Solution Approaches for the Berth Allocation Problem in Container Terminal Logistics – A Review

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ABSTRACT

Container Terminal (CT) Logistics is one of the important elements of any country's economy as it affects distribution efficiency, interest rates, productivity, energy costs and energy availability. For reaping profits, CT optimize various decisions related to the allocation of berth to vessel, choice of material handling equipment, scheduling of quay cranes, scheduling of stacking cranes, scheduling of AGVs, traffic control of AGVs and determination of stack capacity, personnel management, etc. Amongst all decision problems in CT, berth allocation problem (BAP) is the very first decision to be taken which serves as an input to various other management decisions at the CT, as optimal scheduling of berth will improve satisfaction among shipping companies and enhance the performance of CTs and in turn will help in generating higher profits for them. There is a large body of research studies available related to BAP. The objective of this study is to conduct a detailed review of formulation of BAP model and solution approaches addressed for BAP for helping new researchers, particularly for understanding the various modelling and solution methodologies presented so far in the literature, working in the area of BAP. Accordingly, a detailed review was conducted based on scientific journals, conference papers, dissertations, working papers etc. Based on all possible descriptors to identify research papers on BAP, we identified research papers published between 1992 and 2019. We classified these literatures based on BAP-configuration wise studies proposing various mathematical modelling, exact methods, simple constructive heuristic approaches, and metaheuristic approaches. Finally, we acknowledge that the review presented in this study cannot be claimed to be exhaustive, but the output of this study does provide reasonable insights into the state-of-the-art on solution approaches to BAP research. Further, it is hoped that, the output of this focused review will provide a source of reference for any new researchers/readers in identifying or developing newness in terms of problem configuration, solution methodologies, and objective(s) of BAP being proposed and help simulate further interest.

Keywords

Container Terminal Logistics, Berth Allocation Problem, Mathematical Model, Heuristic Approach, Meta Heuristics.

Biographies

Dr. M. Mathirajan obtained his Ph.D. in Operations Management and M.S. (engineering) degree by research in Applied Operations Research from Indian Institute of Science (IISc), Bangalore. He also received M.Sc. degree in Mathematics from Madurai Kamaraj University and Postgraduate Diploma in Operations Research from College of Engineering, Guindy, He has been working as faculty of IISc Bangalore since 1986 and is serving as a Chief Research Scientist since the year 2013. His areas of interest include Mathematical/Heuristic Optimization and Research Methods for Operations and Supply Chain Management, Sequencing and Scheduling, Personnel Scheduling, Routing and Scheduling of Logistics, Urban Road Transport, and Container Terminal Logistics problems. His Ph.D. thesis was adjudged the Best thesis and was awarded the prestigious M.N. Gopalan Award of 2002 at the annual convention of the ORSI. He has more than 50 publications in journals of international and national repute. He has published two books and five edited books/proceedings as co-authors. He is a recipient of Singapore-MIT Alliance (SMA) Research Fellowship of Nanyang Technological University (NTU), Singapore. He has been a Visiting Professor at NTU, Singapore and Sultan Qaboos University, Oman-Muscat.

Ms. Ankita is pursuing integrated PhD in Department of Management Studies at Indian Institute of Science, Bangalore, after completing BE mechanical. Her research interest focuses on Container Terminal (CT) Logistics in general, particularly on operational decisions in Container Terminals. Her on-going research is focused on development of a new and efficient methodology for BAP of CT Logistics.