
Exact and heuristic algorithms for the inventory routing problem with logistic ratio

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Abstract

We study the Inventory Routing Problem with Logistic ratio (IRP-LR), a variant of the classical IRP where the goal is to minimize the average cost per unit delivered. The problem has been recently introduced in the scientific literature (Archetti et al., 2016), although the logistic ratio is commonly used in practice as a performance measure. The adoption of the logistic ratio gives rise to a fractional objective function. An exact algorithm for the IRP-LR, which consists in solving a sequence of IRPs with a linear objective function, is presented. The algorithm stops when an optimality condition is satisfied. Different acceleration techniques to speed-up the exact algorithm are proposed. A descent heuristic algorithm based on the same scheme and on an early stopping condition is also presented. Computational tests are performed on the same instances introduced in Archetti et al. (2016). The results show that the exact algorithm dramatically improves the one proposed in Archetti et al. (2016) and that the acceleration techniques remarkably help in improving its performance. The exact algorithm is also tested on new and larger instances, showing that the algorithm is able to solve to optimality instances with 50 customers and 3 periods or 30 customers and 6 periods in one hour of computing time. Moreover, the heuristic is able to find high quality solutions in a short computing time. Archetti, C., Desaulniers, G., Speranza, M.G. (2016), Minimizing the logistic ratio in the inventory routing problem, to appear in EURO Journal on Transportation and Logistics, DOI 10.1007/s13676-016-0097-9.

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