutions to provide object identifications and trajectories of objects with low energy. The services leveraging BLE beacons include in-door positioning service, smart home, mobile advertising and context-aware services. The more popular such services are the more useful easy and rapid development of such services becomes. In this paper, they present a service platform named BSmart, which supports the core functionalities required for beacon-based services through the associated RESTful Web services. These RESTful Web services provide the functions of beacon/user management, beacon data update/filtering, beacon data searching/monitoring, and alarm notification. With the help of the BSmart platform, developers of services using BLE beacons can rapidly build their services without implementation of core functions related with BLE beacons.

The paper “Research on a New Hybrid Intelligent Fault Diagnosis Method and its Application” proposed an improved particle swarm optimization(PSO) algorithm to optimize the radial basic function (RBF) neural network, in order to propose a new hybrid intelligent fault diagnosis(IMPSO-RBFNN) method. In the IMPSO-RBFNN method, the adaptive dynamic adjusting strategy is used to control the inertia weight of the PSO algorithm in order to an improved particle swarm optimization(IMPSO) algorithm. Then the IMPSO algorithm is selected to optimize the parameters of RBF neural network by encoding the particle and continuous iteration of the IMPSO algorithm in order to obtain the optimal combination values of the parameters of RBF neural network. The optimal combination values are regarded as the values of these parameters of the RBFNN for constructing the final IMPSO-RBFNN method. In order to test the effectiveness of the proposed IMPSO-RBFNN method, the data from bearing data center of CWRU is selected in this paper.

The paper “Research on the Real-time Monitoring System of Cow’s Rumination” uses MSP430F149 processor with a sound sensor to achieve the design of real-time monitoring system for cow’s rumination. Since the system require high accuracy of the audio signal of the cow’s rumination, the ADC acquisition module and filtering and amplification process was made a special design. For the change of the spectral characteristics of the voice when cows ruminating, this paper designed the endpoint detection algorithm and sound sequence windowed function, and FFT transform is performed on the data in the Hamming window, and then do the frequency domain analysis to the audio of cow’s rumination. Comparing the sound spectrum collected from high precision recording instrument and this system, this system has done a good job in frequency and time domain. Applying the high precision recording instrument to the simulation experiment for cow’s rumination which conduct 50 sets of different time ranging, using this system to

do the real-time monitoring, the mean error was 4.38, the R2 value is 0.877, the Pearson correlation was 0.936. This system performed accurate in the acquisition of the sound signal, and more accurately in identifying cows ruminating, and it can also provide effective means for the intelligent management of the pasture on cow's health and breeding.

In the paper "Performance Analysis of PI controlled DC-DC Zeta Converter for Grid connected PV System", there are so many topologies of DC-DC converters are used in Grid connected PV system among all those topologies the PI controlled dc-dc Zeta converter with soft switching provides the best result among all and which is more suitable for both IC and P & O algorithm. This topology is also suitable for switching between two different MPPT algorithms. In this paper the MATLAB simulation performance analysis of combination of PI control and soft switching techniques. This performance analysis of this combination of techniques of a grid connected PV system finds the better suitable converter which can give the output with maximum power from the PV module and can have reliability to connect it to the GRID. .

The study "Design and Implementation of Online Mobile Game based on J2ME" states that online mobile game is a hot industry. It is a comprehensive industry including program design, planning and art design. This paper analyzed JAVA program and mainstream game development environment, then developed a mobile game based on J2ME, including modeling design, architecture design, class.

Paper "Research on the Construction Strategy of Information Model for Manchuria Style Architecture and Its Application" states that "Manchuria style architecture" is an important landmark of colonial architecture in modern China. It shows the combination of western classicism and oriental national style in specific historic context. Its sturdy structure and superb technology are of great academic significance for studies of cross-regional building spectrum. Based on the building information modeling technology, the mapping analysis and three-dimensional reconstruction of Manchuria style architecture is conducive to promoting the routine administration of life cycle information management of historic buildings. Besides, the stirps models date base of the building components established in the research process will provide a multi-dimensional and more accurate database for the study of modern architecture heritage with reinforced concrete frame structure. As research continues, the real-time detection information transmission interface and the virtual historic building situation will be constructed, which will open up new opportunities for the studies of the preventive conservation, cultural value and educational value of historic buildings in China.

