0-5178: Measuring Access to Public Transportation

Background

Increasing traffic congestion, rising fuel prices, and worsening air quality in many metropolitan areas has led to the recognition of a need for the serious consideration of consumer-oriented, efficient, and accessible public transportation systems. In particular, public agencies and transit operators are looking for methodologies to accurately identify public transportation service gaps and quantify the severity of the problem, so that potential service improvements can be tested and prioritized and appropriate actions can be taken.

Public transportation service in Texas ranges from some of the most extensive public transportation systems in larger metropolitan regions to very small service providers in rural and small urban areas. Given this range of service coverage, the Texas Department of Transportation (TxDOT) recognized that all cities and transit programs could directly benefit from a transit accessibility measurement tool.

What the Researchers Did

TxDOT Project 0-5178, titled "Measuring Access to Public Transportation Service," developed a TransCAD-based Transit Accessibility Measure (TAM) software tool and user's guide. The tool provides TxDOT's Public Transportation Division, metropolitan planning organizations, and transit agencies with the ability to measure the level of public transportation accessibility for fixed-route transit systems. In contrast to most existing approaches to measure transit accessibility that focus solely on operational system performance characteristics and/or are limited in their ability to reflect the ease with which different population subgroups are able to participate in their desired activities using transit, the TAM software tool allows for two important features critical to measuring accessibility from a user perspective:

- The software allows for the calculation of accessibility levels for distinct population subgroups traveling for specific trip purposes. More specifically, the software can analyze public transportation accessibility by gender, income level, car ownership level, and travel for work, shopping, and other activities.

- The software allows for aggregation across user groups and geographies. This aggregation lets the user evaluate public transportation accessibility not only for the previously described user groups, but also for different spatial resolution levels from census blocks to the metropolitan area as a whole.

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The core of the software is a discrete choice model that determines the public transportation network and public transportation user demographic factors that impact the choice of public transportation paths. This model was developed using on-board transit rider survey data collected by the Dallas Area Rapid Transit in Dallas, Texas. Specifically, the model parameters were determined by comparing the characteristics of a traveler's observed path of travel with those of other possible paths. The most important accessibility characteristics were access distance and transit travel time, and the model included interactions of these parameters with different sociodemographic variables.

The researchers collected transit and land use information from seven Texas cities during this effort. This compilation required collaboration among different planning and transit organizations in each city since the information required to run the software was dispersed among many organizations. The software tool was applied to each of the cities, and results supported current trends and recognized needs. It will be continually calibrated as more information is collected and more users gain experience using the software.

What They Found

The resulting TAM software is flexible and can be applied to any metropolitan area to obtain transit accessibility for fixed-route systems. The results from the software include scaled transit accessibility levels, scaled transit dependency levels, and scaled critical need areas. The user can redefine these parameters to include different user groups, land uses, and travel trip purposes, based on planning interests and/or needs.

Public agencies and transit operators can use the software to analyze accessibility on the current transit network or potential alternative service configurations of the network (including service expansion/enhancement, and changes in design and/or placement of stops). The goal is to provide decision-makers with information that will enable them to identify areas where a transit system needs improvement, as well as to select the most effective way to improve the services in the context of user needs.

What This Means

The researchers developed the TAM software so that users will require only minimal experience with TransCAD. A workshop was held at the conclusion of the project to showcase the software and obtain feedback from metropolitan planning organizations and transit agencies. The research team also developed a user's guide manual that outlines the purpose of the software, development of the software, data preparation, detailed software walk-through, and summary of result outputs. Project 0-5178 has been extended for an implementation phase in the coming year. In this phase, the research team will continue to calibrate the software with more data sources, add demand-response applications to the software, and complete site visits to help others compile their data and implement the software.