

# 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 36 articles. Achieving such a high quality of papers would have been impossible without the huge work that was undertaken by the Editorial Board members and External Reviewers. We take this opportunity to thank them for their great support and cooperation.

The paper “A Novel Social Context-Aware Data Forwarding Scheme in Mobile Social Networks” introduce a new metric for data forwarding based on social context information, in which node’s social context information is used to calculate the encounter utility between a node and destination, and the social relationship of network nodes is used to calculate the betweenness centrality utility of a node. They combine two utility functions to derive the social strength among users and their importance. They also present social context-based data forwarding algorithm for routing decision.

Authors of the paper “KUKA youBot Integration with LabVIEW for Industrial Application” are going to explore how they have successfully implemented the interaction of KUKA youBot with LabVIEW using NI hardware C-RIO 9025, ether CAT cable and VGA cable. KUKA has recently launched a major research and development effort towards designing a mobile manipulation platform. They have been able to control the movement of all the five axis of youBot and gripper control. With the help of VGA cable they were able to establish connection between the youBot and PC to align youBot in its “open arm position”. Real time motion of youBot is achieved using C-RIO that is real-time embedded controller.

The research “Real-time Monitoring for Freezing and Thawing Process of Subgrade in Seasonal Frozen Regions” shows that there is a cosine changing of the distribution of the temperature field on an annual cycle, and a temperature changing lag exists for the different depth of subgrade. Based on the law of frozen depth of subgrade, the frozen procedures can be divided into four stages. Based on the observation data, the cathode surface temperature is positively correlated with both the frost heave quantity and the frozen depth. In addition, to reduce the observation cost and the measure difficulty, the frost heave quantity can be obtained through the observation of the frozen depth.

In the study “A Hybrid Life-Cycle Analysis and Two-Stage Stochastic Programming Model for Low-Carbon Management upon Urban Water Resources”, a hybrid life-cycle analysis and two-stage stochastic programming model was proposed to analyze the water-allocation strategies based on complicated urban water resource system. The hybrid model can effectively assess the low-carbon performance of an urban water resources system in the framework of life-cycle analysis. The environmental impacts and GHGs reduction of urban water resources were firstly considered as the objective and constraint for solving the water allocation problems.

In the paper “Complex Systems Smart Home Security Studies based Big Data Analytics”, intelligent home system, due to smart appliances and home access points, communication method used copy, and its electric load and the impact brought about by economic

considerations, it makes the intelligent home control and power delivery system has become very complex, complicated accord characteristics of the network; this complex network, its security and Lupin performance becomes extremely important; simply consider the performance of the network topology and other network anomalies can only be expected short-term, however, a large area of network failure systemic, primarily business-related, for this problem, according to the data herein smart home business, a new web-based method of stabilizing the complex network theory.

Paper “Research on Automatic Generation Control System (AGC) for Small and Medium Sized Hydropower Plants” states that automatic generation control of hydropower plants is an important content of the safe and economic operation of hydropower plants. The main task of hydropower plant AGC is: In order to meet the requirements of the system, the active power of the hydropower plant is automatically controlled by the fast and economical way according to the predetermined conditions and requirements. Considering the operating limits of power plant and unit and ensuring the safe operation of the power plant, and according to the requirements of the amount of water or system on the tour, in economic operation principle, determine the number of power plant unit operation units and unit operation combination and unit load distribution. So that the unit runs in the optimal conditions, with the least water consumption of the largest electricity, to create the largest economic benefits for the power plant.

The paper “FSIT: Fire Safety in Trains” provides a remedy to reduce the losses of life occurring due to fire accidents in trains. In the past few years Indian railways has witnessed various forms of train accidents in which catching of fire is of serious concern. Fire on running bogie is severely dangerous than the stationary ones. The damage is severe because of lack of alertness and lack of communication which leads to the time delay in action. This project provides automation to the trains by applying automatic brakes and along with the ventilation in case of fire and smoke detection. The railway staff and passengers need to take all possible precautions in order to avoid any of the above mistakes so as to minimize the possibility of fire break out. The project consists of thermistor gas sensor, buzzer, fans, pneumatic actuators, solenoid pneumatic valve. Whenever the fire is detected with the help of fire sensors, thermistor and a safety circuit sends signal to solenoid valve and triggers the brakes and allows exhaust fans for proper air flow in and out of a chamber to avoid suffocation and it also starts the alarm to alert the authorities.

