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 22 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 "Research on Applications of Mandala Prototype in Architectural Design Field" explores the revelations and application thought from mandala in the design methods of architectural prototype on the basis of some philosophical connotations in analytical psychology and Chinese traditional culture, and attempts to develop a design method of architectural prototype with infinite development possibility.

In the study "A Fundamental Study on the Modularization of Intelligent Skin Design", the importance of building skins has been emphasized since it has the potential to make a direct impact in terms of reducing energy, and due to the developments of IT which provides a wireless network environment, intelligent technologies such as the IOT are being widely expanded, and building skins that were once regarded as fixed exteriors are now adapting to the environment in the current era. Therefore, this study aims to examine building skins that have great potential as a high value added industry in the near future and present fundamental data on intelligent skin design and the optimized types that can be adopted to intelligent skin design by ascertaining the characteristics and planning factors of each category by studying a variety of cases from home and abroad.

The article "The Identification of Tool Eccentricity Parameters in Micro-Milling" states that milling tool eccentricity has great influence in micro-milling. It could cause single edge cutting phenomenon, and effect machining quality and tool life. To recognize tool eccentricity parameters, on the basis of the tool eccentricity model, cutting edge trajectories are analyzed, and then a tool eccentricity identification method is proposed. The parameters of identification model are obtained by experiments and tool eccentricity parameters are calculated by iterative method. Finally, the accuracy of the proposed method is verified by measuring the diameter of a milled hole, and the verified result shows the proposed identification model is effective.

In the paper "Health Care System Based on Wireless Sensor and Mobile Communications", with health wearable device becoming increasingly popular on the market, health has become a hot topic of concern. In view of the aging process as the population appears empty nest, elderly people living alone health care issues, a three-tier health care system architecture design based on the "health care acquisition layer embedded terminal - server software system layer-routing layer" is presented in this paper. Aiming for systematic design plan, this paper studied the implementation of key technologies including the following part: the physiological parameter acquisition, ZigBee networking, GPRS mobile communication and Bluetooth Low Energy (BLE) etc. System enables the user to sign of physiological parameters of the real-time dynamic acquisition upload, and through the Android APP and Web two ways to remotely view, providing real-time reference data for the user and medical personnel.

The study "Roof Slope Calculation by the Shape of Building through Utilizing UAV" states that in order to utilize the roof space of the building, correctly calculated roof area is required. However, existing calculation methods of roof area have problems such as the hassle of on-site measurements and use of the calculation formula which has an incorrect element. Therefore, this study conducted a basic research to establish a faster and more accurate calculation method compared to the traditional calculation method by utilizing UAV. Aerial photographs of the target site were obtained by using UAV and Orthophoto and DEM were generated based on this. Among 54 investigation target buildings, 41 buildings were classified by the roof shape of buildings, except for 13 buildings with a flat roof. Also, the roof slope of 41 buildings was measured by applying the Slope of ArcMap to generated DEM.

In the paper "Effect of Electric Field Distribution on Pulse Electrochemical Machining of Small Holes with Tubular Electrode", Electrochemical machining (ECM) of holes on the surface of nickel-based alloy as tool electrode was investigated to analyze the effect of electric field distribution on hole forming process in ECM of small holes. Based on the experimental and simulation results, it was shown that the law of electric field distribution in electrochemical machining gap with tubular electrode and the effect of gap electric field on dimension of hole were illustrated. In addition, the influences of electrolyte pressure on electric field distribution and stability of machining was studied to conclude the effective factors of machining stability in ECM of holes.

Paper "Nonlinear Model-Free Control and ARX Modeling of Industrial Motor" states that system identification is one of the main challenges in real time control. To design the best controller for linear or nonlinear systems, mathematical modeling is the main challenge. To solve this challenge conventional and intelligent identification are recommended. The second important challenge in the field of control theory is, design high-performance controller. To improve the performance of controller, two factors are very important: 1) high performance mathematical or intelligent modeling, 2) chose the best controller for the system. This paper has two main objectives: after data collection from position motor from industry the first objective is modeling and system identification based on Auto-Regressive with eXternal model input (ARX) and defined Z-function and S-function and the second objective is; design the high-performance controller to have the minimum rise time and error.

