Editorial Special Issue on AI-enabled System Simulation and Modelling

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AI-enabled system simulation and modelling has become useful tools to facilitate humans to understand systems in different domains, such as physics, astrophysics, chemistry, biology, economics, engineering and social science. A complex system is featured with a large number of interacting components (agents, processes, etc.), whose aggregate activities are nonlinear and self-organized. Complex systems are hard to be simulated or modelled by using traditional computational approaches due to complex relationships among system components, distributed features of resources, and dynamics of environments. Meanwhile, agent and multi-agent systems have demonstrated advantages and great potentials in modelling and simulating complex systems.

The special issue on AI-enabled System Simulation and Modelling aims to bring together researchers in both artificial intelligence and system modelling/simulation to share their recent research outputs in agent-based simulation and modelling. The topics of this issue include but are not limited to the modelling and simulation of different complex systems such as agent-based systems, large-scale systems, dynamic environment and ecosystems, smart grid systems, social and economic organizations, market-based systems, transportation systems, and emergency management sys-

tems.

This special issue contains the selected extended papers presented at the 4th International Workshop on Smart Simulation and Modelling for Complex Systems (SSMCS2019) joint with the 28th International Joint Conference on Artificial Intelligence (IJCAI2019) at Macao China in August 2019 as well as many new submissions. After the peer-review process, eight papers were accepted.

Hu, Ye, Zhu and Huo (2021) proposed a novel mechanism based on the Information Diffusion Mechanism (IDM) and differential privacy, which can successfully process the auction and at the same time preserve clients' price information from neighbors. The evaluation shows that the result of their methods only depend on the noise added to the agents and it is independent from the agents' original price.

Yang, Ren and Zhang (2021) proposed a new agent-based adaptive mechanism for efficient job scheduling, where a new type of agent named host agent is introduced to coordinate self-interested behaviors of agents without participating in the decision making of agents during job scheduling. The experimental results indicate that the proposed mechanism is effective and efficient in open and large-scale environments.

Niu, Huang, Zhao and Yu (2021) proposed

a negotiation model for multiple negotiations, where interdependence exists between discrete issues across multiple negotiations. The experimental results show that the proposed model well handles the multiple negotiations with interdependence between discrete issues, it is able to help agents in the decision-making process of proposing acceptable offers and an agent can choose a proper 'tolerance value' to balance between the success rate of multiple negotiations and its expected utility.

Raza, Hardy, Roehrer, Yeom and Kang (2021) proposed a blockchain based family security system for outdoor tracking and in-house monitoring of users' activities via sensors to detect anomalies in users' daily activities with the integration of artificial intelligence. The system is implemented at a small scale with one miner, two user nodes and several device nodes, as a proof of concept.

Hadfi, Haqbeen, Sahab and Ito (2021) studied the influence of the agent on the evolution of an online debate involving human participants. They conducted two experiments to evaluate the platform while looking at the effects of the conversational agent. From the first experiment, they found that the agent improved the responsiveness of the participants and increased the number of identified ideas and issues. From the second experiment, they found that the agent polarized the debate by reinforcing the initial stances of the participant.

Ahmed Moustafa (2021) proposed a novel approach that aims to achieve greater data efficiency by saving the experience data and using it in aggregate to make updates to the learned policy. The results of the experiments show the effectiveness of the proposed approach for composing and adapting cloud services, especially under dynamic environment settings, compared to their online learning counterparts.

Zhang, Li, Li, Zhou and Bai (2021) proposed a novel graph-based context-aware rec-

ommendation systems with knowledge graph to analyze and predict users behaviors. Experimental results indicates that the proposed approach can outperform the state-of-the-art algorithms, and achieve more accurate recommendations.

Ghobadi, Arkat, Farughi and Tavakkoli-Moghaddam (2021) proposed two new mathematical models to combine the decisions about the location and dispatching policy by integrating the location and hypercube queuing models. To verify the models, some small-sized examples are first solved exactly. Then, an optimization framework based on the genetic algorithm is presented due to the complexity of the models for solving larger-sized examples.

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