

# 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.

The study “Using TRIZ Theory to Design and Analyze the Forest Environmental Factors Monitoring Platform” has proposed it can use the theory of TRIZ to improve Forest environmental factors monitoring platform (FEFMP) by solving the problem of organization, monitoring, control of power supply and so on during the networking of the forest IoT. The study first analyzes the evolution laws of the technology system, the best final solution, the substance-field models and technical contradiction in the application foundation of the TRIZ theory. Then, the best final solution of FEFMP based on mixed models has been raised by solving the technical contradiction using contradiction matrix tools and by solving the physical contradiction of the accuracy and power consumption using separation principle. It has raised and built mixed networking basing on 3G and ZigBee and established the FEFMP by using WebGIS and mobile GIS.

The paper “Parking Site Selection in Downtown of Khabarovsk City Using GIS” process consists of two steps. Firstly, it is finding effective criteria for parking site selection. Secondly, they build the model of parking site selection process based on their criteria. As the output of research is the model of parking site selection process which lead us to define suitable place for parking.

The objective of the paper “Development of Data Monitoring Based on Virtual Instrument” is the design and development of the Data Acquisition based on Virtual Instrument and Storage parts of a data monitoring that will be used for a certain control and guide equipment for electronic equipment. The data captured and stored in a database will be an application that will diagnose failure of control and guide equipment. Data acquisition and data Store were developed using finite-state machine model and Virtual Instrument. This paper focuses in the description of the Data Acquisition. The data monitoring is currently installed and applied on a certain control and guide equipment.

Authors of the paper “V2I Based Intersection Scheduling Algorithm” proposed a novel scheduling model based on vehicular ad-hoc networks and autonomous driving system, including vehicle motion, traffic light control and others. Vehicles communicate proactively with traffic lights when approaching to intersections and then transmit required information for scheduling. After summarizing all information about vehicles on different directions, traffic light makes a scheduling decision and distributes a time-slice to vehicle applicants.

Authors of the paper “Optimization Approach for Energy Saving and Comfortable Space Using ACO in Building” proposed efficient optimization method for Simultaneous Comfortable and Energy Saving using ACO (Ant Colony Optimization) algorithm in Building Environment. They have given focus in two directions. First is to maximize the

occupants' comfort level and second is to control the usage of power. At the end, they compared results with optimization method using ACO method using GA (Genetic Algorithm).

The paper "A Technique for Reducing Power Consumption in IC by Test Vector Ordering" considers the issue of high power dissipation in test mode, and puts forward a novel technique based on the reordering of test vectors. This approach considers both the circuit structure and test set. The proposed approach uses a weight to quantify the relationship between the switching of each input and the internal switching activity, then reorder test set based on these weights.

Authors of the article "Boolean Control Network Based Modeling for Context-Aware System in Smart Home" have presented a mathematical modeling used for a context-aware system based on Boolean control network with five nodes for smart home. This Boolean control network describes the relationship between the context elements (user, time, location, activity) and service states (morning call, normal, entertainment, sleeping, guarding). They expressed the dynamics of the state spaces by linear algebraic equation using semi-tensor product of matrices, which is effective to logical inference and control.

Paper "The Design of a Guide Device with Multi-Function to Aid Travel for Blind Person" presented a design method of a guide device with multi-function, the multi-function contents of obstacle avoidance, azimuth guidance, banknote recognition and time broadcast. The hardware system of the guide device based on single-chip system STC89C52 and peripheral added eight expansion units: power supply unit, key input unit, ultrasonic detection unit, azimuth guidance unit, banknote recognition unit, clock Unit, phonetic unit and display unit. The functions were tested and results show that the device is suitable for sunny conditions whose best setting distance range is between 700mm to 1600mm and direction function is good showing in open environment, while the function of currency recognition has some limitations because of color identification. Comprehensive consideration the device can meet the blind person's basic travel demand and has the characteristics of low-cost and stable performance.

In the study "Hardware Implementation of Two-level Scheduling Algorithm in  $\mu$ C/OS-II", aiming at the problem that  $\mu$ C/OS-II does not support round-robin scheduling of the same priority task, a two-level hybrid task scheduling strategy was proposed. In the first level, by putting the task priority as criterion for task scheduling, a preemptive scheduling of different priority task was implemented. And in the second level, adopting time slice circulars scheduling strategy, round-robin scheduling of same priority task was implemented. The waiting list of tasks was designed by on-chip registers of FPGA and the ready list of tasks was designed by RAM of FPGA, and to implement time slice circulars scheduling, hardware circuit for finding successor of task was designed. The system adopted VHDL, and simulated by the software ISE10.1.

