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A Comprehensive Review: Enhance Logistics Performance by Optimizing Supply Chain Routes with Dynamic Factors using Genetic Algorithm

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Abstract

As supply chain networks become increasingly complex, optimizing logistics is critical for industries to maintain competitiveness and adapt to dynamic market demands. Traditional route optimization methods often struggle to address real-time variables such as traffic congestion, unpredictable weather, and evolving customer requirements, resulting in inefficiencies. This study investigates the potential of Genetic Algorithm (GA) as a robust solution for multi-objective route optimization. A thematic literature review was conducted, to evaluate existing algorithms and identify their limitations in managing dynamic, multi-factor logistics environments. The findings highlight that Genetic Algorithms excel in integrating real-time data, enabling more efficient and adaptable delivery route optimization. Real-world applications across various industries demonstrate notable reductions in delivery times, improved resource utilization, and enhanced customer satisfaction. This study underscores the scalability and intelligence of GA as a solution to modern logistics challenges, providing valuable insights for advancing supply chain management practices. The implications suggest that GA offers a transformative approach to addressing inefficiencies in complex logistics networks and improving overall operational performance.

Keywords: *Supply chain management, Route optimization, Genetic algorithm, Real-time logistics, Dynamic factors*