The author of the paper "IoT(Internet of Things) based Smart City Services for The Creative Economy" have outlined the tangible IoT based service models, which are helpful to the academic and industrial world for a better understanding of the IoT business. The South Korean government has suggested a "creative economy" as the country's new economic development paradigm, and strived to establish a creative economic ecosystem by building platforms. IoT is one of the technologies focused on the implementation of the "creative economy". Therefore, the central government and many local governments are eager to invest on the IoT area in order to build smart cities.

In the paper "Taxi Resource Allocation in the Era of 'Internet+'", in view of the problem A, first based on a large number of analysis reports and their own understandings, they defined "supply and demand matching degree" as β value can be quantified and obtained. And then by looking up the related document literature, through summary can get five groups of operational indicators easy to be obtained from the data as: population density,

travel frequency, the selected proportion of the taxi, starting price, average waiting time, and the different areas and different time of target data represent different space-time concept in problem A.

Paper “Research on the Temperature & Humidity Monitoring System in the Key Areas of the Hospital Based on the Internet of Things” designs an internet of things-based temperature & humidity monitoring system in the key areas of the hospital to address the problem that the temperature and humidity monitoring systems are independent from each other in the hospital. The establishment of a hospital-level temperature and humidity monitoring platform is able to realize the integrated monitoring and management on such areas as ICU, pharmacy and operation room etc, where both of the temperature and humidity must be monitored. In every temperature and humidity acquisition node, the collected environmental data about the indoor humidity and temperature will be sent over the 433M wireless sensor network to the internet of things (IoT) gateway, through which data will be uploaded via wifi or the wired access network within the hospital to the background server, where in addition to data collection and analysis, various reports will be generated and control commands will be transferred. Then all of the medical staffs can make a real-time inquiry and control on the environmental data by connecting their intelligent terminals (such as cell phone) to the server. Actually when the humidistat thermostat controller is designed according to the DDC principle and the integral-separation PID control algorithm, the control on the central air-conditioning units is able to realize the real-time control of constant temperature and humidity. Also a prototype system has been established to conduct the functional verification.

The paper “Measuring and Analyzing the Contribution Rate of Agricultural Science and Technological Progress in Heilongjiang Reclamation Area” estimates the contribution rate of agricultural science and technological progress on state farm’s agricultural production in Heilongjiang reclamation with the method of Cobb-douglas production function model of solow residual value . It analyzes the constantly varying of the contribution rate of agricultural technological progress since 2000. Study has shown that, the contribution rate of agricultural science and technological progress in Heilongjiang Reclamation has risen at a faster rate. In addition, the growth of the contribution rate of scientific and technological progress depends not only on the application and promotion of supporting technology, but also on the modern management model likes "state farm + family farm".

Authors of the paper “The Meaning of 'Life-Culture Documentation' in Neighborhood Regeneration Focused on a Castle-village Regeneration Plan in Haengchon District, Seoul” evaluated the purpose and method of life-culture documentation in neighborhood regeneration during establishment of the plan for regeneration of the castle village in Haengchon District, which was recently carried out by Seoul. In particular, the life-culture documentation project in Haengchon District would have greater significance in neighborhood regeneration of 'castle villages.' It is also meaningful not only to assess village resources and collect and utilize basic data therefrom but also to record and preserve the present shape and appearance of the valuable surroundings of the castle.

Paper “The Influence of Composite Wave Field Fluctuation Parameters Matching to Permeability of Low Permeability Reservoirs” states that there are essential differences in the influence rules of the binary composite wave generated by the combination of artificial resonance wave and hydraulic impulse wave to two-phase fluid flow of low permeability reservoirs porous media oil-water. When the fluctuation parameters of binary composite wave field reaching the optimal matching, the binary composite wave will have a good synergetic effect on two-phase fluid flow of oil-water, and the improvement effect on two-phase fluid flow of low permeability reservoirs oil-water will

generate resonance effect which is far more effective than unary wave field. If the fluctuation parameters of binary composite wave field are not matched well, bad synergetic effect on two-phase fluid flow of oil-water will be generated ,not only it can't raise the improvement effect on two-phase fluid flow of oil-water, but also it will make the improvement effect below unary wave field. Even there will be an inhibition effect on fluid flow of oil-water, which reduces the displacement efficiency and the availability of low permeability reservoirs water injection's development. By using the indoor fluctuation oil recovery simulation experiment device, the influence rules of displacement vibration wave and hydraulic impulse binary composite wave field to low permeability reservoirs oil-water single phase and two-phase fluid flow feature were studied. The influence rules of amplitude, frequency, work cycle and the other important parameters of composite wave to the permeability of oil-water single phase was intensively studied. Finally the mechanism of the synergetic effect generated by composite wave to two-phase fluid flow of low permeability reservoirs was analyzed.

