

TRANSPORTATION POOLED FUND PROGRAM QUARTERLY PROGRESS REPORT

Lead Agency (FHWA or State DOT): **Wisconsin Department of Transportation**

INSTRUCTIONS:

Project Managers and/or research project investigators should complete a quarterly progress report for each calendar quarter during which the projects are active. Please provide a project schedule status of the research activities tied to each task that is defined in the proposal; a percentage completion of each task; a concise discussion (2 or 3 sentences) of the current status, including accomplishments and problems encountered, if any. List all tasks, even if no work was done during this period.

Transportation Pooled Fund Program Project # S2458 PP14	Transportation Pooled Fund Program - Report Period: <input checked="" type="checkbox"/> Quarter 1 (January 1 – March 31) <input type="checkbox"/> Quarter 2 (April 1 – June 30) <input type="checkbox"/> Quarter 3 (July 1 – September 30) <input type="checkbox"/> Quarter 4 (October 1 – December 31)	
Project Title: EFFECT OF PRIMARY AND SECONDARY CRASHES: IDENTIFICATION, VISUALIZATION AND PREDICTION		
Name of Project Manager(s): Sabyasachee Mishra	Phone Number: (901) 678-5043	E-Mail smishra3@memphis.edu
Lead Agency Project ID:	Other Project ID (i.e., contract #):	Project Start Date: 01/01/2014
Original Project End Date: 12/31/2014	Current Project End Date: 12/31/2014	Number of Extensions: None

Project schedule status:

On schedule
 On revised schedule
 Ahead of schedule
 Behind schedule

Overall Project Statistics:

Total Project Budget	Total Cost to Date for Project	Percentage of Work Completed to Date
\$150,000	\$64, 488	25%

Quarterly Project Statistics:

Total Project Expenses and Percentage This Quarter	Total Amount of Funds Expended This Quarter	Total Percentage of Time Used to Date
		25%

Project Description:

Traffic crashes are a major source of congestion on freeway and arterial system. A "Primary crash" leads to reduction of roadway capacity which may result in another crash, known as "a secondary crash". Though a relatively small proportion of all the crashes are secondary crashes, it is important to identify the contributing factors as well as their characteristics because secondary crashes can increase congestion, delays, fuel consumption and emissions. A number of states have proposed various programs to reduce secondary crashes and estimate their benefits in crash reduction. Therefore, understanding the characteristics of primary and secondary crashes can help decision makers' select better traffic operation and safety programs.

The purpose of the study is to identify secondary crashes, develop prediction models for incident duration, probability of secondary crash occurrence, associated delays and queue length and apply them to Shelby County, TN. Once the models are established, frameworks will be developed for Hot Spot Visual Tool (HSVT) - to identify the locations which are likely to encounter secondary crashes and Crash Identification Toolbox (CIT) - to obtain specifics of a crash for a set of criteria. Part of the research also will study impact of secondary crashes on freight operations and consequently identify and evaluate strategies that could be used to reduce the impact for hot spots. Identification of the secondary crashes involves extensive literature review to learn different temporal/spatial threshold, methodologies used in the past studies. It also includes developing an algorithm. Developing prediction models would involve identifying the contributing factors using data analysis and based on that, statistical models will be generated that can predict incident duration, probability of secondary crash occurrence, associated delays and queue length

Progress this Quarter (includes meetings, work plan status, contract status, significant progress, etc.):

During this quarter, relevant past studies, reports, journals are reviewed to learn what each of them used for the following: *temporal threshold, spatial threshold, statistical models, dependent variables, independent variables and primary contributing factors*. The literature review is complete in this quarter. The research focused on the thresholds and methodologies used for identification purpose. During this quarter, the team has worked extensively with the Tennessee Roadway Information Management System (TRIMS) database to create a Geodatabase that includes all the necessary attributes of a particular crash for efficient data processing. Using static thresholds (several different temporal and spatial thresholds) secondary crashes were identified in Shelby County for the year of 2013. The team has also started performing the data analysis using the data obtained from TRIMS in order to identify the primary contributing factors as a step towards developing the prediction models.

Anticipated work next quarter:

During the next quarter, the first task that needs to be accomplished is to identify secondary crashes using the dynamic threshold. Dynamic threshold is queue based, hence in order to specify a dynamic threshold incident duration and queue length need to be known. In order to determine the incident duration and associated queue length, detector data will be used.

Once the secondary crashes are identified using (using both static and dynamic thresholds), primary contributing factors leading to a secondary crashes will also need to be identified as a prerequisite for the prediction models. The next step would be to develop prediction models for incident duration, secondary crash occurrence and associated delays and queue Length.

Significant Results:

Most existing studies were limited by the scope as the studies were conducted on only one or two sample freeways or a short segment of highway and on a small regional scale. The major reasons for such scope constraints were the challenge of secondary crash identification in a large scale highway system and due to availability of high resolution traffic data. Also very few studies carried out calibration and validation of the models.

From the literature review, primary contributing factors leading towards the occurrence of a secondary crashes are identified to be: *Primary Incident Type, severity, clearance time, facility type, location (urban vs. rural) , time of day (peak hour, weekdays)* . Also secondary crash identified by dynamic vs. static thresholds can differ by more than 30%. All these findings are taken into great consideration while performing this particular study.

Circumstance affecting project or budget. (Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints set forth in the agreement, along with recommended solutions to those problems).

None.

Potential Implementation:

The research team has established a process of collecting crash, exposure, highway geometry, environmental data for any county in state of TN. All the data are stored in a database and further linked to a shape file for visualization.

At the end of Phase I the state can use the data for following implementation:

- Visualizing predominant crash locations
- Identifying secondary crash locations by user defined thresholds
- Determining same direction and opposite direction secondary crash