The Multi-period Multi-trip Containers Drayage Problem with Due and Release Dates

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Abstract

We introduce the *Multi-trip Multi-period Containers Drayage Problem with Due and Release Dates* (MM-CDP-DRD) aimed at routing a fleet of trucks, based at a common terminal, to serve all customers, minimizing the total distance. A trip starts/ends from/to the terminal, serving a sub-set of customers, each requiring either picking a container up or delivering a container. Moreover, according to the International Standards Organization, containers are of several sizes although 20ft and 40ft are more frequent. A truck can carry up to two 20ft containers or one 40ft container. The planning horizon is divided into periods in each one a truck can perform more than one trip until a maximum duration (T1) is not exceeded. Moreover, a truck cannot travel longer than T2 in two consecutive periods and T3 in the whole horizon. Due and Release Dates (DRDs) are associated with each customer, denoting, respectively, the first and the last period for service. Therefore, a feasible trip must respect capacity, duration and DRDs constraints while it is dominated if a shorter trip serving the same customers exists. We address MM-CDP-DRD by firstly generating all feasible non-dominated trips and then, solving a Trip-based Integer Linear Programming (T-ILP) model. We also design a Combinatorial Benders' Cuts method (CBC) where the T-ILP model is divided into a master that guarantees only the customers' coverage while the duration constraints are dropped and a slave that checks the solution feasibility regarding the dropped constraints. The results of CBC are compared with those of T-ILP model.

Keywords: Set Partitioning, Multi trip Vehicle Routing, Multi period Vehicle Routing, Combinatorial Benders' Cuts

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