Using the Carousel Method to Collect Average Vehicle Occupancy Data for Multi-Lane Freeways

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Abstract: The purpose of this paper is to report the results and effectiveness of implementing the carousel method to collect average vehicle occupancy (AVO) data on multi-lane freeways. The detailed results of this study are published by the Transportation Research Board (TRB) and provide the audience with a proven practice-ready methodology for collecting AVO data. When compared to other AVO data collection methods, the functionality of the carousel method allows for the most accurate vehicle occupancy data to be collected on multi-lane freeways under non-congested conditions. Utilizing the power of a spreadsheet macro user generated form; the carousel method has the capabilities to collect observation data, such as AVO data and vehicle type data, in an effective and efficient manner. As data are collected, a statistical sample size power analysis can be executed to track the progress of the data collection process and can provide intermediate vehicle occupancy results. A 2014 Utah Department of Transportation study successfully utilized the carousel method for data collection on multi-lane freeways. The results of the data analysis give validation to the carousel method as an acceptable method for collecting AVO data.

INTRODUCTION

From the Transportation Research Board (TRB) report (Schultz et al. 2015b and Schultz et al. 2015c):

"Beginning in September 2013, the Utah Department of Transportation (UDOT) extended a contract to a research team from Brigham Young University (BYU) to assess the speeds and volumes of the high occupancy toll (HOT) lanes (i.e., Express Lanes) along the I-15 corridor in Utah between North Salt Lake and Spanish Fork. The result of this study showed that several segments of the 110 miles of Express Lanes (northbound (NB) and southbound (SB)) required additional analysis in order to verify an appropriate action plan to optimize the functionality of the lanes (Schultz et al. 2014). To verify the various action plans proposed for the Express Lanes, additional investigation of the average vehicle occupancy (AVO) and a breakdown of the type of vehicle using the Express Lanes and the general purpose (GP) lanes was necessary.

"Through a literature review and field tests, the carousel method was selected to be the best option for collecting AVO and vehicle type data on the multi-lane I-15 freeway. The carousel method, in combination with a custom spreadsheet macro provided reliable, nearly instantaneous AVO data for the I-15 freeway, thus allowing UDOT to make informed decisions concerning improvements to the Express Lanes (Schultz et al. 2015a).

"The purpose of this paper is to summarize existing AVO data collection methods and compare other collection methods to the carousel method for multi-lane freeways. The details and procedures of collecting AVO data along the multi-lane freeway using the carousel method are then described, after which a sample of the results of the data collected using the carousel method are given. Details on the procedure for collecting data through the carousel method are explained in this report so that the carousel method can be replicated by other research teams for

multi-lane freeway studies" (Schultz et al. 2015b and Schultz et al. 2015c). The reader is referred to these two reports for the details of the procedure.

CONCLUSIONS

The conclusions of the TRB paper are reported as follows (Schultz et al. 2015b and Schultz et al. 2015c):

"The carousel method was demonstrated to be a reliable method for collecting AVO data along multi-lane freeways. Traveling concurrent with the flow of traffic allows the observers to collect accurate vehicle occupancy data as other vehicles pass the observation vehicle. This method also allows for additional information to be gathered, such as vehicle types and violation rates (as a function of vehicle occupancy).

"In the context of the UDOT study, there was a need to provide reliable AVO data along with an analysis of the vehicles using the Express Lanes on I-15 in Utah and Salt Lake County. The carousel method was selected as a simple and effective way to collect this data quickly, without the need of costly equipment. The carousel method provided more than adequate data to give a representation of AVO and vehicle percentage by type in the Express Lanes along I-15, which has illustrated important information to UDOT so that they can optimize the performance of the Express Lanes.

"The carousel method has the capability to meet the needs of a multi-lane freeway study. Vehicle occupancy, vehicle counts by type, and violation rates are some of the important details of a freeway that can be collected through the carousel method. By collecting data while traveling with the flow of traffic, the carousel method allows observers to study vehicle occupancies from a perspective that cannot be provided by stationary observation. Traveling concurrent with the flow of traffic allows for a perceptively higher accuracy than other methods on high speed freeways. The simplicity and effectiveness of the carousel method qualifies it to be a highly recommended method for multi-lane freeway studies" (Schultz et al. 2015b and Schultz et al. 2015c).

The reader is encouraged to refer to the TRB paper as well as the UDOT reports for more information on this topic (Schultz et al. 2014, Schultz et al. 2015a, Schultz et al. 2015b, and Schultz et al. 2015c).

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