Authors of the paper "Personnel Localization Algorithm of Prison Supervision System Based on RFID" states that the particularity of the prison decides the importance of its security system, and how to improve the accuracy of personnel positioning for prison monitoring system is the problem to be solved to realize intelligent prison monitoring management. RFID positioning technology with non line-of-sight transmission and large transmission range is widely applied in the personnel positioning system. RFID technology is used to design the monitoring and management system of prison in this paper. The Trilateral Ranging Method was adopted to realize personnel positioning. RSSI positioning algorithm its technology is relatively simple was adopted when calculating the trilateral distance and correcting the errors in order to improve the positioning precision. Simulation test results show that the positioning precision for the distance between a single reader and the tag is increased by 2.17% on average, up to 4.54% after the error correction. The personnel location coordinates, X direction average error is 2.96%, average error is 3.12%, Y direction, and meeting the requirements of the system design.

In the article entitled "Inter-Cell Interference Mitigation in LTE-Advanced Heterogeneous Networks by Dynamic Subframes Assignment Guaranteeing Fairness", dense network deployment is an important approach to meet the requirements of the future mobile

communications. LTE-Advanced Heterogeneous Networks (HetNets) has been introduced by the 3rd Generation Partnership Project (3GPP) to increase cell throughput, offload data from macro-cell and improve indoor coverage. However, it also brings serious inter-cell interference with the co-channel deployment. Although the Almost Blank Subframes (ABS) scheme, one solution of Enhanced Inter-Cell Interference Coordination (eICIC), mitigates the interference, it results in undesirable fairness, huge difference of users' throughput in the system and even the incapability of communication. To address this problem, they introduce Dynamic Subframes Assignment Guaranteeing Fairness (DSAGF), in which the ABS pattern is set to mitigate inter-cell interference while guaranteeing fairness. As demonstrated in the simulation results, DSAGF significant decline in outage ratios of user equipments, narrowing difference of users' throughput, and improvement for fairness with inter-cell interference mitigation.

The study "A Method for Data-mining of Defects on Building Façade Elements" suggests the "Pixelization Method (PM)" for data mining on building façade elements to collect data on façade defects. PM is a technique that supports the creation of a database by simplifying the analysis of building façades as well as the input data. The database, developed with PM, is expected to be used in various areas such as analysis of the relationship between the defects and the facade elements or the prediction of defects.

The objective of the research entitled "A Comparison of Smart Shading Control Strategies for Better Building Energy Performance" is to investigate the energy performance of different smart solar shading control strategies on typical residential buildings in hot summer and cold winter zone of China. Four typical sensor based automatic shading control strategies were analyzed using building simulation tools to optimize indoor thermal and energy performance. It was found that solar radiation based sensor control has a better energy performance than temperature based sensor control with an energy reduction (both cooling and heating) of about 5-10% depending on the type of control strategy. The results indicate that solar based sensor control on solar shades can be widely used in residential and commercial buildings for an improved energy performance.

In the paper "A Kind of New Wheelchair Based on Robot and Bionics Technology", traditional wheelchair doesn't have the ability of climbing stairs and crossing obstacles. And it has poor ability of climbing slopes. Aiming at these problems, the author improved the traditional wheelchair with the help of robot and bionics technology. The improvement of the wheelchair simulates the movement of animals with four legs. Four mechanical legs are added to the wheelchair. When the wheelchair needs to climb stairs or cross an obstacle,the wheels retract and the four legs walk just like a four legged animal.When the wheelchair needs to climb a slope,the wheels work and the two back legs push it to increase its climbing ability to avoid sliding back. The seat keeps level while climbing stairs or a slope.The author analyzed its moving processes,designed the parameters of its mechanical legs and also analyzed its ability of climbing a slope.To some extend, the improvement of the wheelchair expands the living space of the aged and the disabled people and improves their living quality.

