A SOLUTION FOR STORAGE SPACE ALLOCATION PROBLEM IN CONTAINER TERMINALS

Kathaluwa Liyana Kankanamge Suranga Deshapriya

168216L

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Department of Computer Science and Engineering

University of Moratuwa

Sri Lanka

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DECLARATION

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Name: Dr. Indika Perera

ABSTRACT

Container terminal operations at a container port form an important part of worldwide goods trade. These facilities/operations are usually involved with expensive and limited resources and must, therefore, be planned carefully to ensure effective usage of the limited resources. The main roles of a container terminal are the transfer of inbound and outbound containers as well as their storage within the container yard of the container terminal.

Focusing more on inbound containers, we study the container storage space allocation problem, being one of the major problems in container terminals, and presents a solution with an implementation of a Genetic algorithm. In our solution, we aim to minimize the number of containers that have to be re-handled both when a container is fetched from vessel in order to store in the terminal and when a container is to be dispatched to a customer from the container terminal. In addition, the total Yard crane movements across the bays are aimed to be minimized. We take into account also the different container types such as Regular, Open Top and Reefer containers, which require special storage space allocations. Furthermore, we adapt our solution such that it can provision for the changes in the environment and configurations, etc. with minimal code changes.

For the evaluation of our work, it was compared against both the standard LIFO approach as well as the Optimized LIFO approach, which is an optimization of the manual process used. For this, results of 50 sample shipments were evaluated against these two approaches and the results indicated that Optimized LIFO produced better results than the LIFO approach and that both the LIFO and the Optimized LIFO produced better results than the results of GA's initial generations. But with the generations to pass by, GA results got improved and went past the fitness of LIFO and Optimized LIFO results, even though the rate of improvements declined. Thus, for all 50 samples, the results of our solution could go past the results of LIFO and Optimized LIFO approach, within an average of 21.32 generations.

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LIST OF ABBREVIATIONS

Abbreviation	Description
CT	Container Terminal
CY	Container Yard
YC	Yard Crane
QC	Quay Crane
GA	Genetic algorithm
SSAP	Storage space allocation problem
HS	Harmony Search
B&B	Branch-and-Bound
TEU	Twenty-Foot Equivalent Unit