Improved Layout for the Pallet Loading Problem using Mega-box representation

Deemah Aljuhani and Lazaros G. Papageorgiou
Centre for Process Systems Engineering, Department of Chemical Engineering
UCL (University College London), London WC1E 7JE, UK
deemah.aljuhani.16@ucl.ac.uk, l.papageorgiou@ucl.ac.uk

Abstract

This paper studies the Manufacturers pallet-loading problem (MPLP), which aims to load identical small boxes within a rectangle pallet by maximising the pallet utilisation percentage. In this work, we propose a novel mixed integer linear programming (MILP) model that generates layouts of an improved structure based on the Mega-box representation. Each mega-box simply groups boxes with the same orientation along the X and Y axis. Such approach aids real life operations when fast and less complex operations are essential to reduce the pallet loading time, which will also result into reduction of the overall supply chain cost. The proposed optimisation-based approach has been tested against available literature datasets with supported graphical layout structures. The computational and graphical layout results show the superiority of the proposed approach compared with existing Manufacturers pallet-loading problem layouts.

Keywords

Pallet packing; manufacturer's pallet loading problem, mathematical programming, mixed integer optimization

Biographies
Include author bio(s) of 200 words or less.

Deemah Aljuhani graduated from the University of Surrey, where she received her BSc in Electronic Engineering and her MSc degree in the field of Information and Process Systems Engineering in 2011. She joined University College of London in 2016 as a PhD/MPhil student in the department of Chemical Engineering under the supervision of Prof. Lazaros Papageorgiou and Dr. Vivek Dua. Her research focuses on Supply Chain Optimization, Linear and Mixed Integer Programming using various optimization tools.

Prof Lazaros Papageorgiou received his Diploma in Chemical Engineering from the National Technical University of Athens in 1990 and his PhD in Chemical Engineering from Imperial College London in 1994. He was employed as an adjunct Assistant Professor in the Department of Production Engineering and Management at the Technical University of Crete during 1996-1997 and as Research Associate at the Centre for Process Systems Engineering at Imperial College London for the periods of 1994-1995 and 1997-1998. Professor Papageorgiou joined the Department of Chemical Engineering at UCL in 1998.

Prof Parageorgiou's research interests lie in the area of process systems engineering. His work places particular emphasis on the development of innovative modelling, optimisation methodologies and computational tools with applications spanning the areas of supply chain management, production planning and scheduling, process plant layout, energy and water systems, biological/biochemical systems and data mining. He is the author of over 250 articles in international journals and refereed conference proceedings. He is the co-editor of two volumes on supply chain optimisation of the Wiley-VCH "Process Systems Engineering" book series. He received the 2012 IChemE Hutchinson medal for a research paper on global supply chain planning for pharmaceuticals and also received the ENERGY 2011 (IARIA) best papers award.