감· 가속을 고려한 회전형 자동창고 시스템의 성능분석

The impacts of acceleration/deceleration on travel time models for carousel system

Hark Hwang*, Young-keun Song* and Kap-hwan Kim**

*Department of Industrial Engineering
Korea Advanced Institute of Science and Technology,
373-1 Kusong-dong Yusong-gu, Taejon 305-701, KOREA
Tel: (82-42) 869-3153
Fax: (82-42) 869-3110
E-mail:hhwang@mail.kaist.ac.kr

** Department of Industrial Engineering
Pusan national Univ,
Jangjeon2-dong Kumjung-gu, Pusan 609-735, KOREA

Extended Abstract

Carousel systems have become popular on account of their efficiency and relatively low cost. It is expected that the demand for automated carousels will be increasing due to its capability to handle small-sized parts often found in electronic and pharmaceutical industries. The installation costs of these automated warehouse systems are usually very expensive. Thus accurate estimation of the throughput rate and high utilization of the systems, once installed, become key issues since they are closely related to design and operation of the systems. In this regard, many research papers appeared in the literature relating to its control and performance. All these previous studies assumed the average uniform velocity, ignoring the operating characteristics of carousel body movement such as the acceleration/deceleration rate and the maximum velocity. Consequently, the optimal design and schedule based on the existing models is far from optimum from the practical point of view. Assuming a continuous approximation to the discrete rack face, this paper develops analytically two kinds of travel time models integrating the fore-mentioned operating characteristics of carousel body movement. The first model deals with the situation where the maximum rotating speed of the carousel body is unlimited. In this case, the relationship of travel distance and travel time is used to approximate the speed profile. The second model assumes a finite maximum rotating speed and considers two types of velocity - rotating time relationships. With randomized assignment policy, the expected travel times are determined for both single and dual command cycles. The models developed are examined through discrete evaluation procedures.

<Acknowledgments>

This work was supported by grant No. (1999-1-315-001-3) from the interdisciplinary research program of the KOSEF.