FEEDBACK ANALYSIS OF INTERACTION BETWEEN URBAN DENSITIES AND TRAVEL MODE SPLIT

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Abstract
A feedback simulation model based on radial basis function neural networks is newly developed in this research to analyse the interaction between urban densities and travel mode split. The changes of populations, road mileages, travel mode split, and so on of the enlarging urbanized areas of different cities in China are studied for the trainings of the radial basis function neural networks constituting the proposed feedback model. Furthermore, the effect of different development policies for Beijing on distinct indicators of the urban density and trip shares of various travel modes is also evaluated by the newly developed model. It is found that stopping the quick urban sprawl of Beijing is the most important for the sustainable development of its urban transport. It is confirmed that the newly developed model is able to rationally explain the interactive correlation between urban densities and travel mode split of a city for its different development plans.
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Key Words: Urban Densities, Travel Mode Split, Radial Basis Function Neural Network, Feedback Simulation Modelling, Sustainable Urban Transport Development

1. INTRODUCTION
In the past decades, many cities especially in developing countries have experienced dramatic changes in both land use and transport [1, 2] which have been recognized to actively interact with each other [3-5], mainly owing to the power of urban economy [6]. The interaction between the systems of land use and transport is a dynamic process which involves changes over spatial and temporal dimensions between these two systems [7]. Understanding the interaction between land use and transport is critical for the urban and transport planning, especially in the case of a rapidly growing city with its quick urban motorization [8]. Till now, many efforts have been successively made to analyse the impacts of a wide range of factors on mediating the relationship between urban land use and transport, including settlement size, mix of land use, transport accessibility and so forth [9-14]. It has been proved that land use change can modify travel patterns to induce more changes in urban transport systems and, on the other hand, transport system evolution is able to create new accessibility levels that encourage changes in land use [10]. This interactive relationship is also referred to as the “land use transport feedback cycle” which can be described through some variables regarding geographical features and activity locations, demographic and economic characteristics, transport variables, and characteristics of urban mobility demands [7]. Different approaches and techniques such as cellular automata, structural equation modelling and geographic information systems have been applied to try to explain the nature of this feedback cycle in theory [8, 10, 11].

Though valuable research findings are continually obtained, debates about urban form sustainability have always been increasing, focusing on shapes, sizes, densities, energy consumption and so on of cities, their correlations with travel patterns and the solutions for challenging urban sprawl and decentralization [15-20]. The urban land use characteristics of a city, such as the urban densities of its population, roads, etc., which are closely associated


