

OPTIMIZATION OF PARALLEL SHIP BLOCK ASSEMBLY WITH FLEXIBLE RESOURCE ALLOCATION

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Abstract

The shipbuilding industry involves complex assembly processes where multiple subassemblies must be scheduled and integrated into larger blocks under strict precedence constraints. These activities are executed in parallel across constrained workspaces, making efficient scheduling critical to meeting deadlines and avoiding substantial penalty costs.

In this work, we study a block assembly scheduling problem with cost-based resource augmentation. Workstations operate with baseline resource capacities but may utilize additional resources at an extra cost to alleviate bottlenecks and prevent delays.

We develop both a Mixed-Integer Linear Programming (MILP) formulation and a Constraint Programming (CP) model to address this problem. Computational experiments are conducted under various scenarios to evaluate the performance of both approaches. The results provide a comparative analysis in terms of solution quality and computational efficiency, highlighting the trade-offs between modeling paradigms for this class of scheduling problems.