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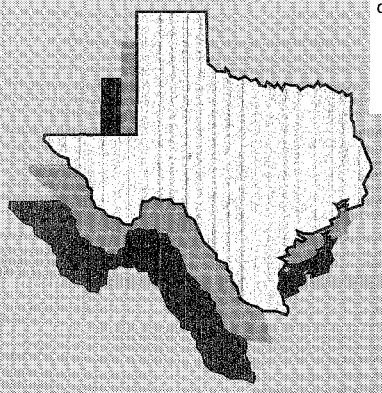

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Summary Report

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ANALYZING THE RESPONSES OF TRAVELERS TO TRAFFIC DISRUPTIONS AND CONTROL ACTIONS

PROBLEM STATEMENT

Historically, transportation planners in Texas and elsewhere have addressed the problem of urban traffic congestion by simply improving and expanding roadways. Thus, when traffic congestion became a serious problem in Houston, the district simply built more lanes and more overpasses. But increasingly over the years, land available for roadway expansion has become both scarce and expensive; moreover, the costs for highway improvements (which, when completed, do not always solve the problem) have soared. Simply put, this type of approach has become too expensive. For this reason, planners have shifted focus in their search for traffic-congestion relief. Now, rather than merely expand facilities, transportation planners at the state and district levels are increasingly looking into the dynamics of commuter behavior as a way of predicting user responses to traffic system disruptions and control actions. What they are finding is that specific analyses of driver behavior can lead to strategies that effectively reduce or modify driver demand, which in turn can increase the efficiency of the existing network. Examples of this "demand-side" approach include telecommuting, congestion pricing, the adoption of work-hour flexibility, and the use of various information technologies. Recent history (and research) has borne out that this method, especially when integrated with the more conventional "supply" approach, has enormous potential for relieving a significant portion of urban highway congestion.

Yet even while this approach is gaining credibility, proponents acknowledge that they still lack a comprehensive understanding of the various aspects of human behavioral response that would allow them to predict and model such behavior (as it relates to travel). Also lacking is an understanding of user response on a day-to-day basis, which is an essential element in the design and implementation of a demand management strategy. Part of the problem, researchers say, is that such knowledge requires that one know all driver options available for any one given situation—a formidable task. Another hurdle has been the fact that previous interactive experiments could not replicate actual situations in ways that would allow planners to predict commuter behavior in real-world settings.

This issue of driver behavior and how to control and predict it was the subject of a recent Center for Transportation Research report prepared by Thomas Joseph, Hani S. Mahmassani, and Rong-Chang Jou, all of The University of Texas at Austin.

OBJECTIVES

The report, "Dynamic Framework for the Analysis of User Responses to Traffic System Disruptions and Control Actions," documents the findings of Project 1216, conducted by the Center for Transportation Research (CTR) of The University of Texas at Austin for the Texas Department of Transportation (TxDOT) and the Federal

Highway Administration (FHWA). According to the report, the primary objective of the study was "to develop and test a systematic procedure for capturing changes in trip decisions that can be used to develop effective control strategies and management techniques for traffic facilities." Such a procedure, the researchers say, will assist corridor managers who must plan for both normal and disrupted highway operations. Given that broad objective, the specific study objectives were (1) to develop a methodology capable of capturing daily driver responses, and (2) to develop an analytical capability to anticipate drivers' daily responses to disruptions and control actions, and then to integrate this capability in an effective corridor and network-level management tool.

FINDINGS

In their development of a methodology to capture the day-to-day response of drivers, the study team conducted extensive surveys of actual commuter behavior in the North Central Expressway Corridor in Dallas, Texas. In these surveys, driver-participants were asked to provide information regarding their daily trips to and from work (e.g., routes and stops) over 10 working days. In this way, the day-to-day dynamics of commuter decisions were characterized and the developed user decision models calibrated. Based on a favorable response to the survey, another such survey was undertaken a year later, the results of which provided insights into driver travel characteristics over a considerable time period.

Pursuing their second objective, the researchers developed a modeling framework for studying the interaction of user decision-making and traffic. This framework consisted of two components: vehicle simulation and vehicle generation. Using well-established characteristics of traffic flow, the vehicle simulation component was set up to recreate the movement of traffic along a facility; the vehicle generation component, on the other hand, used a behavioral module to capture drivers' trip-related decision-making, using several plausible behavioral models.

CONCLUSIONS

The CTR study team succeeded in developing an effective methodology to capture the day-to-day response of commuters to traffic control actions. A computer simulation model, dubbed the Day-to-day Dynamics Traffic Simulation Model (DDTSM), was developed (in Fortran) to study specifically the interactions between driver response and control strategies. According to the report authors, this model is currently "the only tool available to study the dynamics of system performance over an extended duration of time." One component of this model—the traffic movement component—allows researchers to group vehicles into packets, so that their movement may be simulated as a single entity (a feature that also reduces the excessive computer memory requirements typically associated with such modeling). The DDTSM also contains a module for the implementation of real-time entrance control strategies.

At the same time, the researchers developed a survey methodology capable of collecting the kind of detailed data useful in characterizing commuter behavior. And because such data reflect day-to-day activities, the methodology represents an important upgrade over the more conventional single-day surveys now used.

The findings are relevant to traffic system operations at the state and district level, where the procedures can be used to design and analyze such strategies as ramp control and IVHS traffic management schemes. In addition, transportation planners involved with travel demand management and systems planning can benefit from the information regarding the travel behavior of commuters in the Dallas North Central corridor—information which can be applied to other metropolitan areas as well.

Finally, the researchers, in their recommendations, point to relevant work still needing to be undertaken in this area. They cite, for example, the need for more precise information on user response to entrance control strategies; according to the CTR study team, such information is now lacking because of the limited number of sites where control strategies are actually undertaken.

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The information provided in this summary is reported in detail in Research Report 1216-2F, "Dynamic Framework for the Analysis of User Responses to Traffic System Disruptions and Control Actions," by Thomas Joseph, Hani S. Mahmassani, and Rong-Chang Jou (November 1992). The contents of the summary report do not necessarily reflect the official views of the FHWA or TxDOT.