Editorial

Yinong Chen*

School of Computing, Informatics, and Decision Systems Engineering,
Arizona State University,
P.O. Box 878809, Tempe, AZ 85287-8809, USA
Email: yinong.chen@asu.edu
*Corresponding author

Li Xia

Business School,
Sun Yat-sen University,
135 Xingang Xi Road, Guangzhou, Guangdong 510275, China
Email: xiali5@sysu.edu.cn

Zhengtian Wu

School of Electronic and Information Engineering,
Suzhou University of Science and Technology,
99 Xuefu Road, Huqiu District, Suzhou, Jiangsu 215009, China
Email: wzht8@mail.usts.edu.cn

Biographical notes: Yinong Chen received his Dr. Rer. Nat. from the Karlsruhe Institute of Technology (KIT), Germany, in 1993. He did his postdoctoral research at KIT and LAAS-CNRS – France. From 1994 to 2000, he was with the Wits University at Johannesburg, South Africa. He is a Principal Lecturer and Director of IoT/Robotics Education Lab at the Arizona State University in 2001. His primary research interests are in service-oriented computing, robot as a service, the internet of things, and computer science education. He has (co-)authored more than ten books and over 200 technical papers in these areas.

Li Xia received his Bachelor and PhD in Control Theory both from Tsinghua University, Beijing, China, in 2002 and 2007, respectively. He worked at IBM Research China from 2007 to 2009 and King Abdullah University of Science and Technology (KAUST) from 2009 to 2011. He then returned to Tsinghua University as a Lecturer in 2011 and was promoted Associate Professor in 2013. In 2019, he joined Sun Yat-sen University, and currently Professor with the Business School. His research interests include methodology research in stochastic learning and optimisation, Markov decision processes, reinforcement learning, queuing theory, and the application research in energy systems, smart building, and financial technology.

Zhengtian Wu received his PhD from the University of Science and Technology of China and City University of Hong Kong, both in 2014. From 2018 to 2019, he was a Visiting Scholar in the Department of Mechanical Engineering, Politecnico di Milano, Italy. In 2014, he joined Suzhou University of Science and Technology, China, where he is currently an Associate Professor. He is an IEEE senior member and got the certificate of outstanding service as an article reviewer from the *Journal of the Franklin Institute* in 2020. His research interests include intelligent decision and control.

1 Introduction

Smart cities and intelligent buildings consist of collections of functions and services that warp the physical devices and actions provided by the city and building managements and outsourced companies. Smart cities and intelligent buildings present the growing importance of cutting-edge technologies such as cloud computing, big data processing, and artificial intelligence. In a special issue in the *International Journal of Simulation and Process Modelling*, 2018, Vol. 13, No. 2, we selected six papers discussing the latest technologies for building a smart city. In addition to these functional features in developing smart cities and intelligent buildings, there are many important non-functional features, such as energy conservation, utility efficiency, noise suppression, environment reliability, safety and security. Many of these features are interdisciplinary and require decentralised, coherent, and balanced solutions. This special issue is in cooperation with the International Conference on Smart City and Intelligent Building (ICSCIB 2018). Eight papers were accepted to this special issue from the best papers selected from the ICSCIB 2018 after significant extension and an independent review process. This special issue focuses on the innovative design process, modelling, simulation, and implementation of these features, leading to a green progression in energy-aware and environment-friendly smart cities and intelligent buildings. The papers are categorised into the following sections.

1.1 Energy management

In this section, we selected three papers. The first paper is on 'Energy management of microgrid based on day-ahead and short-term optimisation'. In this paper, the output power of the equipment units in a microgrid is modelled, and the objective functions and constraint conditions are determined. A day-ahead and short-term optimisation scheme is carried out, and the optimal scheduling program and combination of each distributed generator are optimised by the particle swarm optimisation algorithm. The simulation is performed and the results are analysed to verify the feasibility and validity of the proposed optimisation strategy.

