Route Planning for a Mixed Delivery System in long distance transportation and comparison with Pure Delivery Systems

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This paper deals with a long distance routing problem. The aim is to improve the use of the resources in order to reduce the distance. In this way of transport are known three kinds of pure distribution strategies: many to many, the trips are full truckload or the time restrictions are very tight, so they are direct shipments; the second one is known as peddling, in this case, closed collecting nodes are grouped in a truck and carried to the delivery node, or a collect node is carried to several closed delivery nodes; the last one is hub&spoke, in this case the hub is used as a depot to reorganize the freight. Previous researches usually study these strategies independently and every order is allocated the same distribution strategy.

This paper shows the results about a long distance problem where the orders contain a collect and a delivery node, the distance between them is large (among 150km and 1500km); time windows must be satisfied and there are two hubs. It allows stopovers in direct shipments and in the links between the nodes and the hubs, but not among the hubs.

The results compare the pure distribution strategies with stopovers between them and with the mixed distribution strategy, where every order is not allocated the same distribution strategy.

In the case of mixed delivery system was developed a heuristic to make the choice of the distribution strategy for each order. Once all of them are allocated, a metaheuristic based on ant colony optimization algorithm was developed for the vehicle routing problem. The tests provide reliable performance results with a large set of randomly generated problem instances that prove that, in general a mixed distribution strategy returns improved results.

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