DRISI
Caltrans Division of Research, Innovation and System Information

Research Results

Methods for Identifying High Collision Concentrations

Develop advanced safety performance functions (SPF) for roadway segments, intersections and ramps for the Caltrans network.

Transportation Safety & Mobility

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Project Title:
Action Item 8.09: Methods for Identifying High Collision Concentrations for Identifying Potential Safety Improvements

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WHAT IS THE NEED?

Caltrans' goal to improving safety on the network requires the development of systematic tools for prioritizing safety improvements in a manner that can yield efficiencies over existing methods. Statistical models using historical geometric and crash and traffic volume data were targeted for implementation of safety predictions. The goal of this study was to refine existing safety performance functions to account for differences in urban and rural corridors through advanced models.

WHAT WAS OUR GOAL?

The primary goals of this research were to develop safety performance functions for roadway segments, intersections and ramps, including type 2 (including geometrics in addition to adt and length) variables, as well as accounting for randomness in geometric coefficients by urban and rural SPF class. As a result, a final objective was to complete a comprehensive model selection process that would recommend the appropriate SPF (basic type 2 or advanced type 2) by severity outcome (total crashes, property damage, complaint of pain, visible injury, severe injury and fatal injury) for each urban and rural class of roadway segment, all intersections, metered ramps and unmetered ramps.

WHAT DID WE DO?

We developed advanced SPF class models for roadway segments using historical crash and geometric data. Further, we developed these SPFs by various severity types in addition to total crash models, such as property damage only (PDO),

complaint of pain, visible injury, severe injury and fatality. We developed SPFs for intersections as well using various severity specific SPFs, and the same approach was used for ramps on the Caltrans network. The advanced type 2 SPFs were estimated using simulation based likelihood methods, a significant methodological advance over current estimation techniques used in the safety literature. Through a comprehensive model selection process based on information theory, we identified the appropriate SPF (basic versus advanced type 2) for each component of the state highway network.

WHAT WAS THE OUTCOME?

We developed type 2 SPFs for roadway segments, and 60 type 2 segment SPFs. In addition, we developed 54 advanced type 2 SPFs and compared them with their basic type 2 SPF baselines using information criteria such as the Akaike and Bayesian information criterions. We determined that rural SPFs is general benefitted from a basic type 2 structure, while a significant number of urban SPFs benefitted from an advanced type 2 structure. We did a similar comparative analysis for intersections by developing 6 advanced type 2 SPFs. Finally, we developed 12 advanced type 2 SPFs for ramps on the entire Caltrans network as well as a subset of ramps that are metered.

WHAT IS THE BENEFIT?

This research has developed methods that Caltrans can use to prioritize safety improvements by efficiently targeting high collision concentrations. Using geometric information, the SPFs developed provide additional predictive capabilities in a systematic manner, so all districts can benefit from a sound statistical procedure. We provided resolution on the type of SPF that will be most appropriate for each SPF class of roadway segment, intersection severity type, and ramp severity type. With this added resolution, decision making on safety prioritizations can be improved to better target high collision locations.

LEARN MORE

Review the complete report
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