0-6210: Adding Tour-Based Modeling to TxDOT's Travel Modeling Framework

Background

The Texas Department of Transportation (TxDOT), in conjunction with the metropolitan planning organizations (MPOs) under its purview, oversees the travel demand model development and implementation for most of the urban areas in Texas. In these urban areas, a package of computer programs labeled as the "Texas Travel Demand Package" or the "Texas Package" is used as the decision making tool to forecast travel demand and support regional planning, project evaluation, and policy analysis efforts.

The Texas Package currently adopts the widely used four-step trip-based urban travel demand modeling process, which was developed in the 1960s when the focus of transportation planning was to meet long-term mobility needs through the provision of additional transportation infrastructure supply. The trip-based model was intended to provide basic, aggregate-level, long-term travel demand forecasts for long-range regional transportation plans and evaluation of major infrastructure investments. Over the past three decades, however, the supply-oriented focus of transportation planning has expanded to include the objective of evaluating a range of travel demand management strategies and policy measures to address rapidly growing transportation problems, including traffic congestion and air quality concerns. The travel demand management emphasis, combined with federal regulations, has placed additional information demands on the capabilities of travel demand models. As a result, new approaches have been developed to model and forecast travel demand. The new approaches include the tour-based modeling approach, which employs tours instead of trips as the unit of analysis.

In this regard, the primary objectives of this research were (1) to identify the practical benefits and advantages of implementing a tour-based modeling framework from the standpoint of behavioral realism, model accuracy, and ease of implementation, and (2) if it is demonstrated that there are distinct advantages in implementing a tour-based model, then clearly layout (and evaluate the feasibility of) the steps required to implement a tour-based modeling process.

What the Researchers Did

- The research team identified TxDOT's modeling responsibilities and summarized current travel demand modeling practice in Texas.
- A synthesis of the state of the practice in tour-based modeling was provided.

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- The research team provided design recommendations for implementing tour-based travel demand model systems for TxDOT.
- The details of implementing a tour-based travel demand model system (the first design option identified above) were identified.
- A Microsoft Access knowledge-base system (KBS) for tour-based modeling was developed to provide TxDOT with information relevant to the development of a tour-based modeling system.

What They Found

The following are the important findings from the project.
- The need to examine individual-level behavioral responses, and accurately forecast long-term travel demand in a rapidly changing demographic context, has led to a more behaviorally-oriented tour-based approach to travel demand modeling.
- The development of tour-based models requires careful and extensive data preparation procedures to construct entire "sequences" of activities and "tours" of travel. However, once the model system is developed, the system can be packaged as a user-friendly travel demand modeling and policy analysis software. Further, the software can be sufficiently generic to allow its use in any study area, provided the model parameters for that area are available.
- The main sources of data for the implementation of a tour-based modeling system are, in general, household activity and/or travel survey, land use data, and transportation network and system performance data – the same data currently being used for the development and/or updating of the trip-based models.
- The models in a simple tour-based modeling system can be grouped into three categories: 1) population synthesizer and the long-term choice models, 2) activity-travel generation module, and 3) scheduling module.

What This Means

The tour-based approach enhances the behavioral realism in modeling travel demand and the abilities of travel forecasting models in assessing transportation policies and evaluating alternative transportation investments. In particular, planners and policy makers aiming to develop effective and reliable travel demand management policies would benefit from usage of such tour-based model systems.