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| **Title:** | Improve Safety of Vehicles and Vulnerable Road Users at Intersections Integrating C-V2X and LiDAR Sensing Technologies |
| **The Problem:** | Of the crashes occurring on Texas roadways in 2022, over 40 percent occurred at intersections or were related to intersections. Close to 8,000 of these crashes caused fatalities or incapacitating injuries, resulting in an estimated cost of approximately $3 billion. The highest reported number of intersection related crashes were attributed to:<br>• Left turn (LT) vehicles failing to yield the right of way during permissive LT phases at intersections.<br>• Crashes involving vulnerable road users (VRUs).<br>• Wrong way driving (WWD).<br><br>With the new advancements in connected vehicle (CV) and traffic detection technologies, and the availability of commercial CV (telematic) data, there is potential to improve intersection safety by leveraging the technologies and CV data to reduce the number of crashes and severity of crashes at intersections. |
| **Technical Objectives:** | The objectives of this project are:<br>• Complete a literature review on the state of the practice on C-V2X (cellular vehicle-to-everything) and LiDAR sensing technologies and identify methodologies in using the technologies in reducing intersection crashes.<br>• Investigate the integration the C-V2X communication and LiDAR (technologies to detect and alert road users of potential risks within intersections.<br>    ○ Demonstrate proof of concept and feasibility of integrating C-V2X communication and LiDAR sensors at signalized intersections to improve safety by targeting crashes involving permissive LTs, VRUs, and WWD.<br>        ▪ Evaluate commercially available systems connecting VRUs with CV infrastructure by converting LiDAR tracked road users data to C-V2X compliant basic safety messages and personal safety messages.<br>        ▪ C-V2X systems are installed at various intersections in Sugar Land, TX, within the Houston District for evaluation.<br>• Develop procedure and use case documents for applying the prototype systems to improve intersection safety throughout Texas.<br><br>The expected technology readiness level (TRL) for this project is 6. |
| **Anticipated Deliverables:** | 1. Technical memorandum for each task completed.<br>2. Monthly progress reports.<br>3. Guidelines for implementing commercially available systems at an intersection.<br>4. Project Summary Report<br>5. Research report documenting the findings of this research, including:<br>• The specific messaging within vehicles from C-V2X,<br>• Value of Research (VoR) that includes both qualitative and economic benefits. |
| **Proposal Requirements:** | 1. RFP#1 Q&A Deadline: 12:00 p.m. Central Time, **Tuesday, February 20, 2024.**<br>2. Proposal Deadline: 12:00 p.m. Central Time, **Thursday, March 21, 2024.**<br>3. Use the current "ProjAgre" and "PA Forms" templates located at the [RTI Forms webpage](#).<br>4. Proposals will be considered non-responsive and will not be accepted for technical evaluation if they are not received by the deadline or do not meet the requirements stated in RTI's [University Handbook](#).<br>5. Proposals should be submitted by the University Liaison in PDF format; (1) PDF file per proposal. File name should include project name and university abbreviation.<br>6. This project will be tracked during the life of the project using the Technology Readiness Level ([TRL](#)) scale.<br>7. The 2021 Texas Legislative Session requires that universities be in compliance with Senate Bill 475 by submitting a completed and signed TxDOT Security Questionnaire (TSQ) to [RTIMAIN@txdot.gov](mailto:RTIMAIN@txdot.gov). Universities that have not submitted a completed and signed TSQ one week after award will be considered non-compliant and unable to participate in the Program. |