
The Split Delivery Vehicle Routing Problem with Time Windows and Customer Inconvenience Constraints

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Abstract

In classical routing problems, each customer is visited exactly once. By contrast, when allowing split deliveries, customers may be served through multiple visits. This potentially results in substantial savings in travel costs. Even if split deliveries are beneficial to the transport company, several visits may be undesirable on the customer side: at each visit the customer has to interrupt his primary activities and handle the goods receipt. The contribution of the present paper consists in a thorough analysis of the possibilities and limitations of split delivery distribution strategies. To this end, we investigate two different types of measures for limiting customer inconvenience (a maximum number of visits and the temporal synchronization of deliveries) and evaluate the impact of these measures on carrier efficiency by means of different objective functions (variable routing costs, fixed fleet costs, schedule-related costs). We consider the vehicle routing problem with time windows in which split deliveries are allowed (SDVRPTW) and define the corresponding generalization that takes into account customer inconvenience constraints (SDVRPTW-IC). We design a branch-and-cut algorithm to solve the SDVRPTW-IC and report on experimental results showing the impact of customer inconvenience constraints.

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