Development of Crash Database Parsing Tools to Support the Highway Safety Improvement Program in Texas

CENTER FOR TRANSPORTATION RESEARCH

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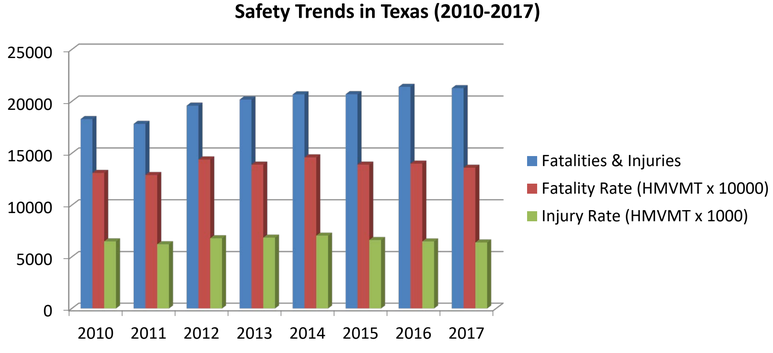
Abstract

The Highway Safety Improvement Program (HSIP) allows for funds to be allocated to safety-related projects on roadways. Given the high need for safety improvements and limited funding, prioritization of safety projects is crucial. To assist transportation agencies in making safety improvement projects and resource allocation decisions, a computerized suite of tools has been developed for the Texas Department of Transportation (TxDOT) that parses the crash database to identify crash hotspots, suggest potential treatments, and calculate safety benefits. To demonstrate the applicability of the tools, a case study was conducted using real data provided by Texas Department of Transportation, Austin District. The results returned a set of 6,174 candidate project recommendations with corresponding most effective treatments.

Background

One of TxDOT's primary goals is to reach zero fatalities on Texas roads. Safety performance measure trends over the last few years have not been promising. Note: HMVMT = Hundred Million Vehicle Miles Travelled, Fatality Rate = Fatalities/HMVMT. Fatality rate has been multiplied by 10,000 to orient graph.



The general process of roadway safety management has six steps:

- Network screening
- Diagnosis
- Countermeasure selection
- Economic appraisal
- Prioritizing projects
- Safety evaluation

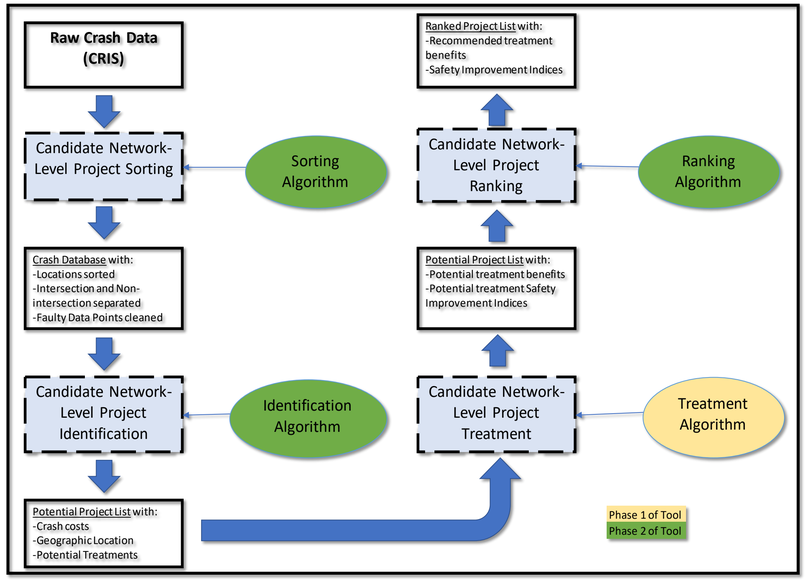
The HSIP program allows for fund-allocation to safety projects. To receive funds, TxDOT submits an annual report with a list of prioritized safety projects. However, the current process to create this list is:

- Time-consuming
- Subjective

Research Objective

To develop a computerized database parsing tool using Microsoft's Visual Basic for Applications (VBA) in Microsoft Excel that improves the current TxDOT HSIP report creation process for both intersection and non-intersection crashes.

Methodology



$$SII = \frac{B\ (S, Cr, ADT\ \ldots)}{C}$$

SII = Safety Improvement Index

B = present worth of project benefits

C = initial cost of the project

S = annual savings in crash costs

Cr = number of fatal, incapacitating injury, and non-incapacitating injury crashes

Results

A case study, using CRIS data from 2015 through 2017, was conducted to verify the functionality of the tool and validate the results obtained by TxDOT. The crash database consisted of **11,709** crash records. A total of **6,174** potential projects were recommended for treatment. The tool took **30** minutes to run (15 mins for Intersection, 15 mins for Non-intersection) on a mid-range laptop. Results from the Intersection analysis are shown below:

	Results: Intersection-related Analysis								
Rank	Lat	Long	Crashes	K	A	B	Crash Cost ($)	Best Crash Cost Savings ($)	Best Work Code
1	XX.XX	XX.XX	49	0	7	42	45,500,000	15,925,000	107
2	XX.XX	XX.XX	60	0	6	54	48,000,000	15,050,000	107

Conclusion

This research:

- Presented a suite of network level tools for parsing crash databases and ranking potential project locations, returning more reliable candidate projects and saving evaluation time;
- Developed algorithms with support from TxDOT's Austin district traffic engineers that analyzed crash records in Texas; identified lists of potential crash hotspots; and finally, ranked them according to crash cost per mile and best crash cost savings;
- Conducted a case study with 11,709 crash records, and the results showed that the tools can support the Austin district in quickly evaluating large amounts of crash data and identifying 6,174 candidate projects for further discussions with engineers and eventual HSIP proposal.

Future Work

Regarding the procedure of the tool itself, there are numerous avenues for further development, related to this research's limitations:

- Consider the relative cost of each treatment code in its recommendation – the tools currently include a manual user input field for costs
- Make intelligent decisions regarding the safety treatment work code. For example, the case study for the non-intersection tool recommended designating school zones. However, a school may not exist in the area.

Acknowledgement

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