

New Method to Predict Driver Diversion Rates During Incidents on Freeway Facilities

(Part 2 of STRIDE Project A: Impact of Smartphone Applications on Trip Routing & Congestion Management)

PROJECT OVERVIEW

When there is congestion due to incidents, drivers seek up-to-date information on traffic conditions and alternative routes. Under these conditions, it is important to estimate driver diversion behaviors to support traffic management plans. For example, under what conditions are drivers likely to take a different route, what is the proportion of the diverted drivers (diversion rate), and which routes are drivers likely to take (diversion route). These behaviors are often predicted using preference surveys. Better estimates can be achieved by the use of traffic data combined with advanced analytics.

RESEARCH GOAL

The goal of this study was to develop a more accurate diversion rate prediction method. Using the new method, researchers calculated diversion rates using 1) freeway mainline detector data (volume, speed, and occupancy) combined with incident data (such as lane blockage, location, duration, etc.) along a limited access facility in Florida and 2) on-line survey and face-to-face (in-person) survey responses. The diversion rates from these datasets were then compared.

FINDINGS

Using the new prediction method, the estimated diversion rate based on mainline detector data ranged from 4% to 22%, depending on the severity (mainly reflecting duration), lane blockage (up to three out of five lanes), and the time of incident occurrence. The estimated diversion rate based on the survey results was up to 40% which is significantly higher than what field observations suggest in this location.

The actual diversion rate is a function of many local conditions such as the availability of alternative routes, travelers' behaviors in the region, and the degree of congestion in the network. The new method can be used to develop site-specific models for each freeway facility in order to address local variabilities.

The study found evidence that the diversion rate is constrained by the capacity of the signals at the off-ramps, indicating the need for special signal control plans during incidents.

PRODUCT

Method to Predict Driver Diversion Rates

The new method predicts the diversion rates under various traffic and incident conditions using data commonly available to traffic management agencies.

IMPACT

The new method will allow the agencies to predict diversion to alternative routes and then use this information to develop special management plans (such as special signal timing plans) and to activate these plans in real-time operations. This is expected to reduce the impacts on the alternative routes and improve the performance of the diversion process.

WHO BENEFITS?

- Traffic management agencies
- Drivers

RESEARCH TEAM

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PRODUCT

Method to Predict Driver Diversion Rates

A new method was developed that predicts the diversion rate based on the incident severity, number of blocked lanes, time of the incident occurrence, and incident locations. The method uses a combination of clustering, cumulative volume analysis, and predictive data analytics.

The clustering analyses was used to categorize the days based on the variations of traffic patterns. Then, the study used a cumulative volume analysis approach to estimate the diversion for each incident, considering the variations in the traffic patterns. Finally, three supervised learning techniques were used and compared to predict the diversion rates due to the incident. These techniques are linear regression (LR), multilayer perceptron (MLP), and support vector machine (SVM). The MLP model produced the best results.

A limitation is that the method estimates the overall diversion rate and not the diversion at each off-ramp. Most transportation agencies in the United States do not install sensors on the off-ramps. It is recommended that agencies start installing sensors at the off-ramps to allow more detailed examination of the diversion.

For more information on Project A (Impact of Smartphone Applications on Trip Routing & Congestion Management), visit the [STRIDE Project page](#).

About STRIDE

The Southeastern Transportation Research, Innovation, Development & Education Center (STRIDE) is the 2016 Region 4 (Southeast) U.S. Department of Transportation University Transportation Center headquartered at the University of Florida Transportation Institute (UFTI).

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