A Threshold Accepting Meta-heuristic for the Vehicle Routing Problem with Backhauls and Time Windows

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Abstract

This paper presents a meta-heuristic, which is based on the Threshold Accepting combined with modified Nearest Neighbor and Exchange procedures, to solve the Vehicle Routing Problem with Backhauls and Time Windows (VRPBTW). The VRPBTW assumes that trucks initially start from the depot, deliver goods to the linehaul customers, successively pickup goods from the backhaul consumers, and finally return to depot. Eighty-one instances are generated to identify the performance of the proposed meta-heuristic. Four experiments are designed and related parameters are set. Numerical results imply the following conclusions: (1) modified Nearest Neighbor procedures are superior to the traditional Nearest Neighbor; (2) among three TA frameworks, TA2 experiences better performance than others; and (3) the average fleet size is reduced from 18.54 to 15.18 and the average routing time is diminished from 1770.83 to 1267.09. In sum, the proposed TA meta-heuristic actually provides an efficient and robust tool for VRPBTW applications.

Keyword：meta-heuristic, threshold accepting, vehicle routing problem, backhauls, time windows