UTC Project Information	
Project Title	Development of a Roadside LiDAR-Based Situational Awareness System for Work Zone Safety: Proof-of-Concept Study
University	Texas A&M Transportation Institute Texas A&M University
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PI Contact Information	j-wu@tti.tamu.edu; 972-994-2203
Funding Source(s) and Amounts Provided (by each agency or organization)	Safe-D (Federal): $234,975
Total Project Cost	$234,975
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Start and End Dates	06/01/2020 – 02/28/2022
Brief Description of Research Project	Roadway construction and maintenance has become increasingly more common as the transportation system in the United States ages and the population and traffic volume increases. This fact places more and more work zone workers in close proximity to high-speed vehicles and increases the probability of being stuck. Although potential benefits were identified from work zone situational awareness or intrusion alert systems, only a few of them have been adopted due to the limitations of effectiveness, cost implications and simplicity. Therefore, developing innovative methods to reduce the number of crashes and vehicles intruding into the work-zone area are still highly desirable. The emerging 360-degree light detection and ranging (LiDAR) sensing technology is a potential solution that addresses the adoption issues identified. This project will deploy lightweight portable 360° LiDAR sensors at the roadside and test their potential for providing work zone safety in terms of accuracy, efficiency, and ease of use. The objective is to develop a set of algorithms to collect and interpret real-time information of each approaching vehicle and worker (e.g., location, speed and direction) in and outside work zones using the roadside LiDAR sensing equipment. Ultimately, the outcome of this study will produce a full-scale warning system that is deployable in a real work zone environment. Such a system can detect and analyze live traffic and work zone activity, activate the appropriate warning scheme, and deliver information to roadway workers in work zones so that they can take evasive actions instead of passively relying on traditional safety countermeasures.

Describe Implementation of Research Outcomes (or why not implemented) Place Any Photos Here	The research outcomes we are expecting: 1) The deliverables of the final report and data (as per DMP) 2) EWD plan ➢ 2 graduate students ➢ 1 undergraduate summer intern/2 undergraduate students ➢ Grade 6-12 students 3) T2 plan ➢ TRB Presentation/Publication ➢ IEEE Presentation/Publication ➢ Web Seminar
Impacts/Benefits of Implementation (actual, not anticipated)	The LiDAR currently plays a critical role in the environment-awareness system for an autonomous vehicle and its price has dropped dramatically in recent years. However, autopilot technology is at least a few decades away from sound and mature applications that require technology exploration, road testing, and development of applicable laws and regulations. If LiDAR is only applied to an in-vehicle detection environment, its application will be greatly limited. Therefore, this project is forward-thinking and will break the limitation of the on-board exploration environment. The LiDAR will be deployed on roadside facilities and used to extract real-time high-resolution and high-accuracy micro traffic information of each approaching vehicle and worker in the work zone area, which realizes the first application of LiDAR technology in Cooperative Vehicle Infrastructure System in work zone safety applications.
Web Links • Reports • Project website	https://www.vtti.vt.edu/utc/safe-d/index.php/projects/development-of-a-roadside-lidar-based-situational-awareness-system-for-work-zone-safety-proof-of-concept-study/