A Metaheuristic Approach for Optimizing Perishable Goods Distribution

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Abstract : Maintaining the freshness and quality of perishable goods during distribution is a critical challenge for logistics companies. This study presents a comprehensive framework aimed at optimizing the distribution of perishable goods through a mathematical model of the Transportation Inventory Location Routing Problem (TILRP). The model incorporates the impact of product age on customer demand, addressing the complexities associated with inventory management and routing. To tackle this problem, we develop both simple and hybrid metaheuristic algorithms designed for small- and medium-scale scenarios. The hybrid algorithm combines Biogeographical Based Optimization (BBO) algorithms with local search techniques to enhance performance in small- and medium-scale scenarios, extending our approach to larger-scale challenges. Through extensive numerical simulations and sensitivity analyses across various scenarios, the performance of the proposed algorithms is evaluated, assessing their effectiveness in achieving optimal solutions. The results demonstrate that our algorithms significantly enhance distribution efficiency, offering valuable insights for logistics companies striving to improve their perishable goods supply chains.