Texas A&M Transportation Institute

PROJECT SUMMARY

Texas Department of Transportation

0-6875-01: Automated and Connected Vehicle (AV/CV) Test Bed to Improve Transit, Bicycle, and Pedestrian Safety — Phase II

Background

Public transit vehicles, pedestrians, and bicyclists share roads in urban, suburban, and rural environments in Texas. Signalized intersections in urban areas are complex shared spaces where crashes involving transit vehicles, bicyclists, and pedestrians may occur. This research explored the potential of automated and connected vehicle (AV/CV) technology to reduce or eliminate these crashes. Building on the research conducted in the first phase, Phase II focused on developing and testing a smart intersection and a beta smartphone app to alert pedestrians and bicyclists of buses turning at intersections.

What the Researchers Did

Researchers conducted a preliminary test on the Texas A&M University campus of different technologies to alert pedestrians. They surveyed pedestrians at three intersections in Houston to obtain additional information on preferred alert methods and messages. Researchers also conducted three focus groups in Houston with predominately Spanish-speaking individuals using wheelchairs, individuals with visual impairments, and individuals with hearing loss to gain further insights into alert methods and messages for disabled pedestrians.

Building on the Phase I concept of operations plan, researchers developed the use cases and alert scenarios for the smart intersection, along with the system requirements and the test plan, test scenarios and test procedure. The system developed by researchers involves a bus communicating with the traffic signal equipment using Dedicated Short Range Communication. The smart intersection determines if the bus will be turning at the intersection based on the bus route and schedule. Cameras and sensors allow the system to detect pedestrians and bicyclists waiting to cross at the intersection and an audio-alert message ("caution bus turning" in English and Spanish) and a visual method (a supplemental bus sign above the pedestrian signal) are activated. A beta android smartphone app was also developed and tested.

As illustrated in Figure 1, TTI installed a state-of-the-art smart intersection at The Texas A&M

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University System's RELLIS Campus to pilot test the system. The smart intersection was developed through public-private collaboration that included this research project, traffic signal control and detection equipment donated by Econolite®, and TTI resources. Researchers conducted proof-of-concept tests on seven of the use cases and the audible warning, the supplemental bus sign, and the beta smartphone app. A proof-of-concept demonstration was also completed as part of the final roundtable forum.

What They Found

The results from the preliminary test, surveys, and focus groups indicate that pedestrians prefer multiple methods to receive alerts of buses turning at intersections, including audio, visual, and smartphone notifications. Preferences were voiced for short, targeted messages, such as "caution, bus turning," in English and Spanish.

The proof-of-concept test of the smart intersection was successful, with the audio, visual, and smartphone alerts activated as designed. The Texas Department of Transportation (TxDOT) participants at the final roundtable forum unanimously supported moving forward with Phase III deployment projects.

What This Means

The smart intersection and beta smartphone app can help make shared space at signalized intersections safer for buses, bicyclists, and pedestrians. Phase III deployment projects would further implementation of these safety features, supporting a key TxDOT goal of making the roadway system safer for all users.

Figure 1. Smart Intersection Proof-of-Concept Demonstration.

For More Information

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