System Design of Large-Scale Port Transportation System Using Multiple Automated Guided Vehicles (AGVs)
(Prof. J. Ota)

The explosive growth in recent years in the volume of freight has resulted in heavier workloads at seaports. In this regard, there are several investigations that have attempted to realization of automation of the container transportation system. For this issue, we have considered machines for loading/unloading/transportation/storage as the multi-robot that have intelligence, then, dealt with the system as AGV transportation system in an automated container terminal (ACT) in Fig. 1.

We need to consider the following problems to construct the AGV transportation system: (I) optimal design of the AGV transportation system, (II) evaluation of the system characteristic, (III) highly management of the AGV transportation system. The problem (I) represents how to design the parameters such as the number of inputting robots and layout. We have proposed a hybrid design methodology with the use of the queuing network theory and simulation as shown in Fig. 2. As for the problem (II), a careful evaluation of the performance based on the system characteristic is needed if there are some considerable systems. The result has shown that the horizontal-type system is more cost-effective. For the problem (III), we have proposed a management methodology using heterogeneous multi-robot behavioral designing, container storage scheduling, and container transportation planning. Finally, it has noticed that the system constructed with the use of the proposed management methodology can be designed effectively than the system that is constructed with the use of the conventional management methodology.

Keywords: Multi-Robot, AGV, Transportation System, Optimal Design, System Management

References

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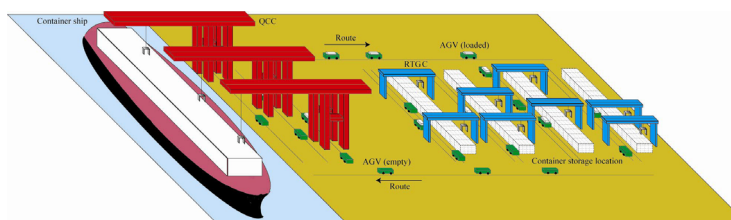
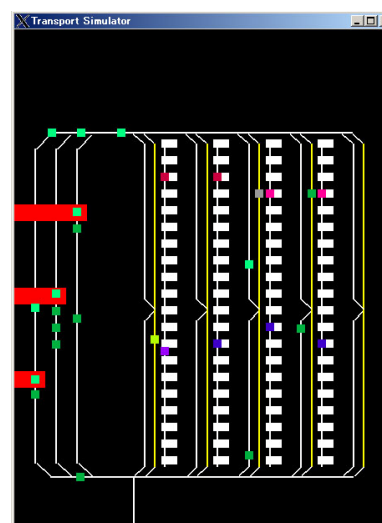Fig. 1   The Horizontal AGV Transportation System

in Automated Container Terminal

Fig. 2   The Modeled AGV Transportation System