Adaptive Memory Programming for the Multi-Product Vehicle Routing Problem with Cross-Docking

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Abstract

This work studies the vehicle routing problem with cross-docking. A new realistic generalization of the problem is introduced, where customers require multiple products from several suppliers. Overall, the aim is to design the minimum cost set of routes for transporting various products via a cross-dock, given a set of suppliers and customers with known demands. The generated routes are subject both to capacity and maximum route duration constraints. An Adaptive Memory Programming framework is proposed for solving the problem. The framework incorporates a Tabu Search algorithm for intensification local search as well as novel adaptive memory mechanisms for generating provisional solutions and for guiding the search process. Computational experiments on well-studied benchmark instances of the literature with time window constraints, indicate that the proposed method is capable of generating high quality solutions within short computational times. Furthermore, the effect of using two different types of vehicles for the pickup and delivery routes is investigated. Lastly, various experiments on randomly generated instances are also performed to evaluate how the number of products and the geographical distributions affect the transportation cost.

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