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Using a multiple-GA method to solve the batch picking problem: Considering travel distance and order due time. (English) Zbl 1154.90381

Int. J. Prod. Res. 46, No. 22, 6533-6555 (2008).

Summary: Warehousing involves all activities related to the movement of goods such as receiving, storage, order picking, accumulation, sorting and shipping within warehouses or distribution centres. Among these activities, order picking is the most costly process because its operations are labour-intensive and repetitive. In this paper, we propose a batch picking model that considers not only travel cost but also an earliness and tardiness penalty to fulfil the current complex and quick-response oriented environment. This model is solved using a multiple-GA method for generating optimal batch picking plans. The core of the multiple-GA method consists of the GA_BATCH and GA_TSP algorithms. The GA_BATCH algorithm finds the optimal batch picking plan by minimizing the sum of the travel cost and earliness and tardiness penalty. The GA_TSP algorithm searches for the most effective travel path for a batch by minimizing the travel distance. To exhibit the benefits of the proposed model a set of simulations and a sensitivity analysis are conducted using a number of datasets with different order characteristics and warehouse environments. The results from these experiments show that the proposed method outperforms benchmark models.

MSC:

90B30 Production models

Cited in 11 Documents

Keywords:

order picking; warehouse management; genetic algorithms; order due time

Full Text: [DOI](#)

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