In the paper “Multi-objective Optimization of Machined Surface Integrity for Hard Turning Process”, the integrity of machined surface (surface roughness and the thickness of the plastic deformation) is focused on for hard turning process of die steel Cr12MoV. The multi-objective optimization was adopted. On the basis of revealing the relationship between cutting conditions and surface integrity indicators, combined with response surface methodology (RSM) the correspondence between the surface integrity evaluation and cutting parameters is established. By improved particle swarm algorithm a multi-objective optimization of surface integrity prediction was achieved, and the relative optimal cutting parameters were obtained.

In the study “Dynamic study of agricultural landscape pattern in the arid zone of Ningxia Based on the RS and GIS Techniques”, based on RS and GIS Technology, they choose arid zone in the middle of Ningxia province as the study area, Classified the remote sensing images in 2006, 2009, 2012 and 2015 with the method of human computer interaction., and they got the classified thematic map of agricultural landscape between 2006 and 2015. Used Fragstats software, they calculated the agricultural landscape pattern

index in the study area and analyse the characteristics of agricultural landscape pattern changes.

The research “Development and Efficiency of Prefabricated Building Components”, aims to study and evaluate the prefabricated housing components in terms of efficiency, effectiveness and the time to spend during construction. It also attempts to search for the development and production of low cost housing, the end-users feedback and other institutions that used these materials and its impact in the market.

In the study “Dynamic Characteristic Simulation of Helicopter Tail Drive Shaft System”, helicopter with the advantage of light, flexible and hovering in the air, is widely used. In both military and civilian domain, it gets more and more attention. It becomes the main subject of research in the world. In the power transmission system of helicopter, the tail rotor shaft is an important part. It is one of the key technologies to predict the dynamic characteristics of the shaft accurately for improving the overall performance of the helicopter. Based on the theory of elastic mechanics, rotor dynamics and the finite element analysis, the former main drive shaft is taken as an example. The dynamic characteristics of the transmission shaft is calculated by the multi/few degrees of freedom finite element method. The validity of the finite element method with few degrees of freedom is determined. Then the structure characteristics of the helicopter tail drive shaft are analyzed, and the dynamic characteristics of the helicopter tail rotor shaft are calculated by using the finite element method with few degrees of freedom. The research results provide the basis and guidance for the design of the helicopter tail drive system.

In the paper “S&T Finance Network and Technological Innovation Performance: An Empirical Study of Chinese Science Park”, along with the economy globalization and the progress of science and technology, Chinese economy has been fleetly developing. Under the background of broad masses’ entrepreneurship and innovation, studying how s&t finance network structure characteristics affects the technological innovation performance of high-tech SMEs has theoretical value and positive practical significance. Based on the theory analysis, they adopt the research method of questionnaire. Empirical study shows that: network structure characteristics have direct positive effect on the technological innovation performance of high-tech SMEs, especially the network density and centrality.

The aim of the study “When the Future Technology is Now: Paradoxical Attitudes of Consumer and Evaluation of IoT Service” is to develop a new research framework that explains consumer attitude toward internet of thing (IoT) service. Based on the literature on IoT service, technology paradox, and consumer values, an empirical structural model is developed and tested. This study collects quantitative survey data from Korean IoT users. The empirical test results show that utilitarian values such as efficiency, technology trust, performance ambiguity, chaos give influences to paradoxical attitudes of consumer and these attitudes give influences to IoT service evaluation separately while, hedonic value like hedonic enjoyment gives influence to IoT service evaluation directly without any mediating variables. This initial research on IoT service from a consumer point of view may stimulate further research on IoT-based consumer service innovations.

The paper “Innovation Network Structure of Industrial Cluster of New Energy Vehicles in the Northeast China” paper uses complex network theory to study the network structure from the perspectives of whole network, community and ego network of Hub. Moreover, this paper further discusses the matching problem of Hubs’ influence in the network. In addition, the relative suggestions about network governance on the innovation network of industrial cluster of new energy vehicles in the northeast China are proposed.

