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WORKING PAPER

An enriched model for the integrated berth allocation and quay crane assignment problem

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ABSTRACT

Given the increasing pressure to improve the efficiency of container terminals, a lot of research efforts have been devoted to optimizing container terminal operations. Most papers deal with either the Berth Allocation Problem (BAP) or the (Quay) Crane Assignment Problem (CAP). In the literature, handling times are often simplified to be berth dependent or proportional to vessel size to ignore the CAP when scheduling vessels. This is unsatisfactory for real-life applications because the handling time primarily depends on the number of containers to be handled and the number of cranes deployed. Only a limited number of papers deal with the combination of berth allocation and crane assignment. In these papers however, authors often have resorted to algorithmic simplifications that limit the practical use of the models. This paper presents an integrated BAP-CAP model taking into account vessel priorities, preferred berthing locations and handling time considerations. The proposed MILP model is validated on real-life data illustrating the potential to support operational and tactical decision-making.

KEYWORDS: container terminal; berth allocation; quay cranes; mathematical modelling