The second paper is on 'A novel method for calculating the light energy distribution in building space'. It studies the lighting design for uniform illumination distribution. The radiation method in computer graphics is studied and combined with formula derivation for light energy calculation based on the Lambert reflection model and the non-Lambert reflection model. Simulation is applied for comparing the uniformity calculation error and for validating the reflection models.

The third paper is on 'Fault diagnosis and location method for electrical power supply and distribution of buildings'. The paper presents a new fault diagnosis and location method for electrical power supply and its distribution in intelligent buildings, based on Bayesian and wavelet neural network. In order to improve the accuracy in fault localisation, a new method is proposed to obtain better thresholds and weights, which are used to enhance the prediction ability. Simulation is conducted using MATLAB/Simulink to verify the performance of the proposed method on the power supply and distribution model.

1.2 Optimisation in smart city construction

In this section, we selected two papers. The first paper is on 'Arancino.cc™: an open hardware platform for urban regeneration'. The second paper is on 'Blockchain for smart city – public service integration by strategic alliance'. A city consists of a set of complex processes whose activities involve worldwide stakeholders, areas, and infrastructures in order to offer sustainable services to people. This paper presents the Arancino system, which can efficiently manage all these city components. The system is based on open hardware and open software technologies in order to achieve green benefits. These benefits essentially result in a better quality of life and a more efficient city management, also optimising energy consumptions and costs.

The second paper applies blockchain technology to smart cities' strategic decision making in the form of strategic alliance for smart city development. The solution is to design a strategic alliance and organise the smart services by promoting the integration of smart solutions and the knowledge of blockchain. According to the study, a smart city model that applies the blockchain technology is developed.

1.3 Data analysis and intelligence techniques

In this section, we selected three papers. The first paper is on 'Deep activity recognition in smart buildings with commercial Wi-Fi devices'. Activity recognition, such as behaviour analysis, health diagnosis, and user authentication, is a key enabler in smart building applications. This paper proposes a device-free human activity recognition system that simply uses prevailing Wi-Fi signals. The system is based on two key techniques used for recognising humans' daily activities. First, a component extraction method is used for capturing the motion-induced distortions and discarding the irrelevant interferences. Second, deep feature maps are constructed with time and frequency domain characteristics, based on a deep convolutional neural network model. The system is implemented using commercial Wi-Fi devices, and the performance is evaluated through extensive experiments. Experiment results show it achieves an average accuracy of 98.6% in a meeting room and 96.4% in a student office.

The second paper is on 'Analysis of vehicle lane-changing behaviour at signalised intersection'. Lane change within a signalled intersection is a dangerous manoeuvre for human drivers owing to the complex conditions. However, for autonomous driving with precise measurements of all surroundings, such lane changes can be done safely. This paper studies the benefits and establishes a vehicle lane-changing mode and the conditions for safely performing lane change, including the relative speed, distance to the adjacent vehicle, and the space available for the lane change.

The third paper is on 'Occupant counting modelling for intelligent buildings based on data from multiple WiFi sniffers'. In an intelligent building, knowing the precise number of occupants in each zone can create energy saving through intelligent control of heating, ventilation, and air conditioning (HVAC) systems. In this paper, a new classification-based occupant counting method using multiple smartphone Wi-Fi sniffers is proposed to obtain a coarse estimation of occupancy. To count the occupants who do not carry a smartphone or the Wi-Fi modules that are not enabled, a p-persistent frequent item set with 1-right-hand-side (RHS)-based occupant correction algorithm is further proposed to improve the occupant detection performance. The proposed methods are validated through real-world experiments. The results show that our classification-based occupant detection method performs better than the 1-WiFi-sniffer-based methods, and the association analysis-based correction algorithm can further improve the accuracy.

The guest editors would like to express our gratitude to the authors for their contribution and the reviewers for their effort in providing feedbacks that have increased the scientific relevance of the papers. Furthermore, our sincere gratitude goes to the Editor-in-Chief of the *IJSPM*, Professor Feng Qiao, and the Journal Manager, Richard Sharp, for their continuous and invaluable support in producing this special issue.