DRISI
Caltrans Division of Research, Innovation and System Information

Research Results

Identify the Data Requirements for Safety Screening to Identify High Collision Concentration Locations

Develop a roadmap for a data collection plan for SPF development using Caltrans and external data sources

Transportation Safety and Mobility

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Project Title:
Identify the Data Requirements for Safety Screening to Identify High Collision Concentration Locations

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WHAT IS THE NEED?

In the near future, Caltrans intends to implement statistical methods that follow the methodology described in the Highway Safety Manual to identify high collision concentration locations (HCCLs) along the state highway system. A successful implementation of such HCCL identification methodologies, which are referred to as network screening techniques, necessitates the development of safety performance functions (SPFs). SPFs are mathematical equations that relate collision frequencies to traffic volumes at a given location and may include other site characteristics such as road geometry and intersection design. The outcome of an SPF is the expected (i.e., average) number of collisions per year for a given location, and it acts as a baseline to detect whether a site has a "higher-than-expected" number of collisions. Prior research efforts to develop California-specific SPFs in Caltrans that used data from the Traffic Accident Surveillance and Analysis System (TASAS) revealed some data limitations (missing variables, inconsistent quality) that motivated the need to identify additional data sources.

WHAT WAS OUR GOAL?

The goal of this project was to assess data gaps for SPF development and address them with a thorough review of additional data sources both within and outside of Caltrans. The objective was to develop a roadmap for a data collection plan to facilitate better SPF model estimation, which in turn facilitates better network screening (Figure 1).

WHAT DID WE DO?

Caltrans, in partnership with the University of California, Berkeley Safe Transportation Research and Education Center identified a set tasks and activities to accomplish this research. The activities included: (i) identifying a list of desirable variables and potential data sources within and outside of Caltrans for SPF development; (ii) developing a suitability analysis framework for evaluating data sources that are available within Caltrans, and (iii) conducting a pilot study to evaluate the data sources that are available outside of Caltrans. The proposed suitability analysis framework was key towards evaluating the quality of data through the metrics of completeness, frequency of updates and spatial variation. Collectively, these metrics ensure that data elements that are available for SPF development can be populated for the entire state highway system, can be periodically updated over time, and have good spatial resolution.

WHAT WAS THE OUTCOME?

We identified a list of data sources both within and outside of Caltrans that can be utilized for collecting new variables for SPF development in addition to the data available within TASAS. These data sources include automated pavement condition survey data for generating horizontal and vertical alignment attributes, Google Street View/Earth for manually collecting design and operational attributes, HERE Maps API for automated estimation of posted speed limits, Google Elevation API for automated estimation of vertical alignment attributes, and GIS-based tools for automated assessment of horizontal alignment attributes. Based on these sources, a roadmap for data collection was proposed, which included recommendations on key performance measures to assess the quality of future data collection efforts, as well as policy considerations to ensure that the data are consistently collected for the entire state highway system.

WHAT IS THE BENEFIT?

This research provides Caltrans with a better assessment of their existing safety-related infrastructure databases with recommended performances measures and policy interventions to improve their quality through future updates. In addition, for variables that can be collected through external data sources, we compared both automated and manual data collection techniques while providing protocols for data collection as well an estimate for how much time it would take to populate them, especially for the latter approach. Finally, we defined newly identified variables at the TASAS segmentation level so that they can be easily integrated into the Caltrans database. The findings from the project will allow Caltrans to maximize the resources available across different internal entities to achieve better SPF models in the future. In the long run, the development of high quality SPFs will lead to more statistically robust methods and tools for network screening that will lead to fewer traffic-related injuries and fatalities on the California State Highway System.

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IMAGES

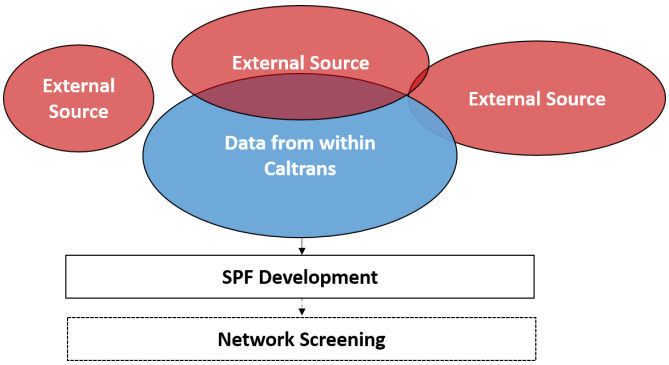

FIGURE 1: Visualization of the scope of the project. This project seeks to develop a roadmap for integrating data sources within as well as outside of Caltrans and improving the overall quality of available data for SPF development, which will eventually improve the effectiveness of network screening employed for identifying high collision concentration locations.