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Editorial: Intelligent Cognitive Internet of Integrated Space and Terrestrial Things

Min Jia[1] · Qing Guo[1]

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As a large-scale network to promote Information big data, Internet of Things (IoT) has been widely used in the fields of modern intelligent services such as ecological protection, intelligent home, food safety, energy-saving and emission-reduction, logistics and transport etc. The development of integrated space and terrestrial communication and networking technologies also provides strong technical support for the popularization of the IoT. However, due to the increasing of the user demands for efficient access to the massive and heterogeneous IoT information, how to improve the autonomous cognitive ability of IoT and realize the intelligent information transmission and integrated space and terrestrial connection has become urgent problems. Although some intelligent sensors have been proposed, there still exists some problems such as intelligent cognition, complex management, high maintenance cost, insufficient self-adaptability and integrated space and terrestrial networking. Hence, the existing IoT needs to change from "perception" to "cognition" through combining IoT with some cognitive technologies, such as machine learning, deep learning, artificial intelligence, etc. Cognitive IoT enables organizations to learn from data coming from connected devices, sensors, machines and other sources, and infuses intelligence into business operations, customer experiences, products and people.

As a powerful supplement, satellite component has been already investigated into international mobile telecommunications (IMT) systems. This special issue features eight selected papers with high quality."Co-Existence Analysis on Satellite-Terrestrial Integrated IMT System" studied the electromagnetic compatibility between satellite and terrestrial components of IMT with several anti-interference measures to avoid harmful mutual interference between them.

✉ Min Jia
jiamin@hit.edu.cn

[1] Harbin Institute of Technology(HIT), Harbin, China

Routing Protocol is the key factor in Intelligent Cognitive Internet of integrated space and terrestrial Things. The fourth paper titled "A Routing Protocol Combining Link State and Distance Vector for GEO-GEO Satellite Backbone Network" focused on satellite routing protocol solution and proposed a novel satellite routing protocol for GEO-GEO satellite backbone network which can obviously improve the routing convergence rate, which meet the requirements of GEO-GEO satellite backbone network application scenarios.

The integrated space and terrestrial networks which incorporate various satellite systems and ground networks could provide a wide variety of services and global seamless network access. This paper is titled "Exploiting Interference for Intelligent Relaying in Integrated Space and Terrestrial Networks Based on PNC and SIC". And the authors studied two interference exploitation schemes, i.e., physical-layer network coding and successive interference cancellation which can efficiently increase data exchange rate for relay systems, and proposed an intelligent relaying scheme combining both the advantages of these two schemes.

The transmission security between ground station and satellite is challenging. Next paper titled "Control Code Multiple Encryption Algorithm on Satellite-to-ground Communication" whose authors proposed a control code multiple encryption algorithm for the single- photon-transmission between satellite and ground station.

The quality of service is severely degraded by coverage holes in wireless sensor networks, also in intelligent cognitive internet of integrated space and terrestrial things. The authors of "Healing Coverage Holes for Big Data Collection in Large-Scale Wireless Sensor Networks" focused on the coverage hole healing (CHH) problem for big data collection in a large-scale wireless sensor network and proposed a greedy healing algorithm (GHA) via the greedy-based heuristic strategy with low computational complexity to solve this CHH problem.

Cognitive IoT (CIoT) based on cognitive radio (CR) has been put forwarded to improve the spectrum utilization of IoT through using the idle spectrum of primary user (PU).The 7th

paper with the title "Joint Time and Node Optimization for Cluster-based Energy-efficient Cognitive Internet of Things" presented a solution to the problem of scarce spectrum resources of Internet of things (IoT), considering the tradeoff between spectrum sensing, spectrum access and energy harvesting.

Due to small battery powered devices and inefficient utilization of resources, the sensor nodes in Internet of Things (IoT) may be lost prematurely. In order to extend the lifetime and avoid energy-hole problem, the authors of "A Novel Hierarchical Data Aggregation with Particle Swarm Optimization for Internet of Things" proposed a novel hierarchical data aggregation with particle swarm optimization for Wireless Sensor Networks and the proposed algorithm can effectively balance the energy consumption of nodes under different node's density, improve the energy efficiency and prolong the lifetime of network significantly.

The traditional localization technology, which requires the target carrying device and participating in localization process, transmits the signal to be received by the device to estimate the target locations, but it perceives the changes in the environment weakly as well as limits the application of localization services. The last article titled" Indoor Target Intrusion Detection via Iterative Transfer Learning Based Cognitive Sensing" proposed a new indoor target intrusion detection approach based on iterative transfer learning without special device. In concrete terms, this approach relies on iterative transfer learning to use the signal received by Monitor Points to determine whether there is a target intrusion in the environment, infer the area where the target is located, and consequently achieve autonomous cognitive sensing of environmental change.

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Min Jia (M'13–SM'17) is an associate Professor and Ph. D supervisor at the School of Information and Communication Engineering of Harbin Institute of Technology(HIT). She received M.S. degree from HIT and Ph.D degree from HIT and SungkyungKwan in 2006 and 2009, respectively. Her research expertise includes the integrated satellite and terrestrial communication system, cognitive radio, machine learning and compressed sensing theory. She has published more than 100 journal and conference papers. And the accumulated impact factor for the paper indexed by SCI is about 86. Moreover, she has 32filed Chinese invention patents and they all applied to the industry products. Importantly, she devote herself to enhance women's right, She is an IEEE senior member and Chair of IEEE Women in Engineering of Harbin Affinity which is the 1st in mainland of China and also the Chair of Member Development in IEEE Harbin Section. She won several national awards and international best paper awards in research and teaching aspects. She is the 1st author of invited papers of 2017 ICCC international conference and 2018 IEEE VTC Spring.

Qing Guo (M'11) received the M.Eng. and Ph.D. degrees in information and communication engineering from the Harbin Institute of Technology, Harbin, China, in 1990 and 1998, respectively. He is currently a Professor and the Dean with the School of Electronics and Information Engineering, Harbin Institute of Technology. His research interests include satellite communications, deep space communications, wireless transmission, and broadband multimedia communication techniques.