A bi-objective two-echelon vehicle routing problem with synchronization and customer-to-echelon assignment

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Abstract

Cargo bikes are an important means of transport in the city of the future. They are environmentally friendly, quiet and perfectly suited for deliveries in the inner-city. However, due to the lower loading capacity and operating distance, they are inefficient for longer distances, such as the ones from a depot on the outskirts to the final customers in the inner city. Therefore, an idea is to introduce transshipment points close to the inner city where goods are transferred between trucks and cargo bikes.
We study a two-echelon vehicle routing problem (2eVRP) with synchronization. In the classical 2eVRP, vehicle routing is performed on two echelons. At transshipment points, the so called satellites, loads are transferred from first echelon vehicles, which supply the satellites, to second echelon vehicles, which supply the final customers. In our problem, customers are not preassigned to the second echelon, and the decision of whether to visit a customer on the first or second echelon has to be taken.
In our bi-objective problem external (social and environmental) as well as economic costs are minimized. As solution method, we use a combination of exact and heuristic methods. Computational experiments on artificial and real world data will be presented.

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