The paper "Design of Home Circulation: Application to Smart Homes" contributes to the notion of "house as machine" by proposing a methodology for producing engineering-type diagrams of machine processes that can be applied to smart home design in resolving such issues as positions of sensors, types of sensors, activity classifications, and activity recognition. The diagrammatic methodology is based on the conceptual model of space as a synchronic order of states (stages): creation, release, transfer, receive, and process. It views space in terms of dynamic content with stages and connections (flows) to create a

representation of the flows in a home. The resultant depiction seems suitable for use in designing of smart homes.

Authors of the paper "Improved Received Signal Strength Ratio Based High Accuracy Indoor Visible Light Positioning Scheme" proposed an Indoor Visible Light Positioning (VLP) Scheme by using visible LED lights for accurate localization. The basic idea of the position scheme is to improve received signal strength ratio algorithm. Received signal strength ratio (RSSR) is the relative ratio of optical powers detected between each LED and optical receiver. In this paper, they introduce concept of multiple LEDs selection to improve RSSR positioning algorithm. By three LEDs are reasonably selected from the multiple LEDs deployed in the room, the positioning accuracy of RSSR is improved. The system can be employed easily because it does not require additional sensors and occlusion problem in visible light would be alleviated. In addition, they performed the simulation experiments, and confirmed the feasibility of their proposed method.

In the study "Design of IoT based fire-watching and Atmospheric Environment Monitoring Systems Applied with Compound Sensors and Image Processing", recently, people's sensitivity to industrialization, external fine dust, and real life dust has increased substantially. As a result, the time during which people stay indoors using air cleaners has been gradually increasing. Therefore, systems to monitor dust concentrations and atmospheric environments in indoor environments where people reside are necessary. In this respect, in the present study, a system was developed that can monitor comprehensive indoor atmospheric environments by acquiring fine dust concentrations, temperatures, and humidity so that general users can easily identify the results. In addition, as kitchen utensils and electrical machinery and apparatuses are used indoors for long periods of time, the importance of fire-watching has been increasing. Therefore, in the present study, real time fire-watching was enabled by installing fire-watching and monitoring systems in indoor sections where fire may occur. Dust sensors, temperature and humidity sensors were used to determine dust concentrations and indoor air quality, Arduino microcontrollers were used to enable data acquisition and monitoring, and Raspberry Pi microcontrollers and image sensors were combined to implement fire-watching and monitoring systems.

Paper "Research on the Internet of Things-based Auxiliary Infant Feeding System" utilizes the internet of things technology to implement an intelligent infant feeding system, which can provide real-time monitoring on the temperature of nursing bottle, checking if the bottle has tilted or seriously tilted in addition to memorizing the feeding times. The measured information and data will be uploaded to the background server after the access to the household internet of things gateway via zigbee. Then the parents can configure the working state of the nursing bottle and receive the warning message on their smart phones. With the design of the hardware, the structure and the software system of the intelligent nursing bottle, this paper takes the intelligent nursing bottle as a node device for the connection to the household internet of things and conducts the experimental verification. The verification result proves that this technology is feasible and able to guarantee a stable operation.

Paper "The Design and Reliability Analysis of Elevator Monitoring System Based on the Internet of Things" states that in order to solve the problems of high cost, complicated wiring and inconvenient operation of the elevator monitoring system, this paper designs an elevator safety monitoring system based on Internet of things technologies. In this system, the CC2530 acts as a processor and communication module, the DHT11 as a temperature and humidity sensor module, and the ADXL345 as an accelerometer sensor module. The power supply module uses the chip LM2576S to provide 3V and 3.3V

voltage. The fault tree analysis method is employed to analyze the reliability of the system designed in this paper. The data acquisition module, power supply module and MCU I/O port are given relatively large weight, which demonstrates that they are more likely to cause system failure. In this paper, the environmental parameters of elevator in a certain residential area are tested. According to the test results, the average relative errors of temperature, air humidity and velocity are 0.47%, 1.40% and 1.36%, respectively. The experimental results show that this easy-to-operate system can monitor the environmental parameters of the elevator with high precision, and can achieve the real-time monitoring on the running state of the elevator.

