The capacitated vehicle routing problem with sequence-based pallet loading and axle weight constraints

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Abstract

The capacitated vehicle routing problem with sequence-based pallet loading and axle weight constraints is an extension of the classical Capacitated Vehicle Routing Problem (CVRP). It integrates loading constraints in a routing problem and is based on a real-world transportation problem. The demand of the customers consists of pallets. These pallets may be placed in two horizontal rows inside the vehicle. Sequence-based loading is imposed which ensures that when arriving at a customer, no pallets belonging to customers served later on the route block the removal of the pallets of the current customer. Furthermore, the capacity of a truck is not only expressed in total weight and number of pallets but also consists of a maximum weight on the axles of the truck. Axle weight limits pose a challenge for transportation companies as they incur high fines in the event of non-compliance. Weigh-In-Motion (WIM) systems on highways monitor axle weight violations of trucks while driving which increase the chances that axle weight violations are detected. Furthermore, trucks with overloaded axles represent a threat for traffic safety and may cause serious damage to the road surface. In this presentation, an Iterated Local Search (ILS) methodology is proposed to tackle the problem on realistic-size instances with networks consisting of 50, 75 and 100 customers. The effects of integrating axle weight restrictions in a CVRP on total routing costs are analyzed by comparing the results with those of the CVRP without axle weight restrictions.

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