Solving the one-commodity pickup and delivery location-routing problem by simulated annealing

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Abstract

This research studies the one-commodity pickup and delivery location-routing problem (1-PDLRP), a variant of the location-routing problem. The problem has many applications, such as repositioning bicycles in a public bike-sharing system. In 1-PDLRP, there are a single commodity, a set of potential depots, and two types of customers, namely pickup customer and delivery customer. A fleet of vehicles with fixed capacity is used to fulfill the demand of customers. The demand of a delivery customer can be supplied by either the product stored at the depot or collected from the pickup customers in the same route. The goal is to find a set of routes that fulfill all customer demands at a minimum total cost, consisting of depot opening cost, vehicle fixed cost, and vehicle traveling cost. A mixed integer linear programming model and a heuristic approach based on simulated annealing (SA) are developed for 1-PDLRP. The results of computational experiments indicate that the proposed SA heuristic performs well on solving 1-PDLRP.

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