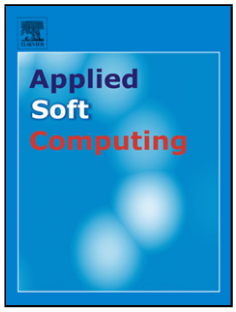

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The impact of particular components of the PSO-based algorithm solving the Dynamic Vehicle Routing Problem

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Abstract

This paper presents and analyzes a Two-Phase Multi-Swarm Particle Swarm Optimizer (2MPSO) solving the Dynamic Vehicle Routing Problem (DVRP). The research presented in this paper focuses on finding a configuration of several optimization improvement techniques, dedicated to solving dynamic optimization problems, within the 2MPSO framework. Techniques, whose impact on results achieved for DVRP is analyzed, include: solving the current state of a problem with a capacitated clustering and routing heuristic algorithms, solving requests-to-vehicles assignment by the PSO algorithm, route optimization by a separate instance of the PSO algorithm, and knowledge transfer between subsequent states of the problem. The results obtained by the best chosen configuration of the 2MPSO are compared with the state-of-the-art literature results on a popular set of benchmark instances.

Our study shows that strong results achieved by 2MPSO should be attributed to three factors: generating initial solutions with a clustering heuristic, optimizing the requests-to-vehicle assignment with a metaheuristic approach, direct passing of solutions obtained in the previous stage (times step) of the problem solving procedure to the next stage. Additionally, 2MPSO outperforms the average results obtained by other algorithms presented in the literature, both in the time limited experiments, as well as those restricted by the number of fitness function evaluations.

Keywords: Dynamic Vehicle Routing Problem, Particle Swarm Optimization, Vehicle Routing Problem, Dynamic Optimization

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