Editorial

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Biographical notes: Koichi Nakade is a Professor in Faculty of Engineering at Nagoya Institute of Technology. He received his Master's degree of Engineering in Kyoto University and Doctor of Engineering at Nagoya Institute of Technology in Japan. His research interest includes stochastic models, Markov decision processes, scheduling and their applications to manufacturing and logistics systems.

Mitsuyoshi Horikawa is a Professor in the Faculty of Software and Information Science at Iwate Prefectural University. He received his Doctor of Engineering degree from the Tokyo Metropolitan Institute of Technology. His research interests include IoT, machine learning, cyber-physical systems, and production management.

Production systems are becoming more complex and require not only efficient but also robust and sustainable structures. Sustained production activities are no longer possible without considering logistics, sales, renewable energy, efficient use of resources, emission controls. This special issue focuses on mathematical modelling and analysis of efficient and sustainable production systems and supply chains.

After rigorous reviews, five papers are included in this issue. Here we give the summary of each paper.

Mr. Wang and Dr. Hasuike formulated a vehicle routing model that integrates external temperature fluctuation in cold-chain logistics. The objective function includes transport, cargo damage and refrigeration costs. They proposed improved ACO and GA algorithms, both of which are highly effective in reducing distribution costs, especially for fluctuating external temperatures. The improved GA algorithm outperforms the improved ACO algorithms.

Ms. Zhao, Dr. Sun and Dr. Nakade dealt with a multi-objective mathematical model for the flexible job-shop scheduling problem considering human-machine efficiency and worker health. GA and artificial bee colony algorithms are proposed for solving the formulated problem, and the numerical experiments show that the optimal balance between productivity and worker safety can be achieved by controlling the production speed.

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Dr. Hayashi presented a study on the optimisation of a hierarchical production system with a combined processing-assembly and hybrid flow shop, which a plastic container manufacturer uses. The target process is a hybrid flow shop which consists of the moulding and decoration processes in different lot sizes and a processing-assembly flow shop. He analysed the relationship between demand forecasting priority parameters, inventory setting parameters and the inventory quantity to prevent excess inventory while minimising stockouts.

Mr. Yoneda and Dr. Kusukawa considered a two-period closed loop supply chain (CLSC) considering quality of used batteries, their secondary uses and recycling into materials. The CLSC consists of a battery manufacturer, which is a Stackelberg leader, a third party, a power grid company and a vehicle manufacturer. Three types of government subsidies are considered. The optimal operation and social welfare are discussed through numerical experiments. The sensitivity analysis was also made.

Dr. Hasegawa and Dr. Shiono proposed a route-length estimation formula based on rectilinear distances, which decreases computational costs to solve TSP and VRP. They focus on estimating the tour length from the origin to the customers randomly generated in the territories of drivers. Through numerical simulation they investigated the effectiveness of this formula. They also demonstrated the relationship of parameters in territory designing through numerical experiments.

We believe that these five papers will enhance sustainable production and logistics systems. Lastly, we appreciate contributors and reviewers for their help in this issue.