입출고 위치가 상이한 회전형 자동창고 시스템의 수행도분석

Travel Time Models for Carousel System with Input and Output at Opposite Sides in the System

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Extended Abstract

Carousels have been widely used in industries for many years due to the advantages of high efficiency and low cost. There are many variations in carousels as the technology and material flow systems evolve. This study is motivated by a carousel system of an IBM assembly plant which is used for the storage and retrieval of work-in-process and parts for the manufacture of printed wire circuit board. The system we consider consists of two storage and retrieval robots and *N* number of carousels with one level in storage rack which can rotate in both directions. One robot is dedicated to storage and the other to retrieval, and Input and Output(I/O) points are at the opposite sides of the system. A cycle is defined as a sequence of operations, beginning with the both robots at the I/O points, ending with the two robots at the same points. Assuming that one storage and one retrieval order are performed during a cycle, this study intends to find the expected value of cycle time. Three types of operations can occur during a cycle : i) the rack openings associated with the storage and retrieval orders are in a same carousel, and the storage operation precedes the retrieval operation, ii) the same as the first type except that the storage operation is performed after the retrieval operation, iii) the locations of the two rack openings are not in a same carousel. For the first two types of operations, the carousel serves the orders sequentially, while in the third type, twoAssuming a continuous approximation to the discrete rack face, we derive analytically the expected cycle time model to estimate the throughput of the system. To examine the validity of the model, a simulation study is performed and the results obtained from discrete racks are compared with those from the model. The results in this paper could be directly adopted for the economic problem design of a similar carousel system. the third type, two orders can be carried out simultaneously, which results in no waiting time for the order service. Assuming a continuous approximation to the discrete rack face, we derive analytically the expected cycle time to estimate the throughput of the system. To examine the validity of the models, a simulation study is performed and the results obtained from discrete racks are compared with those from the models. The results in this paper could be utilized as a guideline for the economic design of a similar carousel system.

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