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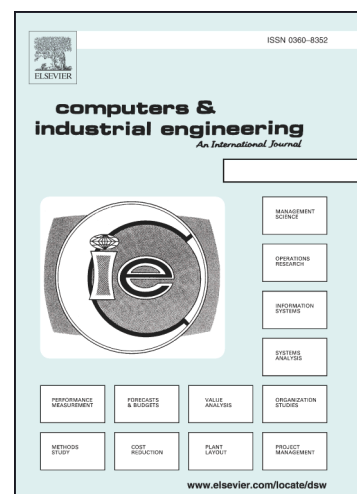
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Improved solutions for the freight consolidation and containerization problem using aggregation and symmetry breaking

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Abstract

We consider the freight consolidation and containerization problem, which consists of loading items into containers and then shipping these containers to different warehouses from where they are delivered to their final destinations. We show through computational experiments that very good solutions can be obtained by heuristically aggregating the items and then using MIP approaches to deal with the aggregated problem. We have been able to find a solution as good as the best known in the literature for 100% of the instances with small items, encountering strictly better solutions for 40.6% of them. Our approach found solutions as good as the best known in the literature for 88.9% of the instances with large items, obtaining strictly better in 59.4% of the cases.

Keywords: Logistics, Freight consolidation, Containerization, Integer programming, Heuristics.

1 Introduction

The management of containers is an important problem in global logistics networks. The freight consolidation and containerization problem (FCCP) deals with the loading of items into containers that are shipped to different possible locations, from where they are sent to their final destinations. It is assumed that third-party logistics providers will take care of the transportation. This problem was introduced in Qin et al. [11] in the context of the transportation of textile products for children.

Some important aspects to be considered in global logistics networks are the loading followed by the transportation of the containers. The complexity of the loading varies depending on the type of items transported. A simple type of containerization corresponds to the NP-hard bin packing problem [7], which consists in packing one-dimensional items into the minimum amount of bins. The more general multi-capacity one-dimensional bin packing

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