



APPLICATION OF GENETIC ALGORITHMS TO VEHICLE ROUTING PROBLEM

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Abstract: Distribution of the goods from a producer to a customer is one of the most important tasks of transportation. This paper focuses on the usage of genetic algorithms (GA) for optimizing problems in transportation, namely vehicle routing problem (VRP). VRP falls in the field of NP-hard problems, which cannot be solved in polynomial time. The problem was solved using genetic algorithm with two types of crossover, both including and leaving-out elitism, setting variable parameters of crossover and mutation probability, as well as prevention of creating invalid individuals. The algorithm was programmed in Matlab, tested on real world problem of spare parts distribution for garages, while the results were compared with another heuristic method (Clarke-Wright method). Genetic algorithm provided a better solution than the heuristic Clarke-Wright method.

Key words: *VRP problem, genetic algorithms, Clarke-Wright algorithm, metaheuristics*

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1. Introduction

Vehicle routing problem can be described as a problem of determining vehicle routes, where every route starts in the depot, then a subset of customers is visited in a specific sequence, followed by return to the depot. Every customer has to be assigned to exactly one route and the overall amount of delivered quantity of consignments assigned to one vehicle cannot exceed the capacity of the vehicle. Routes should be chosen so that the total cost of delivery is the minimum.

VRP can be considered as a generalization of the travelling salesman problem (TSP). Unlike TSP, vehicle routing problem has a wide range of other limitations and extensions that can be often seen in real-world applications. These can include for example:

- distribution is ensured from multiple depots;
- every vehicle can operate on more than one route provided that the total time does not exceed the given value;

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