Guest Editorial: Special Issue on "Selected papers from ISAIC 2021"

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The Internet of Things (IoT) technology is the third revolution in the information technology industry. It can connect ubiquitous terminal sensors and smart devices to the network according to specific protocols, so as to realize efficient and intelligent positioning, monitoring, control and scheduling functions. The core of the IoT is to apply the network to the information hull and control between things and things, and between people and things, so as to realize the efficient integration of human society and physical systems. The typical architecture of IoT can be divided into three layers: sensing layer, transmission layer and application layer. The sensing layer recognizes the real world and collects data through a large number of sensors. The transmission layer performs reliable transmission between the sensing layer and the application layer through the mobile communication network. The application layer processes the collected data through advanced algorithms to provide intelligent and efficient solutions to real-world problems. With the blessing of IoT technology, people have significantly improved the management level of transportation, medical care, security and cities.

The reliable operation and large-scale deployment of the IoT are inseparable from the support of several key technologies: sensor technology that converts analog signals into digital signals that computers can process, embedded technology that applies integrated circuits to IoT terminals, and and intelligent computing technology that acts as the "brain" of IoT. The IoT has been closely related to intelligent computing since it was proposed. Data transmission and processing between various terminals and servers of the Internet of Things are currently highly dependent on human intervention and operation. However, the goal of IoT is to achieve a highly automated and intelligent integration between people and things, so it is of great significance for intelligent computing to empower the IoT, which allows the IoT to respond more intelligently to changes in the external environment through continuous learning, thus reducing the time and cost of manual management.

This Special Issue presents cutting-edge research results for researchers, engineers and policy makers in the field of IoT, focusing on the application of intelligent computing in IoT. This Special Issue selects 4 high-quality excellent papers from "Intelligent computing with internet of things learning" (ISAIC 2021), each of which has been substantially expanded and has a 40% difference from the conference version.

Xian Zhang, Yiwen Liu, Taiguo Qu and Pengju Tang propose a novel ZigBee-based remote online firmware upgrade scheme for embedded devices in the first paper "Research on Remote Online Firmware Upgrade System for Embedded Devices" [1]. This technology can upgrade the firmware of embedded devices through remote online update without affecting the original code. The authors introduce the proposed system from the perspectives of system requirements, module design, software design and fault analysis, and design several groups of experiments to verify the effectiveness and advancement of the system. The experimental results show that the ZigBee-based remote online firmware upgrade system for embedded devices has advantages in transmission speed, efficiency, cost and reliability, and intelligent computing can play an excellent role in IoT embedded devices.

The second paper "PyRS: Cross-platform Data Fault-tolerant Storage Library Based on RS Erasure Code" [2] by Junqiang Ma, Weihao Yan, Xiaotian Zhang, Min Huang and Jingyang Wang presents a data fault-tolerant storage library PyRS based on RS Erasure Code written in Python. The proposed PyRS has the characteristics of easy configuration and cross-platform, and gets rid of the dependence on GPU. The encoding matrix of PyRS is Vandermonde matrix, and Numba and Numpy are used to accelerate the program. The experimental results show that under Linux, the proposed PyRS is 8 times faster than Jerasure, but the CPU and memory usage do not increase significantly. This paper makes a strong case for intelligent computing driving a revolution in data storage systems.

In the third paper "RDF Subgraph Matching by Means of Star Decomposition" [3], Mingyan Wang, Qingrong Huang, Nan Wu and Ying Pan propose a subgraph search algorithm based on star decomposition to solve the common repeated calculation problem in the query process of Resource Description Framework (RDF) subgraphs. Through this decomposition algorithm, the communication cost in the query process can be significantly reduced, and the efficiency of subgraph matching can be improved. The proposed algorithm is tested on two datasets, which proves that the method has a great advantage in data storage.

The fourth paper "Improved Whale Optimization Algorithm via the Inertia Weight Method Based on the Cosine Function" [4] is a modified Whale Optimization Algorithm (WOA) based on the meta-heuristic algorithm proposed by Xiaoming Shi, Kun Li and Liwei Jia inspired by the predation behavior of whales in nature. The algorithm avoids local optimum by adaptive inertia weight, and adopts Levy behavior to significantly improve the global search ability of the algorithm. Experiments on multiple sets of benchmark functions show that compared with traditional WOA, the algorithm proposed in this paper has faster convergence speed and solution accuracy, and is an optimization algorithm with potential application value in intelligent computing.

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We hope that the papers in this Special Issue will further promote the application of intelligent computing in the field of IoT and make an important share of the work and research of relevant researchers, engineers, and other stakeholders. We would like to express our sincere appreciation and thanks to all the authors for their efforts and contributions to this Special Issue. Special thanks to the editors of the Journal of Internet Technology (JIT) for their guidance and assistance during the publication.

Guest Editors

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