TRANSPORTATION PROBLEM WITH VARYING DEMANDS AND SUPPLIES ARISING IN TEA DISTRIBUTION

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This study is motivated by a real-world tea distribution problem. Transportation problem with varying demands and supplies (TPVDS) can be modelled as a variant of the interval transportation problem (ITP). In ITP, the demands and capacities of a homogeneous product may not be known precisely but vary within an interval. Due to these variations, the total cost of the transportation can also be varied within an interval, and thus the cost bounds can be obtained. Determination of an exact upper bound on the minimal total transportation cost to this ITP is an NP-hard problem. This study develops an alternative efficient heuristic technique to find the better near optimal upper bound to a tea-distribution problem. We consider a special case of ITP where the sum of the lower bounds for all supplies is equal to the sum of the lower bounds for all demands, and the sum of the upper bounds for all supplies is equal to the sum of the upper bounds for all demands. The proposed method is formulated using the idea of convex combination in which the points on the supply-demand interval ranges are expressed as a convex combination of their respective lower and upper bound values. The performance of this new heuristic is evaluated on available small-sized benchmark instances and a real-world case study. The proposed method, as a heuristic, provides near-optimal upper bounds of the minimal total costs.

Keywords: NP-hard problem, Tea-distribution problem, Upper bound