UTC Project Information	
Project Title	Development of an Infrastructure Based Data Acquisition System (iDAS) to Naturalistically Collect the Roadway Environment
University	Virginia Tech Transportation Institute
Principal Investigator	Reginald Viray
PI Contact Information	rviray@vtti.vt.edu 757-515-0996
Funding Source(s) and Amounts Provided (by each agency or organization)	UTC Safe-D: $79,082.00 City of Virginia Beach: $89,624.00 (In-Kind)
Total Project Cost	$168,706.00 ($79,082.00 for labor costs)
Agency ID or Contract Number	Grant No: 69A3551747115 Project: 04-121
Start and End Dates	01/14/2019 – 01/14/2020
Brief Description of Research Project	Roadways in the City of Virginia Beach have consistently ranked in the top 10 crash cluster locations in the state of Virginia, many of which occur at signal controlled intersections that control flow on to and off of the only major interstate in the City, I-264 [1]. Further, the Virginia Department of Transportation's (VDOT) Pedestrian Action Plan has identified Pacific Avenue, a major oceanfront resort corridor, as a priority pedestrian crash cluster location [2]. The City, like many municipalities, has invested a significant amount of resources in digitizing their transportation system infrastructure. Such is evident at signal controlled intersections where a myriad of sensors such as vision-based cameras, thermal-based cameras, radars, loop detectors, Wi-Fi detectors, Bluetooth detectors and in some cases wireless Dedicated Short Range Communication (DSRC) Road Side Units (RSU) are integrated. However, such assets are used primarily to adapt signal controller Signal Phase and Timing (SPaT) based on traffic flow. An opportunity exists where the City's infrastructure investment can be leveraged to collect, process, analyze and make safety suggestions based on the sensors' observations at dangerous intersections in the City. This proposal seeks to understand the existing systems and how they can be leveraged to provide the City with insight and suggested countermeasures to address the safety issues on these roadways. In addition, this project seeks to develop methods to populate data from such sensors into formats that can be utilized by the industry to assist in the development of connected and automated vehicle safety systems.

Describe Implementation of Research Outcomes (or why not implemented)
 	
Place Any Photos Here
	<u>Expected Task Outcomes:</u>
	• <u>Task 1 – Project Management</u>
	   o Oversight to ensure that milestone achievements, activity progress and deliverables are met, in particular quarterly reports, bi-annual activity surveys, journal articles, final project reports, project closure reports, data exports and status meetings.
	• <u>Task 2 – Roadway Infrastructure Assessment</u>
	   o Catalog of infrastructure sensors deployed at intersections and their capabilities
	   o Data dictionary of available data elements produced with existing sensors and ones needed to support roadway user kinematic characterization
	   o System diagram detailing the interconnectivity of the City's transportation system sensor network and data flows
	   o Qualitative account of observable safety issues with roadway configuration and/or roadway user interactions
	• <u>Task 3 – State of the Art Integration Assessment</u>
	   o Identification of commercial products that are compatible with existing installations
	   o Identification of methods and/or open source tools to augment existing sensor data
	• <u>Task 4 – Data Availability, Acquisition, Processing, Storage and Analysis</u>
	   o Collection and/or access to streaming of relevant sensor data
	   o Processing of intersection sensor data to populate vehicle kinematics into common data formats such as SAE J2735 BSM
	   o Definition of intersection lanes and approaches formatted into a SAE J2735 3/2016 Intersection MAP utilizing open source tools
	   o Deployment of V2V-based safety algorithms using BSM data to characterize roadways
	   o Calculation of time to collision/intersection of vehicles/landmarks to detect critical events based on existing and/or processed sensor data
	   o Quantitative account of observable safety issues with roadway configuration and/or roadway user interactions based on sensor data

	• Task 5 – Proof of Concept System Development and Data Export
	    ○ Proof of concept system
	    ○ VTTI Dataverse export
	• Education and Workforce Development Plan
	    ○ Data from real-world intersections as a source to support course assignments to deploy, test and improve intelligent transportation system based applications
	    ○ Meetings with City officials to highlight capabilities and use of data
	    ○ Speaking and demonstration activities to support City of Virginia Beach Public School STEM events
	    ○ VDOT Student Work
	• Technology Transfer Plan
	    ○ Proof of concept system design document and demonstration web application
	    ○ Journal articles targeting IEEE, TRB and SAE publications
	    ○ Information regarding safety issues and insights from collected data

Impacts/Benefits of Implementation (actual, not anticipated)	An immediate beneficiary of the outputs of this project is the City of Virginia Beach and its local transportation entities. By focusing on the specific intersections within the city that have safety issues, insights can be gained on improving those conditions once uncovered. Further, the system components defined and developed to acquire, process, store and analyze the data represent a conceptual framework that infrastructure suppliers can leverage to develop new product offerings. Further, the data captured and formatted by this system provides a valuable resource that automotive OEMs can leverage to support intersection collision avoidance systems.
Web Links • Reports • Project website	https://www.vtti.vt.edu/utc/safe-d/index.php/projects/development-of-an-infrastructure-based-data-acquisition-system-idas-to-naturalistically-collect-the-roadway-environment/