Florida Department of Transportation Research
Traffic-event Unification System Highlighting Arterial Roads

August 2020

Current Situation
FDOT has instrumented most of the freeway system in order to manage crashes. This standalone system effectively detects crashes on the freeways and connects traffic information to first responders. On the arterial system, replicating the same standalone system would likely be very costly. Still, rapid detection of these incidents and the interruptions they cause is central to FDOT's incident management role.

Research Objectives
University of Florida researchers explored existing data on traffic flows to develop the right algorithm to find crashes reliably without the investment of significant additional infrastructure and developed software to use data from traffic signal loop detectors and other traffic-related data to detect traffic interruptions.

Detector loops track the presence of vehicles and can be a valuable source of traffic data.

Project Activities
In a literature review, the researchers determined that previous work using loop detector data to detect traffic flow interruption was generally limited to simulation or small datasets. To show the real-world effectiveness of loop detector data, the researchers used six months of real data for 300 intersections, covered by 3,000 detectors. These detectors generate data ten times per second on average for a total of over 700 gigabytes. The first step was to preprocess this data to eliminate the noise common in traffic data. Cleaning and validating the data was a lengthy and complex process.

The researchers then analyzed the data to identify traffic interruptions (termed "events of interest," or EOI). For this project, an interruption was defined as a significant, non-periodic change observed when traffic volumes deviated from predicted volumes and the duration for which actual traffic volume deviated from predicted volume. As EOI were identified, they were compared with EOI from similar time periods, such as day of the week. Selecting an appropriate threshold for the duration of an interruption in order for it to be labeled an EOI was key to this analysis. The researchers found that a threshold of 60 to 90 seconds produced the highest accuracy.

Identified EOI were matched to locations to look for intersections where traffic interruptions occur regularly as well as interruptions at one intersection caused by an interruption at any nearby intersection. The developed procedure was applied to six months of crash data for Seminole County, Florida. For each crash, the researchers identified and analyzed interruptions at intersections within 600 m of the crash. Surprisingly, few reported accidents led to sizeable interruptions at nearby intersections.

Project Benefits
This project demonstrated the ability to utilize traffic signal loop detector data to detect traffic flow interruptions in real time and for historical data, providing additional tools for arterial traffic incident management and historical record correction.

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