The paper "Prediction Simulation Study of Road Traffic Carbon Emission Based on Chaos Theory and Neural Network" study the road traffic carbon emission and accurately predict the problems, the road traffic carbon emission has the complex systems of chaos and nonlinearity, the traditional method ignores the chaos of the road traffic carbon emission change, and it is so difficult to precisely control the rules of the road traffic carbon emission change that the precision of the of traffic carbon emission prediction is lower. In this study, it proposes the road traffic carbon emission prediction model based on the chaos theory and neural network and improves the prediction precision of the road traffic carbon emission time sequence. First of all, it reconstructs the time sequence data of the road traffic carbon emission change through the space, and sorts out the chaos change rules hidden in the time sequence data and then uses the BP neural network to study and carry out the modeling of the time sequence data of the road traffic carbon emission, and optimize the neural network parameter in order to improve the prediction precision of the road traffic carbon emission time sequence.

Paper "Implementation of Digital Contents System for Cleaning Facility Management based on Bluetooth" states that there is a growing demand for a system that allows users to go online and work at anytime anywhere, as the smart phone is widely distributed and the technology is developing. In line with such a trend, this thesis has developed a system using a display with OS and bluetooth to help check and manage facilities of various industries as well as producing and delivering various contents. The system is based on the Internet of Things which supports the function of inspecting and maintaining facilities while providing various contents on display devices. This also receives from a service provider and displays advertisement contents real time. Therefore in short, the system manages facilities of a building including cleaning service management and displays various contents.

In the paper "An Improved Usability Evaluation Model for Point-of-Sale Systems", Point-of-sale (POS) systems are popular in developing countries because they provide fast and convenient ways of transactions for business. These systems contain vital tasks such as online transactions, ecommerce facilities, security, taxes, various management reports and others. Thereby, it is important to ensure their software quality and grantee the effective usages of business functions. Among multiple software quality attributes, usability is highlighted for POS software since the user interfaces are directly linked to cashiers' behaviors, customers' satisfactions and market profits. However, the usability evaluation of POS systems is not easy since they are generally featured with multi-functions, multiple configurations and complex interfaces. Many available quality models have failed to evaluate the usability of POS systems because any of them just cover partial

view of usability. In this paper, they investigated ten well-known quality models and extracted the usability related factors from each of these models. By integrating these factors together, they proposed an improved usability evaluation model with a comprehensive view of usability for POS systems. Following the model, they designed usability scenarios for each factor and thus provided the corresponding questionnaires. A case study of evaluating a POS system in Bangladesh has demonstrated that the proposed model can provide a comprehensive evaluation of POS from 12 usability factors. Also, different demands from different type of customers are also be revealed by the model.

Paper “Designing Emergency Response Information System based on Axiomatic Design” states that an emergency response information system needs to assist decision makers to evaluate emergency plans and select an appropriate one during an emergency. An axiomatic design approach provides a systematic and scientific view of the structural design relating to emergency response information system. It gives deliberate method of decomposition and acceptable standard of information system design, therefore information system become clear and simple. Based on Axiomatic framework they can draw up a clear relation schema of these elements, furthermore assess the success probability of information system.

In the dissertation “Research on Antenna Arraying Combining Technology for Deep Space Measurement & Control”, the key technology of uplink array for deep space TTC is studied. Based on the concept of power combining, the theoretical analysis is made on the uplink array. The spatial power combining can be achieved in a certain power. The uplink antenna array technology is a power combiner. At first this chapter introduces the principle of power combining and leads to the concept of the uplink antenna arraying. Then analyze the theory of the uplink antenna arraying power combining, including the signal strength and antenna pattern. The influence of the number of element, spacing, phase and time delay on power combining is analyzed by simulation. At last the uplink antenna arraying power combining performance is analyzed and verified by simulation.

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