An Integrated Network Modeling Framework for Analysis of Multi-line Order Pick Systems

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Questions for technology selection:
• Which system is better for multi-line orders?
• How do we analyze performance?
• Are existing analytical models sufficient?

Existing models are typically isolated, Analyze only upstream storage system

UPSTREAM SYSTEM

Input and output buffer of the storage system
Returning tote
Input and output buffer of the picking station
Active orders

Downstream: Inspiration from Assembly Synchronization Networks

External Arrival of Customer Orders

ASUS ZenFone 4 Pro
Qualcomm Snapdragon 835 Processor
Asus Zenfone Ares

Full Model

Preliminary Insights

For fewer aisles and higher order arrival rates, SBS/RS outperforms AS/RS (in terms of throughput time)
For most combinations of number of aisles and order arrival rates, AS/RS outperforms SBS/RS (in terms of throughput time)

Future Work and Reference

Perform numerical experiments for large number of line items per order
Study the effect of item commonalities among order profiles
Develop a solution method for handling order line synchronizations with item commonalities
Understand the effect of order batch size on system performance

Reference:
E. Tippie, D. Roy, M. Melacini, and R. De Koster, “Integrated storage order picking systems: technology, performance models, and design insights,” unpublished

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