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Spatial modeling of bicycle activity at signalized intersections

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Abstract

This paper presents a methodology to investigate the link between bicycle activity and built environment, road and transit network characteristics, and bicycle facilities while also accounting for spatial autocorrelation between intersections. The methodology includes the normalization of manual cyclist counts to average seasonal daily volumes (ASDV), taking into account temporal variations and using hourly, daily, and monthly expansion factors obtained from automatic bicycle count data. To correct for weather conditions, two approaches were used. In the first approach, a relative weather ridership model was generated using the automatic bicycle count and weather data. In the second approach, weather variables were introduced directly into the model. For each approach, the effects of built environment, road and transit characteristics, and bicycle facilities on cyclist volumes were determined. It was found that employment, schools, metro stations, bus stops, parks, land mix, mean income, bicycle facility type (bicycle lanes and cycle tracks), length of bicycle facilities, average street length, and presence of parking entrances were associated with bicycle activity. From these, it was found that the main factors associated with bicycle activity were land-use mix, cycle track presence, and employment density. For instance, intersections with cycle tracks have on average 61 percent more cyclists than intersections without. An increase of 10 percent in land-use mix or employment density would cause an increase of 8 percent or 5.3 percent, respectively, in bicycle flows. The methods and results proposed in this research are helpful for planning bicycle facilities and analyzing cyclist safety. Limitations and future work are discussed at the end of this paper.

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