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A container packing support system for determining and visualizing container packing patterns

Chen-Fu Chien*,[1], Jing-Feng Deng

Department of Industrial Engineering and Engineering Management, National Tsing Hua University, 101 Section 2 Kuang Fu Road, Hsinchu 30043, Taiwan, ROC

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Abstract

Relatively few approaches have been developed to solve the container-packing problem despite its important industrial and commercial applications. This study constructs a container packing support system capable of incorporating the computational algorithm, graphic user interface (GUI) input/output interface, and a simulation program for illustrating the container packing process in steps. A numerical example is used to illustrate the proposed container packing support system. We use real data to compare the solutions derived by the proposed algorithm with those of a greedy algorithm and the original solutions of a local transportation company. The results demonstrate the effectiveness and practical viability of this approach.

Keywords: Container packing; Decision support system; Cutting and packing; Knapsack; Heuristics; Combinatorial optimization

1. Introduction

This paper describes the development of a computational procedure and container packing support system to determine and visualize the container packing pattern. Packing pooled shipment in containers is a complex procedure that heavily relies on workers' experience. It often takes several days to allocate the pooled goods into a number of containers and then pack the allocated goods into the containers. Occasionally, workers must unload some containers and then reload them in different patterns to pack more goods in the containers. Thus, a container packing support system capable of flexibly determining the container packing patterns is needed.

Container packing [2,10,11,17] and related problems, e.g., knapsack [12,13], cutting and packing [6,7], and pallet loading [16], have received considerable attention. Related studies attempt to effectively optimize the allocation of limited resources (e.g., space). Knapsack problems aim to pack a number of objects that have different profits into a knapsack with limited volume. Cutting and packing problems involve different dimensions, i.e., one-dimensional cutting [12], two-dimensional cutting [1,8], three-dimensional cutting [3,4], and others [5]. Related studies thoroughly examine one-dimensional cutting and two-dimensional cutting problems by extending their methods to higher dimensional cutting stock problems if possible. Among

* Corresponding author. Current address (good through Jan. 31, 2003): Department of Industrial Engineering and Operations Research, University of California-Berkeley, Berkeley, CA 94720, USA. Tel.: +1-510-5283574.
E-mail addresses: cfchien@ieor.berkeley.edu, cfchien@mx.nthu.edu.tw (C.-F. Chien).
[1] Tel.: +886-3-5742648; fax: +886-3-5722685.

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