

JOINT TRANSPORTATION RESEARCH PROGRAM

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IDENTIFYING TRAFFIC SAFETY NEEDS – A SYSTEMATIC APPROACH

Introduction

The Indiana Department of Transportation (INDOT) manages road safety in Indiana through safety emphasis areas, identification of safety needs within these areas, and development and implementation of transportation interventions that address the safety needs. Indiana applies system-wide performance screening to state roads using the somewhat limited, non-integrated tools available to date. A site-specific countermeasure development and evaluation process (scoring) is being used to determine essential project intent and merit or cost-effectiveness.

This project addresses the need for a unifying approach to data-driven identification of safety emphasis areas and safety improvement projects via a systematic evaluation of safety needs in the Indiana road network. Such a method must utilize a database that integrates the Indiana state network, traffic, road inventory, and crash data.

Findings

A method for safety screening of state roads in Indiana has been developed with the following screening tasks in mind:

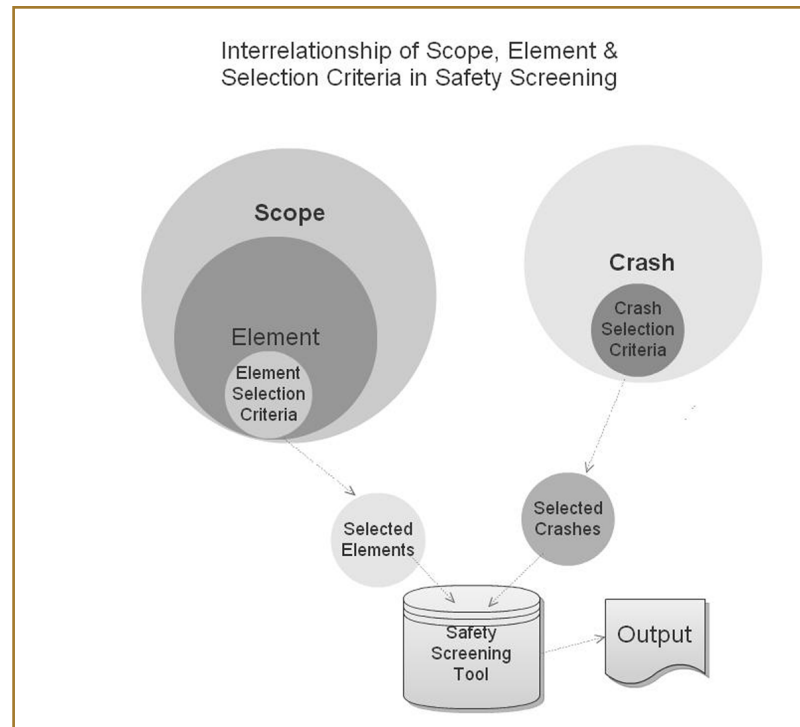
- (1) Identification of high crash locations (segments, intersection, ramps and bridges), corridors, and areas in terms of high crash frequency, crash rate, or proportion of a particular crash type.
- (2) Facilitate program-based screening (e.g., shoulder widening, median improvement etc.).
- (3) Facilitate special programs and projects (e.g., five percent report)

In order to ensure the versatility of screening tasks and the data maintenance, four components are included in the screening tool: (1) Data management, (2) Standard screening, (3) Roads clustering and special studies, (4) Results presentation.

The data management includes updating the existing data by reaching to renewable sources for data, reformatting the

source data to meet the standards of the master database, integrating these data into tables that meet certain specifications, and replacing the existing data. The data management procedures include ArcGIS geo-processing and VBA-implemented and Model Builder codes that are not packaged as a single module but which are used separately as needed to maintain flexibility of the data management process.

A window-based user interface, query editor, facilitates selection of criteria for safety screening. To help the user build a query, the selection criteria have been grouped into four categories: geographical scope (state, county, etc.), element (segment, township, etc.), crash criteria, and road criteria. The query is translated to SQL and sent to the screening engine. The results include safety performance measures such as crash frequencies, rates, and proportion together with basic statistical indicators.



Scope, Element, and Selection Criteria for Safety Screening

Road segments and intersections that exhibit an excessive number of crashes may be concentrated along longer road sections. Clustering these elements may reveal large scale safety issues that otherwise might be overlooked if the screening analysis is focus on individual spots.

The geo-coded results can be sorted in a table or displayed on GIS maps with Google Earth or ArcGIS to visualize the spatial distribution of the identified high-crash roads.

Implementation Recommendations

The developed tool includes two major parts: data management component which is a collection of procedures and tools to facilitate data renewal and integration. Data management is complex but it is repeated only once a year or two years. The second part includes the screening and clustering tools that have a convenient user interface and are fed by datasets prepared in the data management process and optimized for screening. Screening and clustering have convenient user interfaces as they are expected to be run more frequently than the data management component.

A research report describes the concept and statistical fundamentals of the screening and clustering operations. A user manual developed as the part of the project includes an example study and is meant to help train the INDOT personnel. A sequence of hand-on workshop are helpful in facilitate the implementation.

References

Tarko, A., Azam, S., Thomaz, J., Romero, M. Identifying Traffic Safety Needs - A Systematic Approach: Research Report and User Manual. Publication FHWA/IN/JTRP-2012/02. Joint Transportation Research Program, Indiana Department of Transportation and Purdue University, West Lafayette, Indiana, 2012. DOI: 10.5703/1288284314650

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