

Interaction between Space Syntax and Agent-Based Approaches for Vehicle Volume Modelling

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Abstract : Modelling and understanding vehicle volume distribution over the urban network are essential for urban design and transport planning. The space syntax approach was widely applied as the main conceptual and methodological framework for contemporary vehicle volume models with the help of the statistical method of multiple regression analysis (MRA). However, the MRA model with space syntax variables shows a limitation in vehicle volume predicting in accounting for the crossed effect of the urban configurational characters and socio-economic factors. The aim of this paper is to construct models by interacting with the combined impact of the street network structure and socio-economic factors. In this paper, we present a multilevel linear (ML) and an agent-based (AB) vehicle volume model at an urban scale interacting with space syntax theoretical framework. The ML model allowed random effects of urban configurational characteristics in different urban contexts. And the AB model was developed with the incorporation of transformed space syntax components of the MRA models into the agents' spatial behaviour. Three models were implemented in the same urban environment. The ML model exhibit superiority over the original MRA model in identifying the relative impacts of the configurational characters and macro-scale socio-economic factors that shape vehicle movement distribution over the city. Compared with the ML model, the suggested AB model represented the ability to estimate vehicle volume in the urban network considering the combined effects of configurational characters and land-use patterns at the street segment level.

Keywords : space syntax, vehicle volume modeling, multilevel model, agent-based model

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