Hindawi Publishing Corporation
Mathematical Problems in Engineering
Volume 2014, Article ID 179457, 3 pages
http://dx.doi.org/10.1155/2014/179457

Editorial

Intelligent Techniques for Simulation and Modelling

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Received 23 January 2014; Accepted 23 January 2014; Published 26 February 2014

Emergence and development of computational intelligence in the last 20 years have broadened the scope of simulation and modelling in many scientific and engineering disciplines. In conjunction with the 2013 International Conference on Information Technology, Computation and Applications (ICITCA2013) held in Hohhot, China on August 6–8, 2013, an open special issue on "Intelligent Techniques for Simulation and Modelling (ITSM)" in Mathematical Problems in Engineering (MPE) was organized for publishing high-quality papers selected from both the conference and open submissions. In total, fifty-three papers were submitted to this special issue through MPE's online submission system by the closure. Contributors were from more than 70 institutions in Australia, Brazil, Canada, China, India, Iran, Mexico, Serbia, Spain, and USA. After rigorous peer review of each of these submissions, thirty-two revised papers were accepted for publishing in this special issue. Depending on the completion time of revision and final editing, these papers have been published progressively since September 2013.

An engineering or a scientific problem is often based on some physical natures. To solve such a problem, we need to formulate the problem as a mathematical model in terms of variables, functions, and equations. The process of creating such a model, solving it, and interpreting the result in physical, chemical, geometric, engineering, or other terms is *modelling*. Such a model is likely comprised of a number of unknown factors, such as temporal and spatial constraints. By varying one or more of these unknown factors within the limits, different outcomes can be generated from the mathematical model and/or solution. These outcomes correlate to different physical, chemical, geometric, engineering scenarios. This model-based iterative mathematical computation is *simulation*. Modelling and simulation are two different but closely related approaches in many disciplines, which are illustrated in Figure 1 [1].

Many techniques play important roles in the stages of finding solutions for and interpreting the solutions for different purposes from the simulation and modelling process. Commonly used techniques in simulation and modelling include statistics, intelligent methods, numeric computations, experiments, and combinations [2–6]. Popular and emerging applications of simulation and modelling include systems control, forecasting, scheduling or planning, network security, and various optimizations [7–10]. All these techniques and applications are found in the 32 accepted papers in this special issue.

Categorically, there are six papers in adaptive or optimal control of various systems. Pedroso et al. presented an adaptive control that integrates two linear control strategies for the stepdown converter. Hong and Cheng designed a predictive control algorithm based on the Kalman filter for constrained Hammerstein—Wiener systems. Liu et al. studied the mathematical model of the machine directional register system for the multicolor gravure printing machines in order to improve the control accuracy of the register system. Mo et al. presented a new behavior-based fuzzy control method for mobile robot navigation which can deal with uncertainties in unknown environments and has the ability to accommodate different behaviors. Prema et al. described the design, modeling, simulation, control, and implementation of an

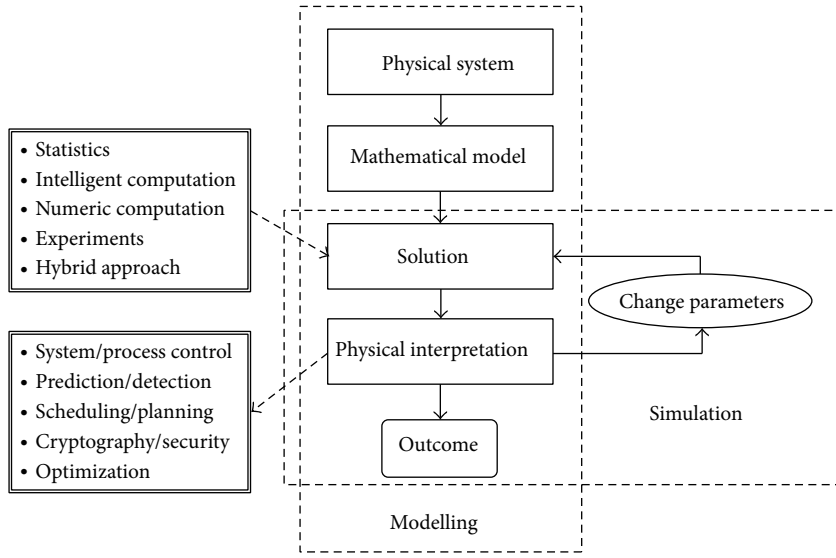

Figure 1: The procedure of modelling and simulation (modified from [1]).

intelligent system for controlling the teleoperated agricultural vehicle. Zhou and Chen proposed a sliding mode control scheme for near space vehicles with strong nonlinearity, high coupling, parameter uncertainty and unknown time-varying disturbance based on radial basis function neural networks (RBFNNs) and the nonlinear disturbance observer.

The five papers in scheduling, planning, and resources allocation include the paper on a new pruning strategy for search based planning and its realisation through numeric approximation by Cai et al., the paper on a new algorithm for phase transitions of the planning problem by Zhou et al., the paper on crop yield forecasting using neural network models by Guo and Xue, the paper on a new similarity-based link prediction algorithm for social networks by Dong et al., and the paper on a new method for learning resources allocation or recommendation by Wang et al. There are nine papers that proposed new algorithms for feature detection, extraction, or reconstruction in digital data and image processing contributed by Feng et al., Zhao et al., Wang et al., Zhang et al., Wang et al., Li et al., Zhang et al., Liu et al., and Su et al., respectively.

The four papers in encryption and security in digital data storage and communication networks are contributed by Zhu et al. on an effective structural attack to deanonymize social graph data on social networks, Rahuman and Athisha on a new reconfigurable architecture for elliptic curve cryptography using FPGA, Li and Fu on a new scalable model for the design of p-cycles with the differentiated levels of node protection for communication networks, and Yin et al. on a new efficient cloud storage system to protect and recover data in cloud environment. The remaining eight papers in optimization algorithms for various applications were contributed by Liu et al., Liu et al., Wang et al., Liu et al., Moreno-Salinas et al., Zhang et al., and Liu and Yu, respectively.

All these papers have made new contributions to the broad area of modelling and simulation.

Acknowledgments

We are grateful to all authors and reviewers for their contributions to this special issue.

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