Paper “A Novel Dummy-Based KNN Query Anonymization Method in Mobile Services” states that due to the advances of mobile devices with GPS (Global Positioning System), a user's privacy threat is increased in location based services (LBSs). So, various Location Privacy-Preserving Mechanisms (LPPMs) have been proposed in the literature to address the privacy risks derived from the exposure of user locations through the use of LBSs. However, these methods obfuscate the locations disclosed to the LBS provider using a variety of strategies, most of which come at a cost of resource consumption. Therefore, they propose a privacy-protected KNN query anonymization method based on Bayesian estimation for Location-based services. Unlike previous dummy-based approaches, in their method, the request to the LBS server doesn't contain the genuine user location, so they can't calculate whether meet the threshold condition of two location directly, but must to decision making by transition probability. In addition, their method just requires the server returns the results the client needs. Further, they propose an effective search algorithm to improve the server processing. So it can reduce bandwidth usages and efficiently support K-nearest neighbor queries without revealing the private information of the query issuer. An empirical study shows that their proposal is effective in terms of offering location privacy, and efficient in terms of computation and communication costs.

The paper “Smart Door Lock System for Elderly, Handicapped People Living Alone” is about the device which is made to solve the problem faced by old people of opening and closing of door again and again, by using an Arduino based remote that can control the door lock using RF module, for receiving and transmitting the data. The product consists of two devices both are based on Arduino. One of the two devices will be fitted at the door that will send the signals to indicate the old person to open the device and will receive the signal to open and close the door lock while the other device will work as a remote consists of chargeable batteries, easy to carry just like a mobile will help to indicate the person carrying it to open the door. The receiving and transferring of signals will be done using RF modules connected to the Arduino boards. The device will help to ease the problem faced by the old, blind and deaf people in controlling the door lock from any part of the house. In future, the RF module in the device to transmit and receive the data can be replaced by Internet of things technology to control the lock from any part of the world. More features like controlling of home appliances, windows etc. will also be the part of this device in future therefore, it has a good future scope also.

In the paper “Implementation on Intelligent Lighting Control System of Infrared Wireless”, based on STC microprocessor as a center of the transmitting and receiving parts, apply the interrupt systems, timers, counters integrated. Using Code-Division infrared coding, infrared receiver distinguishes the light pulse, judges and makes the corresponding control actions to complete the all infrared remote control transmitter and receiver process. Combination of the software programs, after commissioning the system can achieve multiple dimming function, such as LED lamp PWM dimming, alternating current filament lamp dimming, multiple channel switches. The system realized the function that weak power can control not only flea power but also strong power. This system has the feature of simple hardware circuit, sophisticated software capability, high cost performance. At the same time the study of intelligent lighting control system contributes to the improvement and development of the intelligent home system.

Paper “Research on a New Hybrid Optimization Algorithm based on QPSO and FNN” states that Fuzzy neural network(FNN) is a neural network based on combining the advantages of the fuzzy theory and neural network. It has the characteristics of dealing with the non-linear and fuzziness and so on. Particle swarm optimization(PSO) algorithm is a population-based search algorithm by simulating the social behavior of birds within a flock. So the quantum PSO(QPSO) algorithm is proposed for optimizing the parameters

of FNN in order to construct a new hybrid optimization(QPSO-FNN) algorithm in this paper. In the proposed QPSO-FNN algorithm, the quantum theory is used to improve the PSO algorithm, then the global optimization ability of QPSO algorithm is optimize the parameters of FNN model by putting these parameters in the particle encoding. The found optimal values are regarded as the parameters of FNN model to obtain the final QPSO-FNN method. Finally, the QPSO-FNN algorithm is used to solve the complex problem, the experimental results show that the QPSO-FNN algorithm takes on the shorter response time and higher solving accuracy.

The study “Applying an Intelligent Method to Estimate Air Passenger Demand: Theory and Computerized Implementation” states that air travel demand estimation is vital for airlines and government authorities to make reasonable decisions. However, when estimating the demand, air passenger volume has been frequently employed as an instrumental variable, although there exists a big deviation between them. This inappropriate practice will lead to misleading conclusions and seriously perverse decisions. This paper, based on the partial adjustment theory, proposes a new method to distinguish and estimate air travel demand from air passenger volume. A multi-dimensional variable selection method is originally proposed and a new estimation method is advanced to solve the problem of endogeneity and serial correlation.

