Preface

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Safanah M. Raafat received her BSc and MSc in Control and Systems Engineering from the University of Technology, Baghdad, and PhD in Mechatronics Engineering at the International Islamic University Malaysia. She has many publications in robust control and identification of uncertainties, sliding mode control, extremum seeking control and real time scheduling. She is currently an Assistant Professor of the Department of Control and Systems Engineering at the University of Technology in Baghdad. She is a senior member of the Institute of Electrical and Electronics Engineers (IEEE), and a member of the IEEE Control Systems Society. Her main research interests include system identification, optimisation and optimal control, robust control systems theory and applications, intelligent systems, robotics and positioning systems.

Sustainable systems that involve multi-disciplinary concepts become increasingly important in social and scientific terms. Feeding back signals within specific systems is important to obtain a real sense of the true information. Accordingly, necessary modifications of the systems themselves can be performed in order to maintain desired research environments within the dynamic conditions of natural and socio-economic environments. Modelling and simulation are adequate tools developed for this purpose as they minimise or eliminate uncertainties.

Sustainability loops comprise a sequence or chain of balanced operations and interactions of different nodes, such that their feedback or feed-forward stimulates polarised or even multi-directional growth across a continuum within natural and socio-economic patterns, the effect of the complete balanced loop is sustenance of the entire group and generation of new areas in order to maximise resource efficiency. The method by which sustainability loops are present may be open or closed. Closed loops are those of specific/known systems (with set limits), whereas open loop structures consider the operation of a collection of nodes which are balanced against each other and hence are subject to expansion or contraction. Thus, integration of closed loops and their linkages within dispersed open loops offer processes and optimisation potential, which is paramount in resource use for both social and scientific areas.

The main objectives of this special issue include addressing optimisation problems within different areas of applications, consequently nodes of new information may be formed within the key areas. We propose mathematical process modelling and simulation to be effective solutions to form new systems to aid policy formation, educational frameworks, biological and biomedical systems, novel geographic information systems, chemically engineered systems, energy production and tracking and physical systems.

Specific objectives include identifying qualitative and quantitative formulae and processes for risk assessment structures towards protection of vulnerable areas of high diversity, and validation of business activity/protective policy formation essential in national governance. In addition, the formation of policies can be established within developing and developed countries, and priority setting facilitates socio-economic participation in active sustainability approaches. We also hope to identify factors and enhance efficiency in data simulation processes using nationally stored information, pertinent to wastage, to simultaneously increase safety and the capacity of governance structures to manage human populations.

Minimising pollution contributes to human community stability. Finally, we hope to identify complexities and essential processes for the most efficient coding platforms for geographic information system formation, which can be used to monitor national units with combined user interfaces and analytical functions for simulation use.

In this special issue, some of the most vital, recently important problems are considered and a variety of optimisation methods are effectively applied. The first paper presents the development of a single-phase proton exchange membrane fuel cell model based on Brinkman-Darcy's law, considering the effects of flow field on both local electrochemical area and effective permeability. In the second paper, the dynamic performance of a high scale supporting formwork subjected to horizontal impact loading is examined. The problem of resource management in the cloud environment, especially on a platform as a service is examined in the third paper to satisfy the demands of users and relieve the load on servers in high concurrency, a dynamic orchestration optimisation framework based on the autoregressive moving average model is presented. In the fourth paper, forward-modelling is applied to simulate the ground-penetrating radar (GPR) detection environment and additionally, a modified morphological component analysis algorithm is applied to GPR signal denoising. A data cleaning method for water based on an improved balanced iterative reducing and clustering using hierarchies algorithm is proposed in the fifth paper. The sixth paper presents a prediction model based on an intelligent water drops optimisation support vector machine (IWD-SVM) for maximum power point working voltage, IWD is used to optimise the penalty factor and kernel function parameters of the SVM, thus improving the training efficiency of the learning machine. Finally, in the last paper, the Chan algorithm applies the theory of time-difference-of-arrival to solve the target position of the mathematical model. By introducing intermediate variables, the algorithm adopts a two-step weighted least-squares to locate, which has low computational complexity and high positioning accuracy.

We would like to express thanks to all contributors for their valuable insights in research areas crucial for the setting of optimal sustainability patterns, relevant in both national and international settings.