In the paper "A Comprehensive Review of BeagleBone Technology: Smart Board Powered by ARM", in the last few years, there have been a rapid increase towards single-board microcontrollers. These days, trend has shifted towards development of full-fledged credit-card sized computer's like Arduino Mega2560, Raspberry Pi, Orange Pi, Chip and even Beaglebone. These boards are low cost, low power, easy deployable and has user-friendly configurable options. Beaglebone technology is speeding up and growing like anything as millions of pieces are sold worldwide till date. Beaglebone boards are showing tremendous increase in adaptability and implementation in diverse areas like Robotics, Drones, Smart Homes, IoT devices, Linux and Cloud Computing Servers and even more. The aim and objective of this research paper is to provide a comprehensive

review of Beaglebone Technology, various Beaglebone boards available till date with their technical specifications along with various research areas which can enable researchers and industry professionals to take up Beaglebone Technology and develop wide range of ready to use efficient and low cost products.

In the paper “Design of Switching System Based on FC-AE-1553 Bus”, as 1553B bus system is also widely used in modern avionics system, so in the new bus system development, not only the quality improvement on the performance is needed, but also should be required to be compatible with the original avionics equipment complying with 1553Bbus protocol , maximum reducing avionics system upgrade difficulty. Based on this consideration, the American National Standards Committee has developed the upper mapping of FC protocol—FC-AE-1553 agreement. FC-AE-155 agreement takes full advantages of the fibre channel and also gives full consideration to the requirement of being compatible with the original 1553B equipment, so the system upgrade can be easily realized. Conduct the fibre bus study based on FC-AE-1553, raise the hardware and software design methods and complete the control system demonstration verification based on fibre-optic bus. At the same time, conduct the bridging technology of FC-AE-1553 and MIL-STD-1553B, construct two types of demonstration verification system for bus bridging, breaking the hardware and software technology of FC-AE-1553 and MIL-STD-1553B bridging and establish the hybrid structure of the high and low speed bus, to meet the needs of the actual model, which plays a very important significance for the further development of China’s aerospace business.

Paper “Applying Multifractal Formalism Combined with Wavelet Transform to Wood Defects Detection” state that nowadays, X-ray computed tomography (CT) wood nondestructive testing technology has been applied to detection of internal defects in log for the purpose of obtaining the optimal wood cutting plan. Multifractal spectrum and wavelet transform are usually used for analyzing, modeling, and extracting different complex features of signals and images. A novel CT image edge detection method which using multifractal spectrum theory combined with wavelet transform is applied in this paper. The new method can be divided into the following main steps: (1) Calculating the wavelet module values of wood defect image. (2) Combining wavelet transform module values with multifractal theory. (3) Calculating the multifractal spectrum from the wavelet transform. (4) Selecting the appropriate threshold to wood defects detection. A large number of experimental results show that the new method to recognize the wood defects is effective.

In the study “Threshold Selection for 60 GHz TOA Estimation Based on Skewness and Kurtosis Analysis”, because of the high sampling rate, coherent Time of Arrival (TOA) estimation algorithms are not practical for low cost, low complexity 60 GHz systems. In this paper, energy detect (ED) based non-coherent TOA estimation algorithm is presented. The expected values of the skewness and kurtosis with respect to the signal to noise ratio (SNR) are investigated. It is shown that the ratio of kurtosis and skewness is more suitable for TOA estimation. To improve the precision of TOA estimation, a new threshold selection algorithm is proposed which is based on the ratio of kurtosis and skewness analysis. The best threshold values for different SNRs are investigated and the effects of integration period and channel modes are examined. Comparisons with other ED based algorithms show that in CM1.1 and CM2.1 channels, the proposed algorithm provides higher precision and robustness in both high and low SNR environments.

The paper “Production Rate Determination for Linear Construction Projects Based on Linear Scheduling Method” first analyses the parameters of linear scheduling method and their interrelationships, such as distance interval, time interval, activity, CAP

determination of LSM. Then it gives determination method of production rate and the rate float. The determination method can increase the effectiveness of production rate input and output data for the linear projects, which will significantly improve the resource allocation. It also draws the effect of production rate float in the construction schedule control.

The paper “Pspice Implementation of a New Esaki Tunnel Diode Macro-Model” proposes an Analog Behavioral Model (ABM) in Pspice of a tunnel diode. The Pspice parameters are extracted and implemented by deriving the device parameters from the device structure. Most of the device parameters are calculated from estimated values. A tunnel diode based oscillator is also proposed and simulated using circuit analysis software. The model is validated by means of comparison with experimental measurements and with the results obtained from other reference model. Excellent agreement is demonstrated between measured and simulation responses. The proposed implementation can be used in a PSpice program, designed as a subcircuit which can be called when required by the main program.

