A Mathematical Model to Solve Order Batching, Sequencing and Routing Problems in Warehouse Operation

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Abstract

Order picking is the most important part of warehouse operations that consumes about 55% of the total operation time of a warehouse. It has a substantial impact on supply chain efficiency too. An efficient order batching may considerably enhance the effectiveness of the order-picking process. In reality, customer orders must be accomplished within a specific due dates to prevent production or shipment delays. The consolidation of the customer orders into batches, the sequencing of batches, and the routing method to pick each batch have a substantial impact on whether or how frequently these due dates are violated. In this paper, a quadratic programming model is proposed to solve the order batching, sequencing and routing problems jointly. The objective is to minimize the total processing costs and tardiness penalty costs. The developed model is considered as an NP-hard problem. Therefore, as a solution methodology, a genetic algorithm (GA) based meta-heuristic is proposed to solve large scale problems. The effectiveness of the proposed heuristic is tested on randomly generated data sets. The output of the proposed GA approach generates promising results in reasonable amount of computational times.

Keywords
Order picking; Order batching; Greedy routing policy; Genetic algorithm (GA); Warehouse management.

Biographies

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