Smooth Operations in Rugged Supply Chains - Balancing Operations for the Inventory Routing Problem

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Abstract

Many supply chains include fluctuating demand situations. For the resulting logistics operations, which are often modelled as an inventory routing (or vehicle routing) problem, this implies that a changing number of vehicles must be used throughout the planning horizon. This circumstance puts a stress on logistics and the resulting planning problems. Our work presents a solution approach to the inventory routing problem in the environment sketched above. With the aim of levelling the number of vehicles in use, we propose a novel solution encoding based on binary matrices, which encode detailed delivery decisions for each customer and timeframe. In order to produce feasible solutions in the optimization phase, an advanced decoder is introduced and studied, that corrects out-of-stock-situations, as well as customer and vehicle capacity violations. We closely investigate the effectiveness of this solution representation approach and monitor the effect of different solution construction techniques. Experiments on benchmark instances are conducted and a comparison to a lower bound, which we have found, is given.

Key words: Inventory routing problem, smooth operations, replenishment plan

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