Preface

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Biographical notes: Lingzhong Guo obtained his PhD in Control Engineering from Bristol Robotics Laboratory (BRL), UWE in 2003. He is currently a Lecturer at the Department of Automatic Control and Systems Engineering, The University of Sheffield, UK. His research interest covers system modelling and simulation, nonlinear system identification, adaptive and intelligent control, and analysis and control design for nonlinear PDEs.

Shaowen Lu received his BS and MS in Computer Science from Northeastern University, China, and PhD in Electronic Engineering from the Queen Mary University of London, UK. He is currently a Professor in the State Key Laboratory of Synthetical Automation for Process Industries at Northeastern University, China. His research interests include industrial process modelling and simulation. His most recent research has been in the area of high performance industrial machine learning algorithms, especially focusing on industrial time series analysis, working with both data driven and model driven methods.

Dongya Zhao received BEng from Shandong University, Jinan, China, in 1998, MSc from Tianhua Institute of Chemical Machinery & Automation, Lanzhou, China, in 2002 and PhD from Shanghai Jiao Tong University, Shanghai, China, in 2009. He was a Research Fellow in Nanyang Technological University during July 2011 to July 2012. Since 2002, he has been with College of New Energy, China University of Petroleum (East China), where he is currently a Professor. His research interests include robot control, sliding mode control, process modelling and control, nonlinear system control and analysis. He is a committee member of Technical Committee on Process Control, Chinese Association of Automation, a Senior Member of the Chinese Association of Automation and a member of IEEE.

Modelling and simulation provide a useful and effective tool and platform for testing and validation of design methods and architectures in complex manufacturing and production environment before their application on the shop floor for the actual production process. From production planning and scheduling to digital twin, simulation models have been extensively used in manufacturing to enhance the design, planning and productivity of the production processes, and modelling and simulation technology and methods are now revolutionising and reshaping our manufacturing industry worldwide. In complicated manufacturing environments, many processes, such as material movement in assembling plants which deal with intertwined multi-product and multi-process, are often influenced by various dynamic factors. How to analyse these factors and find better solution in a real-life business environment is very complex and challenging. Optimisation is a very important and effective way to tackle these challenges for manufacturing and production processes because it can reduce the cost and energy use effectively.

Multipurpose and hybrid modelling and simulation of manufacturing and production processes provides the optimal solutions for the difficulties in industry of different machining operations, multidimensional, nonlinear, stochastic nature of machining, and lack of reliable data. Furthermore, modelling and simulation would be helpful to verify the effectiveness and feasibility of different operation schemes and strategies in industry.

This special issue collected the papers from the 2018 International Symposium on Simulation and Process Modelling (ISSPM 2018), Shenyang, China. Its aim is to provide a forum for the scientists, researchers and practitioners to exchange their knowledge and experience in the new developments of theory and methodology and the recent practical applications in M&S.

There are six articles accepted for this special issue ranging from intelligent stowage simulation for a container ship to steelmaking continuous casting scheduling, which are described briefly as follows.

1 'Modelling and implementation of an intelligent stowage simulator for container ships', by Qingwu Wang, Jian Zhao and Lin Ma, presents an intelligent simulator for the container stowage problem, where a BLOCK algorithm is proposed for restowage of the containers on deck jam. The efficacy of the proposed method is demonstrated by different loading conditions from the loading manual.

2 'An optimised steelmaking-continuous casting scheduling simulation system with Unity 3D', by Liangliang Sun, Yaqian Yu, Hang Jin, Li Zhang and Tingting An, develops an optimisation system based on unity 3D simulation platform to study the optimal scheduling problem in ladle allocation during the steelmaking continuous-casting process. The simulation platform can effectively evaluate and optimise the solutions, which has been validated by using real production data.

3 'Bus manufacturing workshop scheduling method with routing buffer', by Zhonghua Han, Jingyuan Zhang, Shiyao Wang and Yuanwei Qi, proposes a routing buffer mathematical programming model for the bus manufacturing workshop scheduling problem. The proposed approach is to minimise the total setup cost for moving around the routing buffer. The simulation results show a better scheduling solution with minimising the maximum total completion time.

4 'Test and effect analysis of hydraulic automatic pressure-regulating water injection device in Shengli Oilfield', by Yuhai Cui, Jiehua Feng and Dongya Zhao, develops a set of hydraulic automatic pressure-regulating water injection devices. These devices are composed of three key components: screw motor module, screw pump module, and transmission device for the purpose of automatic pressure regulation. The test and field experiments in Shengli Oilfield, Dongying, China, show that the developed devices provide great energy saving effect.

5 'A study of flexible flow shop scheduling problem with variable processing times based on improved bat algorithm', by Jianyong Bian and Liying Yang, presents a simulation study of flexible flow shop scheduling problem with variable processing times (FFSP-VPT). A self-adaptive elite bat algorithm (SEBA) is proposed to optimise the solution. The method has been tested and verified by comparing the proposed algorithm and other methods in real production process.

6 'Parameter co-evolution mechanism of particle swarm optimisation algorithm', by Ming Zhao, Xiaoyu Song and Yichen Gao, proposes a co-evolution mechanism for the optimisation of the PSO parameters, including the inertia weight and the acceleration factors. The proposed method can implement cooperative evolution of the operational parameters by dynamically tuning their values according to the population evolution state. The effectiveness and efficiency of the method are verified based on indicators such as success rate, stability and convergence speed.

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