

# Time-dependent and bi-objective vehicle routing problem with time windows

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## ABSTRACT

The optimization of bi-objective vehicle routing problem has become a research hotspot in recent years. In this paper, a time-dependent and bi-objective vehicle routing problem with time windows (TD-BO-VRPTW) is proposed, which is a new extension of classical vehicle routing problem. Time-dependency is presented for the situation that vehicle's travel speed is affected by its departure time and the distance between two customers. The total transportation costs and time costs are two objectives optimized simultaneously through constructing a bi-objective mixed integer linear programming model. To deal with this problem, the non-dominated sorting genetic algorithm II (NSGA-II) is adopted to obtain the Pareto optimal solution set. In the numerical examples, the RC108 from Solomon's benchmark set is employed and the results in the Pareto front show the efficiency of NSGA-II for the TD-BO-VRPTW. To further test the performance of this algorithm, two objectives are optimized separately and then the sum of two objectives is also optimized. Through comparing these results with solutions in the Pareto front, it can be concluded that the algorithm is reliable, and the results in Pareto front are competitive because there is a trade-off between two objectives.

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