Authors of the paper “A Novel Non-Line of Sight Identification Algorithm in the 60 GHz Wireless Communication Systems” propose a novel NLOS identification technique based on the ratio values of kurtosis and minimum slope of energy block of the received signal using energy detector. In particular, the IEEE 802.15.3c 60 GHz channel models are used as examples and the above statistics is found to be explained in detail. The simplicity of the proposed approach lies in the use of the parameters of the energy-based time of arrival (TOA) estimation algorithm. The CM1 (LOS) and CM2 (NLOS) channel models of the standard IEEE 802.15.3c channel models are used.

In the paper “Investigation on the Trajectory Planning of Spray Gun of Spray Robot and Its Spraying Effect”, the spray gun trajectory and spraying effect are studied. The concave and convex surfaces are adopted as the study objects. In the simulation, when the spraying time is equal for the two workpiece surfaces, two different coating thicknesses will appear. The thickness on the concave surface will be bigger and that on the convex surface will be thinner. When the spraying time is modified, coating thickness of the two kinds of circular arc surfaces will be almost the same just under simple conditions without modification of the nozzle path. The comparative study indicated that the spray gun path model can better describe the actual injection pattern, and it also has a certain degree of adaptability to the curved surfaces.

In the study “Demand Bidding and Real-Time Pricing-Based Optimal Operation of Multi-Microgrids”, an algorithm based on hierarchical centralized EMS has been proposed for day-ahead scheduling of multi-microgrids (MMGs) operation in the grid-connected mode. The proposed hierarchical EMS has two levels of EMSs, which are microgrid EMS (MG-EMS) and community EMS (C-EMS). Due to the utilization of hierarchical centralized EMS, privacy of each MG will be preserved. In order to reduce the load demand in peak hours and reshape the load profile, demand response (DR) programs such as real-time pricing (RTP) and demand bidding programs have been integrated in the optimization strategy. The mathematical model of the proposed algorithm is based on a mixed integer linear programming (MILP) and has been implemented through Java/CPLEX.

In the paper “Wireless Smart Home System Based On Zigbee” designed a wireless smart home system to achieve the purpose of intelligence, convenience and comfortability in smart home. This system adopts S3C6410 as its controlling core and Zigbee technique as wireless data transmission and has achieved control over lighting, curtain and common household appliances in the house. This article also gives the design of main software and

hardware. This system is proven to be stable, easy and simple to handle and easy to extend after testing and now has been applied in many residential areas.

Authors of the paper “Research on College Students' Recognition and Practice of Socialist Core Values Based on Online Questionnaire” analyze the influence of network media and try to find out the key factors that impact on college students' recognition and practice in socialist core values. By using online questionnaire, the result shows that 77% college students have a political belief and correct ideal faith, 37.4% college students believe communism will be achieved, and 75% college students identify socialist core values. In conclusion, network will provide the conditions for the public participation. In order to realize the effective dissemination of network media on the socialist core values, college should strengthen the norms of network media use, adhere to the guidance of socialist core values and fulfill the gatekeeper duties.

In the paper “Polishing Path Planning of Complex Curved Surfaces and the Realization of Automatic Control”, a new polishing path determining a method has been proposed. With this path, the abrasive properties have been studied. Firstly, the abrasive has been selected according to the surface roughness experiment; then, the detailed parameters of processing have been researched. The experimental results show that there is a reasonable grain size meeting the roughness requirement of the workpiece surface with relatively larger abrasive grain size. Besides, it can also be concluded that the roughness of the workpiece surface and the path planning of the abrasive and the processing parameters have high relationship, and only the full consideration of all the parameters can help to improve the processing efficiency with the low cost.

In the study “A Temperature Control System Design Based on 51 SCM”, temperature control is quite extensive in their daily lives and industrial applications, and past temperature control is done by hand and not enough attention, in fact, temperature needs to be monitored in many places in order to prevent accidents. To solve this problem, a temperature control system based on 51 Single Chip Microcomputer (SCM) is designed in the paper. Combining with SCM AT89C51, temperature sensor is used to collect temperature, the collected temperature values are transferred to the LED display to shows. Then cooling or heating is automatically operated by the fan or an electric wire in order to achieve a constant temperature.

Authors of “A Study on the Prefab Greenhouse on the Rooftop for the Neighborhood Regeneration in Seoul, South Korea” evaluated the purpose and method of new facilities for the urban farming in neighborhood regeneration during establishment of the plan for regeneration of the castle village in Haengchon District, which was recently carried out by Seoul. By utilizing the unused rooftop spaces of multi-family houses, the economic burden of residents to purchase land decreased, and although at a small scale, a method to generate profits together with neighbors is examined. So selecting the rooftop of the “Haengchon Lot”, which is the revitalization center of Haengchon-dong, the business trial and research were officially launched. Unlike vinyl greenhouse that are planned at the ground level, the prefabricated greenhouse on the rooftop has been designed. The expansion models must be lightened and miniaturized. By taking into consideration the different installation conditions of different rooftops and also taking into consideration the convenience of installation, the safety of the structure and economic costs etc.

