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# An improved discrete particle swarm optimization approach for a multi-objective optimization model of an urban logistics distribution network considering traffic congestion

**Li, K.**[a], **Li, D.**[a,*], **Ma, H.Q.**[b]

[a]School of Business Administration, Shanghai Lixin University of Accounting and Finance, Shanghai, P.R. China
[b]Human Resources Department, Shanghai Institute of Visual Arts, Shanghai, P.R. China

**ABSTRACT**

To optimize urban logistics networks, this paper proposes a multi-objective optimization model for urban logistics distribution networks (ULDN). The model optimizes vehicle usage costs, transportation costs, penalty costs for failing to meet time windows, and carbon emission costs, while also considering the impact of urban road traffic congestion on total costs. To solve the model, a DPSO (Discrete Particle Swarm Optimization) algorithm based on the basic principle of PSO (Particle Swarm Optimization) is proposed. The DPSO introduces multiple populations to handle multiple targets and uses a variable neighbourhood search strategy to improve the search ability of particles, which helps to improve the local search ability of the algorithm. Simulation results demonstrate the effectiveness of the proposed model in avoiding traffic congestion, reducing carbon emissions costs, and time penalty costs. The optimization comparison results between DPSO and PSO also verify the superiority of the DPSO algorithm. The proposed model can be applied to real-world urban logistics networks to improve their efficiency, reduce costs, and minimize environmental impact.

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**Corresponding author:*
gslidan@lixin.edu.cn
(Li, D.)

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