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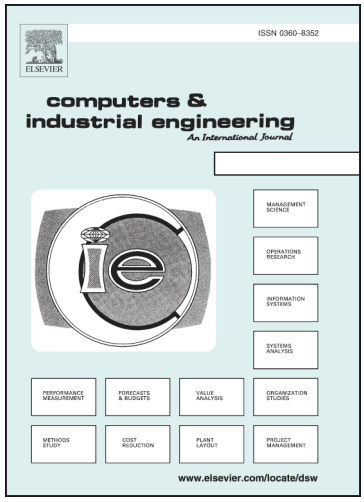

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An Integrated Decision Support System for Berth and Ship Unloader Allocation in Bulk Material Handling port

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Abstract

Berth allocation and material handling problems in ports are generally solved independently. This article provides a framework for aligning allocation decisions of berth and ship un-loader in an integrative manner. The ultimate goal of these decisions is to minimize the waiting time, operating time and ships priority deviation. As the sojourn time of a ship in port is costly, and given the scale and the complexity of the problem, a Decision Support System (DSS) is developed for the port authority. Two different approaches have been considered in this paper: 1) Solving the problem sequentially by decomposing the problem into two sub-problems- the berth allocation and the dynamic allocation of ship un-loaders in different berths 2) solving the problem by integrating berth allocation and dynamic allocation problem. Controlled Elitist Non - dominated Sorting Genetic Algorithm and Chemical Reaction Optimization are proposed in designing the DSS. Computational experiments are conducted on information provided from an Indian port. Results show that integrating berth and ship un-loader allocation achieves significant cost savings by considerably reducing the ship sojourn time in port.

Keywords: Ship Sequencing; Berth allocation; Ship-unloader allocation; Bulk material handling terminal port; Meta-heuristic.

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