ACTIVITY-BAED TRAVEL DEMAND MODELING SYSTEM IN SUBURBAN AREA

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Abstract

Transportation problems such as congestion and air pollution are attracting more attention than ever. Transportation strategies such as congestion pricing and construction of infrastructure have been adopted to alleviate the problems. However, these strategies all involve great cost. Therefore, accurate forecasting of the response of travel demand to changes in the transportation system is required in planning and evaluating future transportation strategy. The present research sought to develop a comprehensive activity-based travel demand modeling system in order to make travel demand forecasting more accurate and realistic as well as easy to use. The modeling system comprises four sequential steps: lifestyle basis of activity decisions, activity generation, destination and mode choice, and departure time choice.

Numerous attempts have been made, especially in the last ten years, to model decision processes more realistically in formulating activity-travel patterns. Many of these approaches are very complex and there is always the issue of trade-offs between behavioral realism and complexity. Due to the potential heterogeneous responses to transportation policy and land-use planning and the diverse lifestyles of a population, it is often advantageous to first divide individuals of a study area into several lifestyle clusters before the development of separate activity-based travel demand models. By doing so, the complexity of the models can be greatly reduced and, at the same time, the activity and travel patterns can be implicitly considered.

There has been considerable research conducted over the last 20 years focused on trip/activity generation. The statistical models commonly applied are of two main types. One is discrete choice models and the other is count data models. There is little discussion in the literature comparing different statistical modeling approaches or identifying which statistical models are most appropriate for modeling trip/activity generation data. The current dissertation compares the two model systems to identify which one can give a more realistic representation of the patterns of activities performed by suburban residents.

Once an individual has decided on his/her activity type, choosing a suitable destination and transportation mode follows. People are assumed to select a destination first and then choose a particular transportation mode to the destination. In the current dissertation, the destination choice and mode choice given the destination are modeled by using a generalized logit model and a binary logit model separately. Finally, a Bayesian theorem is used to develop an activity-based travel demand model that incorporates the interrelationship between activity-type, destination and mode choices.

Departure time is the next decision. The current study formulates and applies a random-coefficients Cox hazard model to analyze departure time choice for non-workers in the context of daily activity schedules. The model recognizes the presence of unobserved heterogeneity affecting departure time decisions by means of random-coefficients.

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