A Method for 1-M-1 Pickup and Delivery Problem with Robust Paths

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Abstract

1-M-1 Pickup and Delivery Problem (1-M-1 PDP) can be defined as pickup and delivery of materials between warehouse and customers. There are four kinds of solution models for 1-M-1 PDP in the literature. One of them is Hamiltonian solution model that allows simultaneously pickup and delivery at the same time. As the objective of this problem is minimizing total travel cost, routes should be designed by considering shortest paths without exceeding capacity of vehicles. However, especially in-plant logistics, some paths may not be available for vehicles due to the various reasons such as traffic congestion or temporarily blockage of a road. Therefore, paths to be used by vehicles should be determined dynamically based on the changing road conditions. Especially, if Autonomous Robots or AGVs are used in-plant logistics, the convenience of these roads is essential in terms of completing the tours. In this case, the shortest travel time is much more important than the shortest path. Hence, obtaining reliable path by considering the shortest travel time can be called robust path. In this study, a method is suggested to find robust paths for the 1-M-1 PDP using Simulated Annealing algorithm. Different test problems are generated to evaluate the performance of the proposed method. The computational results show that the proposed method is efficient to obtain robust paths for this problem. **Acknowledgement:** This work is supported by the Scientific and Technical Research Council of Turkey (TUBITAK), Contract-No 116E731, project-title: "Development of Autonomous Transport Vehicles and Human-Machine/Machine-Machine Interfaces for Smart Factories"

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