Guest Editorial Preface

Special Issue on Operations Research and its Application in Engineering

Georgios K.D. Saharidis, Department of Mechanical Engineering, University of Thessaly, Volos, Greece & Kathikas Institute of Research & Technology, Kathikas, Cyprus

Michalis Golias, Department of Civil Engineering, Intermodal Freight Transportation Institute, University of Memphis, TN, USA

In the context of the 2nd International Conference on Energy, Sustainability and Climate Change (ESCC), the University of Florida and the University of Thessaly in collaboration with International Journal of Operations Research and Information Systems (IJORIS) publish the current special issue on Operations Research and its Application in Engineering. The International Congress on Energy, Sustainability and Climate Change is a tradition in the field of engineering enumerating a series of events which are being organized under the cooperation of the research and professional community in the field of engineering. Energy, Sustainability and Climate Change topics are some of the most important and this explains and justifies the relevance of the proposed topics to current international research. The main objective of this special issue is to contribute to the dissemination of original and high-quality research work presented to 2nd ESCC regarding the development and/or application of information systems and operation research of Energy, Sustainability and Climate Change fields.

Four interesting papers are published in the current special issue. The main objective of the first paper is to examine a Markov process model of a push-pull merge system with two reliable suppliers, an intermediate finite buffer and two reliable retailers. The two reliable non-identical suppliers performing merge operations feed a buffer that is located immediately upstream of two non-identical reliable retailers. External customers arrive to each retailer with non-identical inter-arrival times that are exponentially distributed. The contribution of this study is the performance evaluation of the above system using as an evaluative tool the proposed algorithm. The transition probabilities of the Markovian model were derived and an algorithm that generates the transition matrix for any value of the system parameters was developed. Additionally, the steady state probabilities of the model were computed. The obtained numerical results were compared with those obtained by simulation and showed that the proposed algorithm evaluates the performance measures of the system with very high accuracy and quite fast.

The second published paper focuses on the special properties of process industries when developing a mathematical model that can be used as a decision support tool for the supply chain planning for a chemical process industry in Sweden. A mixed-integer linear programming model for the supply chain planning problem at Perstorp Oxo AB, a world-leading company within several sectors of the specialty chemicals market is presented. The model is tailored for the needs of Perstorp, intended to be used as a decision support tool at the site in Stenungsund, but is still general enough to be applicable also for similar large scale supply chain applications within the chemical process industry. The developed model makes it possible to conduct numerical experiments, to evaluate scenarios and

to analyze what-if situations. The numerical experiments shown that the solution quality is very high. Compared to the present planning situation at Perstorp, which is very time consuming, the suggested decision support tool could make the planning more efficient for the company.

The objective of the third research paper is the modelling and optimization of resource availability in car parks, serving different priority classes of customers. The authors examine various formulations of the problem concerning two general objectives: a) increasing the availability for high priority customers and b) maximizing the aggregate service level. A stochastic model which describes the behaviour of the service system is implemented. The crucial decision is to identify the proper time interval in order to apply the stochastic model. The parking customers are divided into priority classes and resources, in terms of parking spaces. The appropriate theoretical framework is introduced and applied to real data provided by the car parking company, CPS Athens S.A. based in Athens, Greece. The parking company under study could adopt the proposed model and manage to assure that high priority classes can be almost always satisfied. Finally, the proposed policy gives to the company the opportunity to form a "free-parking" policy by exploiting the left over parking spaces when this is possible.

Finally, the last paper of this special issue studies the proper assignment of loading units onto wagons, taking under consideration numerous factors like the maximum axle load restrictions, the condition of the railway infrastructure, the operating conditions, safety regulations etc. The current work describes the steps that were followed and enabled the analysis, optimization and integration of the train loading plan into the information system that supports the new railway service of the Greek national railway company for containers transport on the Athens – Thessaloniki line. A wagon loading heuristic algorithm has been presented for the information system of the provided service that performs the "simulation" of train loading each time a customer enters a new order in the system. The performance of this algorithm was evaluated against the solutions produced by an integer programming model. The analysis concluded that the current algorithm although fast, produces results which in most cases are near optimal.

Georgios K.D. Saharidis
Michalis Golias
Guest Editors
IJORIS