

## **Multi-objectives memetic discrete differential evolution algorithm for solving the container pre-marshalling problem**

**Hossam M. J. Mustafa, Masri Ayob, Mohd Zakree Ahmad Nazri and Sawsan Abu-Taleb**

The Container Pre-marshalling Problem (CPMP) has the significant effect of reducing ship berthing time, and can help in increasing terminal turnover rate. In order to solve the CPMP, this research proposes a Multi-objectives Memetic Discrete Differential Evolution algorithm (MODDE). To date, existing research in CPMP only focuses on single-objective approaches. However, this is not a suitable approach due to the considerable effort required to validate the hard constraints of CPMP. Therefore, this work aims at addressing the effect of minimizing the number of miss-overlaid containers on the total number of movements in building the final feasible bay layout by embedding it in the multi-objectives evaluation function. The proposed algorithm combines the Discrete Differential Evolution mutation with the Memetic Algorithm evolutionary steps in order to find high quality CPMP solutions, achieve high convergence rate and avoid premature convergence and local optima problems. In addition, it improves the exploration and exploitation capabilities of the algorithm. The standard pre-marshalling benchmark dataset (i.e., Bortfeldt-Forster) is used to evaluate the effectiveness of the proposed algorithm. The experimental results reveal that the proposed MODDE algorithm can find good solutions on instances of the standard pre-marshalling benchmarks. This demonstrates that using the multi-objectives approach with a combination of the Discrete Differential Evolution mutation and the Memetic Algorithm evolutionary is a suitable approach for solving multi-objectives CPMP.

Hossam M. J. Mustafa, Masri Ayob, Mohd Zakree Ahmad Nazri and Sawsan Abu-Taleb, (2019), Multi-objectives memetic discrete differential evolution algorithm for solving the container pre-marshalling problem, Journal of Information and Communication Technology.