

Tuning the Parameters of a Memetic Algorithm to Solve Vehicle Routing Problem with Backhauls Using Design of Experiments

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Abstract—Vehicle Routing Problem with Backhauls (VRPB) is an extension of the general Vehicle Routing Problem (VRP). In contrast with general VRP, VRPB considers two types of linehaul and backhaul customers. VRPB tries to find optimal routes with minimum cost in which backhaul customers are visited after linehaul customers for a fleet of heterogeneous vehicles. In this paper, a Memetic Algorithm (MA) is developed to solve the VRPB. Similar to other metaheuristic algorithms, an important issue that affects the performance of MA is the selection of components employed in the algorithm along with their parameters' values. This work examines the effect of employing different combinations of MA components and parameter values on both the algorithm's efficiency and the quality of solutions. Design of Experiments (DOE) is introduced as a systematic approach to find the best combination of these parameters' values. Analysis of variance (ANOVA) is used to analyze the main effect and interaction effects of the considered parameters. Results verified the efficacy of the proposed MA method and the systematic tuning approach for MA to solve VRPB.

Keywords—Memetic algorithm, Design of experiments, Metaheuristics, Vehicle routing problem

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