Transportation Consortium of South Central States

Portable Roadway High Water Detection System for Driver Safety and Infrastructure Assessment

Key Points

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18SATSA05

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Funds Requested to UTC:
$39,000

Funding Source(s):
Tran-SET
University of Texas at San Antonio

Total Project Cost:
$78,000

Brief Project Description

This study aims to evaluate the functioning of existing flood warning systems in Texas during Hurricane Harvey and devise a portable high water detection based on the Weigh-In-Motion (WIM) technology that can serve as the core of a road flood warning system and record data on the flood depth and duration and passing vehicles that can be used, in conjunction with other post-event data, to evaluate the impact of flooding on the road integrity.

Problem Statement

The dense road networks and numerous low water crossings throughout Texas may be contributing to the higher recurrence rates of floods that pose a danger to vehicles. Several ephemeral streams in Texas have steep slopes. The highly intermittent flow of these streams reduces the overall financial efficiency of such large, expensive structures at road-stream crossings. Therefore, many crossings are constructed as armored sag vertical curves, often with a small corrugated metal culvert pipe as a relief structure to prevent long-term ponding of water upstream of the roadway embankment. In flood conditions water has to flow over the road. These low-water crossings pose immediate danger to vehicles that try to cross during flooding conditions. It is at these crossings where most motor vehicle-related flood fatalities happen.

Objectives

The first objective of this study is “to evaluate the performance of the High Water Detection Systems installed in Texas during Hurricane Harvey flooding” with a focus on the city of Houston, Texas. The second objective is “to design a portable High Water Detection system based on the same technology used in weigh-in-motion (WIM) systems”. The third objective is “to is to develop a mechanism for two-way communication between the portable a High Water Detection System and traffic control systems”.

Intended Implementation of Research

This research includes collecting and analyzing data from different sources including site visits. Other tasks include analysis and synthesis of safety information and spatiotemporal analysis, mail-out surveys, driver observations, and reporting. The research findings will be convened in the form of a list of recommendations, a technical brief, an educational presentation targeting local communities, and a final report. This study will be implemented in consultation with the City of San Antonio traffic engineers and other interested entities within Region 6.

To enhance and facilitate engagement of students, the research team will require faculty to engage their students by including an in-class activity surrounding this study. The research team is dedicated to infusing innovation in associate, undergrad, and graduate coursework each and every semester and will thus share educational materials resulting from this study with all members of Tran-SET. The project team will offer summer research experiences for undergraduate students in collaboration with existing programs. This study will provide full support to two graduate students.

The research team will make research results available to potential users in a form that can be implemented, utilized, commercialized or otherwise applied. The research team has been and will continue to make presentations at TRB meetings, FHWA expert task group (ETG) meetings, transportation-related association meetings and international, national, and regional transportation conferences. The results will be published in prestigious journals.

Anticipated Impacts/Benefits of Implementation

- A major outcome of this study is evaluation of the performance of existing High Water Detection Systems installed in Texas during Hurricane Harvey flooding in order to meet transportation departments' goals and objectives of transportation safety in urban areas.
- A new low-budget, portable High Water Detection system be installed on warning signs at low water crossing locations.
- The approach will help traffic engineers integrate the developed technology into traffic control systems, identify and analyze roadways safety problems and opportunities, select the most effective strategies to address them, determine project limits, and evaluate the priority of proposed improvements.
- The developed approach will allow the research team to determine ways to address safety issues at low-water crossings and provide the safest possible solutions for motorists and members of the local communities.

Weblinks:

- Tran-SET's website (http://transet.lsu.edu/research-in-progress/)
- TBR's Research in Progress (RIP) database (https://rip.trb.org/View/1505469)