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Vehicle Routing Problems with Time Windows – Status and Recent Developments

The talk presents a survey on optimization methods for the vehicle routing problem with hard time windows (VRPTW). Furthermore, some recent developments are presented.

The most common basic method is based on Dantzig-Wolfe decomposition and Lagrangean relaxation in which the coupling/relaxed constraints are the constraint set requiring that each customer must be serviced. The subproblem is a shortest path problem with time windows and capacity constraints.

The decomposition/relaxation schemes combined with branch and bound techniques has proven effective in solving a large number of instances of the VRPTW. To get better bounds a number of valid inequalities are generated and incorporated in the master problem as needed.

In this presentation methods for speeding up the separation algorithms for some of the valid inequalities and methods for speeding up the column generation will be discussed. Furthermore parallelization issues and a hybrid approach will be mentioned.

The algorithms implemented have been tested on a series of well known data sets of size up to 100 customers and a few other problems of size up to 1000 customers. The algorithms have succeeded in solving problems of size up to 1000 customers to optimality.