Travel distance estimation of relation-based storage assignment policies in picker-to-part warehouses

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ABSTRACT

Relation-Based Storage Assignment (RBSA), also called the "family grouping method," has garnered significant interest among researchers and practitioners looking for an intuitive means by which to arrange related Stock Keeping Units (SKUs) in nearby regions for simultaneous picking. However, there is no analytic model for picking distance estimation for RBSA. Most of the related studies have targeted specific cases and applied simulation or mathematical programming to validate the family grouping method's superiority over traditional storage assignment methods including the random assignment policy. To explore the effects of RBSA, this current study develops a preliminary analytical model of travel distance estimation for low-level, picker-to-part, and pick-by-order warehouses. We use Frequency-Based Storage Assignment (FBSA) as a baseline for comparison. We consider both single-aisle warehouse layouts and two-block, multi-aisle warehouse layouts, with return and traversal picking policies. The skewed ABC distribution curve of SKUs, the number of picks (N) per picking tour, the number of SKUs (n1) in a family, and the number of families (n2) are also taken into account. Our results show that, in comparison with the FBSA method, the RBSA method decreases the picking distance by as much as 32%.

Keywords:

Logistics, Order picking, Warehouse management, Storage assignment policy.