

EXPLORING TRAVELERS' BEHAVIOR IN RESPONSE TO DYNAMIC MESSAGE SIGNS (DMS) USING A DRIVING SIMULATOR

Problem

The Maryland State Highway Administration (SHA) uses dynamic message signs (DMS) for traffic and incident management and for providing travel time information. Previous research in Maryland has shown that a DMS can be an accurate, effective, and safe device to convey real-time traffic information to drivers and that it can be an effective traffic management strategy. However, little research has been done to understand how drivers in Maryland react to posted messages and to what extent they choose travel routes based on the information provided.

Objective

The objective of this study was to use a driving simulator to study drivers' behavior in response to DMS messages, identify the human factors involved (driver perception, reaction time, etc.) and help SHA assess the effectiveness of DMS message formats.

Description

This study used a UC-win/Road simulator, which enables researchers to collect details of drivers' route choice in addition to several other useful parameters, including geographic positions, distance traveled, lane number, offset from lane center, spot speed, acceleration, braking, etc. A 12×12 mi² (20×20 km²) network southwest of the Baltimore metropolitan area was created. The test route started from MD 100, 3.45 miles (5,550 m) west of I-95 interchange, to the intersection of East Pratt Street and Light Street in downtown Baltimore. Roadway objects, including signs, DMSs, trees, and buildings, were loaded to the network according to Google® Maps. Two DMSs mounted on overhead structures are embedded in the network. DMS1 is located on MD 100, 1.39 miles (2,240 m) from the network start point, and DMS2 is located on I-95, 1.56 miles (2,507 m) from the MD 100 entrance ramp.



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Driving experiments were performed in the network. Five scenarios were developed to address various traffic regimes and travel time information. Drivers' route choices were observed under these five scenarios. 102 human subjects from balanced socioeconomic groups drove the simulated network 577 times. In addition, a Stated Preference (SP) study was conducted through three sequential survey questionnaires. The SP data was utilized to better understand drivers' perceptions of the efficiency-related attributes. It was also used for validating the route choice simulation results. The three questionnaires address all requirements to develop a behavioral model for drivers' route choice/diversion.

Results

The research team found that no significant speed reduction was made by the subjects when reading a DMS message. Drivers with a higher DMS exposure rate were more likely to pay attention to a DMS than those with less exposure, and the majority of drivers chose their routes based on the travel time information provided by DMS. The information provided after a route is selected was less effective, meaning that drivers were more reluctant to change route after choosing their route.

The study concluded that travel time is not the only factor affecting route choice. Personal perceptions and experiences (which were affirmed to be different from the reality) and the DMS information and its accuracy were significant determinants in the route decisions. The effectiveness of major factors such as travel time saving, perceived and actual travel time, route familiarity, and drivers' previous experience of the driving simulator (DS) experiments in route choice behavior were identified, and it was demonstrated that the combination of past experiences and information provided by DMS determined their route choices. Subjects' perceived travel time was closer to what they observed (DMS travel time) than the actual travel time and they also overestimated travel time for the longer route. Drivers' route preferences, which were acquired by multiple choice questions, were compared to their actual choices in the DS experiments. Although the overall reaction trend to DMS information was consistent between the SP and DS, there was an approximately 40 percent contradiction in individuals' responses on paper and in the driving experiments. Lastly, the compliance rate with the DMS information was 65 percent for the DS and 59 percent for the SP cases.

Report Information

Link to the final report: http://www.roads.maryland.gov/OPR_Research/MD-13-SP209B4K_Exploring-Travelers-Behavior-in-Response-To-DMS_Report.pdf. For more information about the study please contact:

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