Optimal Dwell Point Policies for Automated Storage/Retrieval Systems with Dedicated Storage

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Abstract

This study is to develop an optimal dwell point policy for automated storage/retrieval systems. A dwell point is an idling location of a storage/retrieval (S/R) machine when it becomes idle. Bozer and White (1984) raised the problem of determining the dwell point for automated storage/retrieval systems. Egbelu (1991) developed linear programming models which can dynamically determine the dwell point. Egbelu and Wu (1993) compared various dwell point policies by utilizing computer simulation and showed that the dwell point policy can have a significant impact on the job sojourn time.

In this study, we determine the optimal dwell point in closed form for square-in-time racks with dedicated storage. The optimal dwell point is determined in terms of the skewness parameter of the pallet turnover distribution and the probability of the incoming transaction request type: storage or retrieval. We also confirm the intuitive result that the input point is a good alternative dwell point for dedicated storage.

Our approach can be said to be "static" in that we assume a pre-determined pallet turnover distribution. However, with this approach, we can be relieved from a little laborious and time-consuming work, i.e., identifying candidate pallets for retrieval and inputing the data to the control system, which were assumed in Egbelu (1991). The optimal dwell point policy developed in this study can respond to changes in the incoming transaction request type, thus applicable even in short-term "dynamic" environments.

References

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