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The spatial coupling effect between urban street network's centrality and collection & delivery points: A spatial design network analysis-based study

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Abstract

The sustainable development of collection and delivery points and urban street network is an important consideration of logistic planners. Urban street networks have a significant impact on collection and delivery points' location, but the spatial relationship between the centrality of urban street network and collection and delivery points has not been studied using spatial design network analysis. In a multiple centrality assessment model, we used point of interest and street network data to evaluate the location of two types of collection and delivery points and the centrality of streets in Nanjing city, based on four indicators: closeness, betweenness, severance, and efficiency. Then, kernel density estimation and spatial autocorrelation are used to study spatial patterns of distribution and centrality coupling effects of urban street network and collection and delivery points. The results show that the centrality of Nanjing streets has a big influence on the location of the collection and delivery points, and the directions of different types of centrality also vary. The location of the Cainiao Stations are largely related to closeness, followed by betweenness, severance, and efficiency. China Post Stations and street centrality have a weak correlation between efficiency and severance, but no correlation between closeness and betweenness. Our results can help logistics enterprises and urban planners to develop collection and delivery points' network based on the urban street network.

1. Introduction

With the rapid development of information technology and e-commerce, the internet economy has become a new force in China's economic development. Online trading is driving the rapid development of the offline logistics industry, which also makes the "last mile" distribution issue [1, 2]. In order to solve this problem, logistic enterprises created collection and