

Summary

Over the last decades increasing economic growth and wealth are causing a significant increase in freight transportation across the world. Most of the transportation of consumer goods is realized by shipping it in standardized containers across different modes of transportation. Maritime container terminals are critical elements in the total freight transportation chain and an improvement of the performance of these terminals is desired to decrease total transportation time and satisfy customer needs. Therefore many studies have been performed to realize an improvement of these terminals. In the last ten years a trend toward a more integrated approach of modeling a container terminal can be recognized. These integrated approaches try to incorporate the influence of the performance of one mode onto another mode of transportation.

For this report we performed a literature study and found sixteen papers which propose an integrated approach for modeling and controlling a maritime container terminal. These papers are discussed and classified with the intention to improve the quality of future studies on the integrated modeling of a maritime container terminal. The chosen classification structure resulted in a comparison of various characteristics of the models such as the sort of integrated approach, the level of operation, the modes of transportation, the system under consideration, the control method and control goals and the validation performed with the model. Especially the difference between system and the control method of the discussed papers is discussed in detail because that distinction makes it easier to propose combinations of the best characteristics of various models.

After comparing these sixteen papers general conclusions are made. First, a large variety of different modes of transportation in the discussed papers can be observed. Furthermore the level of detail in which the system of a container terminal is described varies significantly. Also the method for controlling a container terminal is different per paper. Some papers consider automated controllers which perform actions according to a certain optimization algorithm whereas other papers consider a human controller. Furthermore a variety of different control goals can be observed, although most of the discussed papers agree on the importance of minimization of the ship turnaround time. Finally, the validation performed on the proposed integrated approached is, generally speaking, limited.

It is proposed to include in future research a study of a combination of the best characteristics of various models. In this report three possible combinations are proposed and shortly discussed. Furthermore it is proposed to investigate modeling of a larger part of the freight transportation chain in order to obtain improvements. Also the focus should be more on future societal developments such as an increasing awareness for environmental and safety issues, which may have an influence on the characteristics of future maritime container terminals. Finally also the possibility of a combination of non-integrated approaches with integrated approached for modeling a container terminal should be investigated.