In the article “Web Fusion Model of Internet of Things Based on Hierarchy Requirement Analysis”, each item of sensory information is effectively integrated by Internet of things (IoT) system. However, due to different framework and interface, software and hardware platform and communication protocol are mutually independent, which makes distributed IoT system unable to fulfill uniform operation and management. By aiming at issues difficultly fulfilled by IoT system, a kind of framework model of IoT system based on Web Service is put forward. Firstly, function and framework analysis is conducted for local sensor service system, integrated sensor service system and integrated application service system required by model; next, an introduction about design of Web Service interface is made; finally, services and functions are abstracted to normalize the relation among three varieties of service systems of model. This scheme is proved to be with good applicability, flexibility and expansibility in cases.

Paper “Deregulated AGC scheme using Dynamic Programming Controller” states that Action Dependent Heuristic Dynamic Programming (ADHDP) optimal controller for multi area Automatic Generation Control (AGC) scheme has been designed in this paper. A competitive environment has been considered in the interconnected power system. Conventional AGC model has been modified to include bilateral transactions taking place in energy market. The modified AGC model has been discretized to implement ADHDP. ADHDP is a powerful technique of Approximate Dynamic Programming, used for providing optimal solution by minimizing the given objective function. The proposed approach has been tested on two area AGC scheme for different cases.

In the article entitled “TOA Analysis Based on Energy for 60 GHz Signals”, in the field of sensor networks, impulse radio 60 GHz signals are even much more practical for accurate localization which is low cost, low complexity with high time and multipath resolution. Typically, accurate Time of Arrival (TOA) estimation is very important for localization. In order to improve precision of TOA estimation, a new TOA estimation algorithm based on energy detector (ED) is proposed which is based on a joint metric of skewness, standard deviation and kurtosis after ED. The best threshold based on signal-to-noise ratio (SNR) is investigated and effects of integration period and channel model are examined.

Paper “Hilbert-Huang Transformation based Solar Light Noise Suppression Method” states that solar light noise, as the main part of channel noise in outdoor visible light communication (VLC) system, would easily saturate the photon-detector, and dramatically decrease the outdoor VLC system performance. A Hilbert-Huang Transformation based solar light noise suppression method is proposed in this paper, a background light noise measurement system is also designed and implemented to verify the noise suppression method's performance. And the measurement result shows that it could effectively reduce the solar light noise, and improve the VLC system's stability and reliability.

Authors of the study “Research on Mobile Internet User Behavior Preference Based on Support Vector Machine” use qualitative research and quantitative research, combined with empirical data and simulation analysis and the combination of traditional statistical analysis and modern data mining methods, to study the behavior preference of mobile Internet. Besides, they use the discrete choice model to build the binaryLogit model using SAS tools, and analyze the selected variables through data processing. Based on the significant influence factors, the behavior preference of mobile Internet users is classified by using support vector machine. The C-SVM binary classification machine is used as kernel function, and the parameters of the model and kernel function are optimized by cross validation. In this research, they introduce the support vector machine theory into the research field of the mobile Internet user behavior effectively, solve the problem of small and medium-sized samples effectively, and provide new ideas and methods for the research of mobile Internet user behavior.

In the paper “Research on Speech Control Toy Car based on Single Chip Microcomputer”, the speech recognition is a kind of technology, which makes a machine change the speech signals into homologous text or order by recognition and comprehend. The speech recognition is a cross-subject, and it is becoming to the key-technology of human-computer interface in information technology. It makes man can operate the computer through the speech order without the keyboard. Speech recognition technology has been used in fields such as household electronic products and intellectual toys. The bus controlled by speech signals proposed in this paper will be more powerful than traditional toy bus. It will be structure simple, strong stability, high precise. More important, its speech control system will have special attraction to children. This paper introduces hardware system and software system of speech control intellectual toy bus.

The article “A Novel Multi-scale 3D Area Morphological Filtering Method for Airborne LiDAR Building Extraction” states that automatic building extraction is one of the most important issues in the fields of geoscience and remote sensing. In this letter, by introducing the idea of area morphology to the analysis of 3-D point clouds, a novel approach for automatic building extraction from airborne LiDAR data was proposed. At first, single scale area opening and area closing operator was used to produce normalized point clouds. With the normalized point clouds as input, multi-scale area morphology was employed to obtain connected regions, and then tree points were removed by PCA based local structural analyzing technique. Finally, building regions were extracted by analyzing geometry properties of the obtained connected regions without tree points.

