Lower bound on the logistic ratio objective function for bulk distribution inventory-routing problem

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Abstract

Bulk distribution inventory-routing problem (IRP) typically occurs in the gas industry. In this paper we tackle the one-to-many problem structure, where both customers and vehicles can have different capacities. Such problem is proposed by Air Liquide within ROADEF/EURO 2016 challenge. The objective function to be minimized is represented as so-called logistic ratio, which is the ratio between the total transportation cost and the total delivered amount of a concerned product. Time dimension of this problem is the main factor rising the complexity. All the routing and delivery decisions have to be made in terms of minutes, and the whole horizon can be given in terms of months. For this reason, it is very important to have some knowledge on the objective function behaviour. The logistic ratio, as an objective function of IRP, is not well studied in the literature. We define an LP and an iterative method that gives us a sequence of lower bounds to the optimal solution of our problem. The tightness of these lower bounds does not necessary depend on the total number of customers to be served, but on the number of small capacitated customers.

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