Florida Department of Transportation Research

Strategies to Identify and Mitigate Secondary Crashes Using Real-Time Traffic Data on Florida's Turnpike System

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Project Managers
Eric Gordin
Florida's Turnpike Enterprise

Principal Investigator
Priyanka Alluri
Florida International University

Current Situation

From fender-benders to more serious incidents, crashes are the primary source of non-recurring congestion on Florida roadways. Vehicles that stop or slow down because of a crash not only block traffic flow, they can also cause secondary crashes, further complicating the crash scene and increasing congestion. Predicting when a secondary crash might occur is critical for devising strategies to prevent or mitigate them. However, this is difficult to do. It is not always clear when a crash is secondary, and a useful definition is needed to identify relevant incidents to begin the process of discovering contributing factors. With the increasing availability of real-time traffic measurement, an understanding of these factors could be used to estimate the likelihood of secondary crashes in real time and create new possibilities to reduce these crashes.

A crash can reduce a three-lane highway to one lane, causing slowdowns and possibly secondary crashes.

Research Objectives

Florida International University researchers developed a comprehensive approach for the real-time identification and mitigation of secondary crashes on Florida's Turnpike.

Project Activities

The researchers defined a secondary crash as one that occurs within the effective impact area of a primary crash. They identified impact areas for primary incidents on Florida's Turnpike system using speed profiles derived from data on a 97-mile section of the Turnpike Mainline and the 48-mile Homestead Extension for a multiyear period. Over 4,500 secondary crashes were identified using this method.

The researchers modeled a wide variety of secondary incident data to identify factors most likely to influence secondary crashes. Increased likelihood of secondary crashes was associated with incidents attended to by more than one responding agency, incidents occurring on wet roads, and incidents occurring during morning peak hours, among others. Decreased likelihood was associated with higher average prevailing speed or speed variation before the incident and a merge influence area or wider shoulder width within the impact area.

The researchers developed a system to demonstrate the feasibility of predicting secondary crashes in real-time. The system consists of databases and applications that collect and store the necessary data and then perform the operations that predict the likelihood of a secondary crash every fifteen minutes from the time the primary incident is detected until it is cleared.

Microsimulation was used to examine whether connected vehicle (CV) applications could mitigate secondary crashes. Such applications include advisories about speed, lane changes, and detours. The simulations showed that deployment of CV applications could result in up to a 98% reduction in traffic conflicts. The amount of reduction depended on the number of vehicles with installed CV applications; however, the reduction was significant in less congested traffic even when the proportion of vehicles with CV applications was low.

Project Benefits

This project shows how the technology being installed on Florida highways and increasingly in vehicles can be used to reduce crashes and the delays associated with them.

For more information, please see www.fdot.gov/research/.