The comparative study “Performance of Different Types of DC - DC Converter with P & O Algorithm of MPPT” 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. In this paper the performance of LLC, ZETA and SEPIC converters are designed and simulated then its results are compared to identify the best suitable converter for the grid connected PV with P and O algorithm of MPPT circuit. The performance analysis has

been carried out by connecting these converters in the circuit which already simulated for connecting the PV output to the commercial grid. The comparative performance analysis is done at the stage of grid as well as in the stage of output of the converter too.

In the paper “SRRS Effects on ICF Laser Drive Beam with the Variation of Pump Light Distribution on Space”, tens to hundreds of output high power lasers from ICF (inertial confinement fusion) device, generally need to propagate through a long air path before they reach the target chamber. During the process, interaction between the high power pulse laser and air molecules emerges. Once the SRRS (stimulated rotational Raman scattering) threshold was reached, the SRRS effect would result in the loss of laser energy, the decrease of laser beam quality, or unable to reach the target. Further the transmitted laser would enter the multipliers as fundamental beam, then the conversion efficiency of triple-harmonic would be affected, even cause the destroy of frequency multiplication crystal. In order to improve the output ability, beam quality and control ability of the ICF high power laser drive, ultimately achieve the fusion ignition success, the SRRS effect must be suppressed. Based on SRRS four-dimensional mathematical model which conforms to current ICF experiment conditions, the longitudinal and horizontal rules of SRRS effect on ICF laser drive beam with the variation of pump light distribution on space was obtained. The research provided a support for the parameters choice of ICF laser drive and the optimization of output beam quality.

Paper “A Electrochemical Sensor based on Poly (Sulfosalicylic Acid) Film Modified Electrode and Application to Phenol Detection in Oilfield Wastewater” established a highly sensitive and selective method based on the poly (sulfosalicylic acid) modified electrode (PSA /CPE) to detect phenol. The morphologies and interface properties of PSA film were characterized by scanning electron microscopy and electrochemical impedance spectroscopy. It was illustrated that the PSA/CPE had an excellent electrocatalytic ability towards the oxidation of phenol. Meanwhile the influence of parameters such as pH and scan rate effect on the analytical performance of the sensor was evaluated. Moreover, the interference from o-nitrophenol can be neglected. By using differential pulse voltammetry (DPV), linear calibration curves were obtained as 5–175 and 220–555  $\mu\text{mol L}^{-1}$  for phenol. The detection limits are 2.2  $\mu\text{mol L}^{-1}$  for phenol. With favorable selectivity and sensitivity, the present method has been applied to the determination of phenol in oilfield wastewater.

In the research entitled “Distributed Frequency Control Strategy for Islanded Microgrid with Consideration of Transmission Congestion”, to guarantee the security and stability of islanded microgrid, transmission congestion problem is considered during the frequency control so as to efficiently make use of power available without violating system constraints. A novel strategy was proposed, which combines distributed frequency control and congestion management and makes the distributive frequency control reasonable at the request of line congestion. It effectively solve multi-objective problem with multi-linear equality and inequality constraints. To testify the proposed strategy, an islanded microgrid with five-machines is provided in Matlab/Simulink.

In the paper “Design of Digital Campus Office Automation System Based on Portlet and Workflow”, the digital campus information unified portal can provide the services not possessed by traditional campus network. Firstly, the portal technology and the relation with Portlet are analyzed for the secondary development of liferay technology; secondly, the digital campus portal system is realized according to the requirement analysis of the digital campus portal system and the system development principles as well as the system implementation characteristics. Unified portal system, SSO (Single Sing-on) unified identity authentication and campus workflow system are realized in this paper.

Meanwhile, this design scheme can not only support the integration of data, contents and information, but also transfer the contents, application programs and services inherited thereby through the customizable portal channel, thus to reduce the operation cost of the campus information portal and improve the working efficiency of the users as well as play an important role in digital campus construction. This portal system design scheme has been applied in the digital campus system of Southwest Petroleum University, and is practicably proven to have certain feasibility and practicability.

