

Improving efficiency in Container Terminals through Coordinated Truck Scheduling: a Heuristic-based Approach

Maritime trade has been continuously growing in the last decades, increasing the pressure on container terminals and intensifying needs for more effective management systems. Inefficiency arises on the land-side operations with the increasing number of truck arrivals for the collection and delivery of containers. The highly stochastic nature of truck arrivals leads to an unbalanced workload distribution and inconsistent resource utilization, heavily impacting congestion and overall operational efficiency.

Conventional appointment systems still prioritize carrier requests without considering terminal constraints, resulting in a suboptimal truck scheduling performance.

To tackle these challenges, a heuristic-based optimization model was developed in this work, to improve the scheduling of container pickups. The model integrates the truck appointment preferences with terminal-related data such as container yard locations, terminal layout, and resources availability. To minimize operating time, the model addresses two core decisions –the assignment of containers to time-windows and the truck pickups sequencing within each time-window.

By dynamically reallocating containers within the yard, aiming to minimize relocations and handling times, the heuristic seeks to balance resource utilization and carrier preferences. Preliminary results show the proposed approach reduces operational time, decreases truck waiting times, and enhances terminal throughput, thus contributing to more sustainable and efficient port operations.

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