VEHICLE OCCUPANCY DATA COLLECTION METHODS

PROBLEM STATEMENT

Traditionally, vehicle occupancy rates have been used to convert person trips to vehicle trips in the four-step travel demand forecasting process and to determine the required the number of parking spaces for fixed-seat facilities (e.g., sporting facilities, performing centers). The Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 expanded the role of vehicle occupancy rates by requiring continued monitoring of congestion management strategies, many of which emphasize person movements rather than vehicle movements. Today, traffic engineers use vehicle occupancy data to compute person delays; transportation planners use vehicle occupancy rates to derive person-miles traveled and to set policies for high-occupancy and managed lanes; and transit planners use transit occupancy rates to identify routes that need service expansion. More applications of vehicle occupancy data can be expected. With the increasing need for vehicle occupancy data comes the need to examine the ways in which these data have been (and will be) collected.

OBJECTIVES

The objectives of this project include the following:

1. Research and evaluate existing methods of vehicle occupancy data collection with respect to their geographic, temporal, and vehicle coverage design.
2. Identify new methods as a potential source of vehicle occupancy data.
3. Recommend practices to serve as guidelines for the collection of vehicle occupancy data.
4. Develop tools to facilitate the collection, processing, and analysis of vehicle occupancy data.

FINDINGS AND CONCLUSIONS

Existing methods for collecting vehicle occupancy data can be grouped into those that are collected in the field for the sole purpose of computing vehicle occupancy rates and those that are collected for other purposes but that may be used to estimate vehicle occupancy rates. Important design considerations for vehicle occupancy data collection include geographic and temporal coverages, facility types, collection cycles, locations, and vehicle types. A typical procedure for vehicle occupancy studies includes defining study objectives, selecting a data collection method, establishing a sampling plan, comparing costs, performing random sampling, and computing the average vehicle occupancy (AVO). A sound sampling procedure is needed to ensure that the AVO estimates meet the desired precision with a certain level of confidence. In this study, standard deviations for several factors were derived from vehicle occupancy data collected in a Florida statewide study between 1996 and 1999. In the absence of standard deviations from local data, these standard deviations are recommended for use in determining the appropriate sample sizes for corridor and area-wide studies.

A user-friendly software system called FAVORITE (**F**lorida **A**ccident **V**ehicle **O**ccupancy **R**ate **I**nforma**T**ion **E**stimator) was developed to estimate vehicle occupancy rates from multiple years of accident records on the Florida state roadway system. With this system, AVOs may be stratified by

district, county, hour of day, day of week, month of year, vehicle type, facility type, area type, and crash severity. While a preliminary assessment of the system shows outputs that are consistent with the expected data trends, an enhanced version of the system would require additional research that takes into account over- and under-involvement of certain types of accidents.

To facilitate field data collection and processing, an automated field data collection tool designed for use with a handheld Pocket PC was developed. The tool eliminates the need for manual data post-processing by allowing the user to make use of the touch-screen interface on a Pocket PC to record the number of passengers for different types of vehicles and different lane numbers. In addition, a companion program that can calculate AVOs from the data collected from the automated tool was also developed.

Current research into new methods for collecting vehicle occupancy has mainly been motivated by the needs for automated enforcement of high occupancy and managed lanes. These methods can be divided into photographic and in-vehicle detection. While photographic systems have achieved some success in counting vehicle occupants and have been shown to have some potential for further improvements, an operational, cost-effective system for occupancy data collection does not currently exist. In-vehicle detection systems that can detect the presence, location, and weight of a passenger for safer deployment of air bags and seat belt usage have the potential to provide more accurate vehicle occupancy information than any of the existing methods.

Fully automated methods of vehicle occupancy data collection are still largely a distant reality due to technological, cost, and institutional barriers. Semi-automated methods that record and analyze occupancy data electronically remain the methods of choice. Researchers developed a set of study guidelines for the manual counting methods for corridor and area-wide studies. The guidelines address design issues related to the following:

- time period
- sampling plan
- field operation
- work plan
- personnel training
- use of data collection tools and equipment
- data collection plan
- data analysis.

BENEFITS

This project provides a detailed review of the existing methods for vehicle occupancy data collection methods. The study guidelines developed provide important guidance and information on how to properly conduct a vehicle occupancy study. The FAVORITE system developed in the study provides a continuous, cost-effective alternative for monitoring statewide, regional, and site-specific vehicle occupancy trends. The automated field data collection tool, which eliminates the need for costly and error-prone manual data post-processing, is ready for use in field data collection.

This research project was conducted by Albert Gan, Ph.D., of the Lehman Center for Transportation Research (LCTR) at the Florida International University. For more information, contact Gordon Morgan, Project Manager, at (850) 414-4730, gordon.morgan@dot.state.fl.us.