



Research Project Statement 20-259 FY 2019 Annual Program

Title:	Defining Operational Design Domains (ODDs) for the Safe Blending of Levels 0-4 Connected and Autonomous Vehicles (CAVs) in the Traffic Stream
The Problem:	<p>Texas had almost 3,800 traffic fatalities in 2016. Studies have suggested that driverless vehicles (Level 5 CAVs) may decrease traffic fatalities by up to 90 percent; however, no studies have assessed the accident reduction rates associated with the more near-term reality; blending of Level 0-4 CAVs in the traffic stream. While safety measures inherent in CAVs will reduce accidents, the problem of mixing different sensor technologies, vehicles with dated technology, and drivers that trust their vehicles can communicate with the surrounding environment may actually result in more, not fewer, fatalities in the near term.</p> <p>The federal government has been cautious to pass legislation that defines a real-world operating environment for CAVs. In A Vision for Safety 2.0, the National Highway Transportation Safety Administration provides safety guidelines for Automated Driving Systems (ADS) and generally outlines the Operational Design Domain (ODD) as a segment of the network where and when an ADS is designed to operate. An ODD includes: (1) roadway type on which ADS is intended to operate; (2) geographic area; (3) speed range; (4) environmental conditions in which the ADS will operate; and (5) other domain constraints. No specific definitions are provided, nor are the following issues addressed: ODD certification, regulatory control, law enforcement, or technological challenges associated with the blending of Level 0-4 CAVs within the ODD. Level 4 CAVs are currently being tested on Texas roads and will be available for purchase by 2020. In order to safely accommodate CAVs on TxDOT facilities, TxDOT has the opportunity to define an acceptable environment, or ODD, for their operation and lead the way in the safe integration of CAVs on roadways.</p> <p>Part of this research effort will be to quantify the expected value of the blended CAV environment related to safety performance, and then prepare the infrastructure environment to mitigate any higher risk.</p>
Technical Objectives :	<p>The focus of this research will be twofold:</p> <ol style="list-style-type: none">1. Policy and agency participation:<ol style="list-style-type: none">a. Identify a regulatory agency as an ODD certifying entity.b. Develop and apply rules and protocols related to enforcement of ODD certification, including how CAVs with different levels of technology will blend within ODDs.c. Establish specific criteria that enable uniform application in the review and approval process of ODDs.d. Develop and apply policies related to ODDs for law enforcement in the field.2. Technical:<ol style="list-style-type: none">a. Study the challenge of blending Level 0-4 CAVs, including technology (sensors, on-board data transmission systems, software updates) that will be installed and that technology age as the market advances.b. Determine how vehicles with dated technology will continue to operate alongside newer vehicles through the life cycle of each vehicle, and analyze how the vehicles with varying levels of autonomy work together.c. Determine which supplemental safety elements can be integrated into infrastructure in order to accommodate these vehicles while providing a safe operating environment. This will enable the operator (TxDOT) to confirm which vehicles entering the ODD are capable of autonomous operation safely within the infrastructure.d. Develop a set of standards to provide guidance for defining, enforcement within, and safe operation of ODDs. <p>The expectation of this project is that the end product will obtain a TRL level 7.</p>



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Desired Deliverables:	<ol style="list-style-type: none">1. Technical memorandum for each task completed.2. Monthly progress reports.3. Value of Research (VoR) that includes both qualitative and economic benefits, to be included in the final research report.4. Research report documenting the findings of the research, including:<ol style="list-style-type: none">a. Recommendations for the appropriate ODD-certifying agency or agencies.b. Policies and guidelines for achieving certification, for law enforcement in the field, and for accommodating a blend of Levels 0-4 vehicles within an ODD.c. Technical specifications and standards that achieve a level of safety within an ODD while accommodating Levels 0-4 CAVs.4. Project Summary Report.
Proposal Requirements:	<ol style="list-style-type: none">1. Utilize the "Proj/Agre" and "PA_Form" templates located at the TxDOT RTI website.2. 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, which is also located at the RTI website.3. Proposals should be submitted in PDF format, 1 PDF file per proposal. File name should include project name and university abbreviation.4. This project will be tracked during the life of the project using a Technology Readiness Level (TRL) scale. For more information about the use of a TRL, click.