In the paper “Research on the Customer Satisfaction in Electronic Business Environment based on DEA Method: An Empirical Analysis”, the author analyzes the key factors affecting the development of electronic commerce, then find out the factors that affect customer satisfaction by using DEA method. The result shows that commodity

characteristics, service features and website quality are the main factors that influence the customer satisfaction. At the same time, the variance contribution rate of commodity information is 72.57%, and the variance contribution rate of commodity brand is 66.17%. In service features, the variance contribution rate of logistics service is 81.25%. In website quality, the variance contribution rate of layout is 70.84%, and the variance contribution rate of easy operate is 68.13%. On this basis, they put forward relevant policy suggestions.

In the article “Dynamic Assessment of Human Resource Management on Organizational Effectiveness based on Network Platform”, analyze the characteristics of strategic human resource management, and study on how strategic human resource management will influence on organizational effectiveness. By using network data, the result shows that strategic human resource management has a significant positive impact on organizational effectiveness. Strategic human resource management model can explain 62.9% variation of team factor, 63.1% variation of flexible factor, 65.9% variation of hierarchy factor and 66.8% variation of market factor. At the same time, organizational culture and commitment has played an intermediary role between strategic human resource management and organizational effectiveness.

In the paper “Green IoT Agriculture and Healthcare Application (GAHA)”, the application of the two trending and popular technologies, Cloud Computing (CC) and the Internet of Things (IoT) are current hot discussions in the field of agriculture and healthcare applications. Motivated by achieving a sustainable world, this paper discusses various technologies and issues regarding green cloud computing and green Internet of Things, further improves the discussion with the reduction in energy consumption of the two techniques (CC and IoT) combination in agriculture and healthcare systems. The history and concept of the hot green information and communications technologies (ICT's) which are enabling green IoT will be discussed. Green computing introduction first and later focuses on the recent works done regarding the two emerging technologies in both agriculture and healthcare cases. Furthermore, this paper contributes by presenting Green IoT Agriculture and Healthcare Application (GAHA) using sensor-cloud integration model. Finally, lists out the advantages, challenges, and future research directions related to green application design. Their research aims to make green area broad and contribution to sustainable application world.

In the study “Performance Evaluation of Public Cultural Services in the Context of Information Technology: A Government Perspective”, authors construct an evaluation index system of public cultural service efficiency based on DEA method, and test the public cultural service efficiency in 26 province from 2010-2015. The result shows that from the average performance level, the performance level of the eastern provinces of China is not high, especially in Shandong, Jiangsu and other provinces, while the western region has a higher level of performance. By contrast, the relatively low level of the basic public cultural services in China is still unable to meet the public's demand. On this basis, they put forward relevant policy recommendations.

In the paper entitled “Integration of RFID Network Planning with Xbee Network: A New Approach”, radio Frequency Identification (RFID) is a wireless technology used for real time identification and data capture of items. It replaces the traditional barcode at retail shop, warehousing, logistics and supply chain management etc. The basic requirements for deploying RFID network are to know the number of readers needed, location of the readers and the efficient power setting for each reader. The optimal solution of RFID network planning problems can be achieved by the implementation of newly developed Multi-Colony Global Particle Swarm Optimization (MC-GPSO) algorithm, which

computes objective functions scientifically. However owing to the limited transmission range of RFID reader, it can track and identify items within specified range only. A novel approach to integrate RFID network planning with XBee wireless mesh network was developed. It could enhance the communication range and visibility of items identification and tracking activity faster and accurate. It also increases the tracking activity of multiple items as compared to existing barcode technology. RFID system is able to reduce the product loss or shrinkage and bullwhip effect resulting to reduce the overall cost. It also reduces the time of data transfer in global network.

Authors of the paper “Empirical Analysis of New Agricultural Operators based on Scale Management: a Perspective of Farmer Household” construct the peasant household model, and analyze the dynamic mechanism for the implementation of large-scale operation. Then they make empirical analysis of agricultural scale operation by using large-scale data, the result shows that the key factor of production factors allocation is the income of Peasant household, and the decline of agricultural operating income will promote the surplus labor force transformation. At the same time, this situation will enhance the farmers' willingness to transfer the land. Therefore, the government should create a good environment for agricultural entrepreneurship and employment, guide and encourage farmers to become the main body of new agricultural management.

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