Paper “Optimization Analysis on Distribution of Temperature of a Corn Based on Fluent” says that traditional method of drying corn is using higher temperature to dry quickly. But high drying temperature can make the corn lost nutrients. Provide the foundation of designing a new corn drier which can dry corn efficient as well as sustain nutrition. Optimization analysis on distribution of temperature of a corn by Fluent. It shows that: 1). Hot winds is 0.8m/s, temperature is 343K. Temperature distributions of corn is evenlier. The highest temperature is below 333K. 2). More fluid inlet make corn evenlier. Change the angle between corn and velocity vector will not impact the temperature distributions of corn.

The article “Study on Farmland Soil’s Absorption Characteristics to BHC in Northeastern Industrial Polluted Area” adopts samples from farmland soil in Zhang Yi Zhan, Shenyang City, where is located in China’s northeastern industrial polluted area, assisted by systematic absorption test and soil column device and measuring system, to conduct in-depth study on the transfer rule of a persistent pollutant-organochlorine pesticide (OCP) BHC in soil, by which they could obtain the spatiotemporal variation process of pollutant concentration in unsaturated soil column under certain pollution transport condition. The experiment result indicates, that by comparing the leaching curves of each soil column filled with sample soil collected from various soil layers across the district, they could find that the transfer velocity of BHC in the vadose zone of soil column No. IV (60~80cm) was faster than that in No. I (0~20cm), No. II (20~40cm) and No. III (40~60cm), while that in No. V (80~100cm) was the maximum. This was possibly due to its close to upper soil layer where high content of clay and organic matter exist, while the lower soil layer was nearly sandy with low content of organic matter. However, the proved research shows, that soil’s absorptive capacity to BHC would grow with an increase of organic matter content, therefore, the soil column No. V had smaller absorptive capacity than No. IV, and much smaller than No. I, II and III, extending the transfer capacity of pollutant to a larger degree. Namely, once the water body polluted by OCP reached to the lower soil layer of vadose zone, its transfer velocity would accelerate, which could be potentially hazardous to ecological system and underground water. Thus to research on the transfer characteristics of BHC in each soil layer of vadose zone would be of great importance as it would provide theoretical basis for improvement and restoration of soil and underground water pollution.

The study “Design and Implementation of System for Structural Health Monitoring in Horticultures” proposed a system that monitors the structural health of horticultural facilities using acceleration data. This system analyzes data obtained by structural health monitoring sensors and informs users of problems that have occurred in horticultural facilities through a client. In addition, the system proposed in this study has been designed, implemented, and tested to ensure it can detect a change in the location of an object that has been moved.

The purpose of the article “Early Warning of Urban Residential Development Considering Sustainability Factors” is to integrate two diverse approaches, including the systems of environmental indicator and the analysis for early warning. This paper also



aims to offer a tool that helps the decision maker to measure whether the development of residential urban areas are sustainable and healthy or not, and prevent problems in advance so that urban areas develop healthily and quickly. Hence, this paper analyzes how to create proper early warning indicators and appropriate approaches and modeling that can be utilized for the analysis. To provide sufficient evidence to this article, a real case is discussed in this paper that is connected to the evolution of a residential urban area in China.

In this study “Experimental Analysis of Indoor Illuminance and Daylight Distribution Compared to the Generation Performance of Silicon based PV Window System”, indoor illuminance and daylight distribution compared to the generation performance of PV window system are experimented and analyzed in accordance with the types of silicon (crystalline, amorphous). According to the analysis of generation quantity during the measurement period, when solar radiation is 138.1kW, daily maximum generation quantity is 27.4kW (19.8% of efficiency) for crystalline PV window system, and 5.8kW (4.1% of efficiency) for amorphous PV window system. In addition, according to analysis of indoor illuminance and daylight distribution, the illuminance of 500lx is secured from all measuring points, and in the case of daylight factor, more than 1.5% of minimum standard (BS 8206-2) is indicated. Therefore, it is analyzed that the lighting performance required by residential environment is satisfied by crystalline as well as amorphous PV window system. However, in the case of illuminance uniformity, crystalline PV window system are analyzed to be 10.5% lower for the measuring height of 400mm and 48.6% lower for the measuring height of 850mm compared to the amorphous PV door and window system.

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