A LOCAL SEARCH ALGORITHM FOR THE HETEROGENEOUS VEHICLE ROUTING PROBLEM

A. Khmelev

Novosibirsk State University, Novosibirsk
e-mail: avhmel@gmail.com

In this work we study Heterogeneous Vehicle Routing Problems (HVRP) with limited fleet. Since it is a generalization of the classical Vehicle Routing Problem (VRP), the HVRP is NP-hard. In the classical problem, a fleet of capacitated vehicles is available to serve a set of geographically dispersed customers with known demands. Each customer should be visited by exactly one vehicle, each route should be started and finished in depot and the capacity of each vehicle should not be exceeded. The objective is to minimize the total distance traveled. In the HVRP, we use vehicles with distinct capacities, vehicle costs, and travel unit costs. The goal is to minimize the total cost of client service[3].

We developed hybrid algorithm based on Variable Neighborhood Search. It uses six well-known inter–route swap moves. Due to the specificity of the problem, these moves combine with reallocation of vehicles between routes. We also use three intra–route moves. To improve the performance of the algorithm, we use randomization of neighborhoods and auxiliary data structure. For intensification of search we use three exponential neighborhood structures based on ejection chains. For a regular change of the search area, we developed special procedure to split giant tour into routes. Algorithm was tested on well-known benchmark instances with number of customers up to 250 [1]. It showed its efficiency in comparison with other known heuristics and produced competitive results [1,2].

REFERENCES

1. C. Duhamel , C. Gouinaud, P. Lacomme, C. Prodhon, *A multi-thread GRASPxELS for the heterogeneous capacitated vehicle routing problem.* — Hybrid Metaheuristics, 2013, vol. 434 of Studies in Computational Intelligence, pp. 237–269.

2. P.H.V. Penna, A. Subramanian, L.S. Ochi, *An iterated local search heuristic for the heterogeneous fleet vehicle routing problem.* — Journal of Heuristics, 2013, vol. 19, pp. 201-232.

3. C. Prins, *Two memetic algorithms for heterogeneous fleet vehicle routing problems.* — Engineering Applications of Artificial Intelligence, 2009, vol. 22, n. 6, pp. 916–928.