In the paper "Reduction Effects of Shaped Noise Barrier by Composition with Adsorbed Filter Panel", the functional soundproof wall is composed of a sound absorption panel with a filter function and flat panel for the top, a zigzag-shaped soundproof panel whose effects were verified through simulation, and a flat panel for the bottom. The functional soundproof wall is 2 m wide and 2 m high, and it will be installed upright up to 1.5 m, forming the bottom, and will then be tilted by 30° from 1.5 m, forming the top. Noise will be generated at the distance of 2 m, 3 m and 4 m from the functional soundproof wall, and the measured noise will be classified into reflected sound and diffracted sound. The reflected sound will be measured for each height from 1 m, 2 m, 3 m and 4 m at the distance of 6 m, while noise measured in front of the soundproof wall will also be collected. The experiment result showed that there was a noise reduction effect by approximately 4 dB according to the composition. In terms of composition, the soundproof wall composing of the sound absorption panel and the shaped soundproof panel showed excellent reflected sound reduction effects, while the soundproof wall consisting of the filter showed overall excellent noise reduction effects. On the other hand, reflected noise and diffracted sound reduction effects of the shaped soundproof wall were shown clearer as the distance from the noise source was longer, especially at the distance of 4 m. The composed soundproof wall was effective for reducing reflected noise and diffracted sound. More importantly, the composition of the sound absorption panel and the shaped soundproof panel showed excellent reflected noise reduction effects, while in the case of composing with only the shaped soundproof panel, the reflected noise reduction effects began to be shown from 4 m from the noise source. Therefore, it is expected that the relevant soundproof measures can be used in the field effectively.

The paper "The Optimal Positioning Algorithm Based on RSSI of WiFi" proposes an indoor optimal positioning algorithm based on Wi-Fi signal strength. It introduces positioning evaluation function, using the optimal algorithm to get a set of path loss exponent to improve the positioning accuracy. Experiment results show that the algorithm can obtain higher positioning accuracy without priori information of indoor environment or additional hardware investment.

In the study "Research on Smart Campus Based on the Internet of Things and Virtual Reality", Smart campus is an inevitable trend in the development of digital campus construction. With the development of the Internet of Things (IoT) and Virtual Reality (VR) technology, these technologies become the key to the construction of smart campus. The major objective of this study put forward a smart campus system prototype based on Internet technology. This paper firstly introduces the definition and characteristics of the IoT and VR technology. Secondly, presents the architecture and implementation methodology of the system prototype, and analyzes the core idea of smart campus. Finally, discuss the problems should be noticed in the smart campus construction.

In the paper "A Study on the Analysis of U-healthcare in Smart Homes", Healthcare is the one of the most concerned regions in their everyday life. U-healthcare is one aspect of

healthcare that is pushing the limits of how to acquire, transport, store, process, and secure the raw and processed data to deliver meaningful results, U-health offers the ability for remote individuals to participate in the health care value matrix, which may not have been possible in the past. In this paper, they examine the U-healthcare industry. In their works, U-healthcare transition was included. they described actual cases, analysis and applicability of current U-healthcare.

The paper "A Strategy for Optimal Operation of Hybrid AC/DC Microgrid under Different Connection Failure Scenarios" proposes an operation strategy to optimize the day-ahead scheduling of hybrid AC/DC microgrid (MG). The strategy schedules its resources, such as distributed generators, AC/DC battery energy storage systems to minimize the operation cost while increasing the system reliability. Moreover, an energy management system (EMS) is developed based on centralized optimization framework, which is used to optimize the MG operation in grid-connected mode. On the other hand, the EMS aims to minimize the load shedding amount in both AC and DC sides in islanded mode. In this study, the operation of hybrid MG under different connection failure scenarios is also represented. The results illustrate the effectiveness of the strategy for different operation modes of hybrid AC/DC MG.

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