



Deutsche Post Lehrstuhl
für Optimierung von
Distributionsnetzwerken

RWTHAACHEN
UNIVERSITY

Master Thesis

The Lin-Kernighan Neighborhood operator for the Vehicle Routing Problem with Time Windows

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Our chair

Our chair is devoted to the development and implementation of decision support systems for solving and analyzing planning problems in logistics and production, especially transportation, network design, location planning, warehouse management and workforce scheduling problems. The methodological focus lies on mathematical modeling, exact and heuristics optimization, and machine learning techniques. Our intensive collaboration with Deutsche Post DHL and other industry partners provides a strong application focus for many of our projects.

Your task

The Capacitated Vehicle Routing Problem (CVRP) deals with the task of meeting the demands of a set of customers with a fleet of vehicles at minimum cost. Each customer must be visited exactly once, vehicle routes start and end at the depot, and vehicle capacities must be respected. The VRP with Time Windows (VRPTW) is an extension of the CVRP which additionally requires that service at the customers is started within given time windows. Heuristic solution methods for the VRPTW are often based on local search: a starting solution generated by a construction heuristic is iteratively improved by the use of so-called neighborhood operators. The Lin-Kernighan neighborhood operator deletes and creates edges in a stepwise fashion such that the sum of the partial improvements remains positive.

In this master thesis, the Lin-Kernighan operator shall be integrated into a local search for the VRPTW. A generalized objective function is used, which allows constraint violations and handles them by means of penalty costs, thus enabling the search to consider infeasible solutions. The search with the LK operator is strongly accelerated by evaluating only those partial moves that have a positive effect on the cost function. The central question of the work is how potentially infeasible partial moves can be evaluated in the course of the search. Programming skills are beneficial for working on this topic.

Your profile

- Reliable, independent and motivated way of working
- Conscientious and structured approach to work
- Good knowledge of German or English
- Programming knowledge advantageous

If you are interested, please feel free to write an email with your CV and your transcript of records to Christian Becker (schroeder@dpo.rwth-aachen.de).