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## Optimization of Warehouse Storage Assignment Using Community Detection and Integer Programming

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**Abstract:** This paper presents a community detection and integer programming approach to analyze and optimize warehouse storage assignment for order picking operations. Storage assignment is a key warehouse management function that greatly affects the overall order picking productivity. An inefficient storage configuration leads to a higher frequency of traffic congestion and less effective routing decisions; therefore, the optimization of items location becomes critical. However, storage assignment optimization is challenging because it requires the analysis of large amount of data. To analyze this data efficiently, networks community detection is used to extract the association relationships between items. These relationships are then utilized in an integer programming model to determine the optimal inventory locations. Experiments conducted using simulation indicate that the proposed approach provides a storage configuration that reduces congestion by 60% while maintaining similar total order picker travel time.

*Keywords:* Supply Chain, Order Picking, Optimization