

UTC Project Information	
Project Title	Vehicle-based Sensing for Energy and Emission Reduction
University	University of South Florida
Principal Investigator	Xiaopeng Li
PI Contact Information	xiaopengli@usf.edu
Funding Source(s) and Amounts Provided (by each agency or organization)	USDOT: \$100,000 USF: \$50,000
Total Project Cost	\$150,000
Agency ID or Contract Number	Sponsor Source: Federal Government CFDA #: 20.701 Agreement ID: 69A3551747119
Start and End Dates	<ul style="list-style-type: none"> ▪ Start date: 4/1/2020 ▪ End date: 3/31/2021
Brief Description of Research Project	<p>Vehicle technologies have undergone drastic improvements in recent years, in particular on sensing technologies that report a variety of vehicle and environment conditions and control technologies that automate vehicle driving. For example, many existing production vehicles are furnished with sensors that can record vehicles operational states, including speed, fuel consumption, steering angle, and each individual tire speed. Further, recently emerging automated vehicles (AV) may be able to provide advanced information about the surrounding information with video cameras, radar sensors, lidar sensors, etc. On the other hand, connected vehicle (CV) technology that enables communications between vehicles and road side infrastructure provides the communication platform to integrate sensor information from multiple vehicles or even a traffic stream. Such information will enable estimating and predicting transportation system states on mobility, energy and emissions. Further, it will help better control AVs to smooth traffic and reduce system energy consumption and emissions, thereby improving environment and community health. This project will set up a framework for utilizing vehicle-based sensing information to assist AV driving and traffic control, aiming to bring in mobility and environmental benefits. The following tasks are proposed to complete this objective.</p> <p>Task 1. Literature review. This task aims to review relevant literature on types of vehicle-based sensors in traffic control. This task will focus</p>

	<p>on research with real-world data collection and experiments rather than simulation-based studies. By the end of the task, we expect to report the available sensor types and relevant traffic control applications. This task will be led by PI Li. PI Mannering and PI Bertini will provide advice on this task.</p> <p>Task 2. Vehicle sensor data collection proof-of-concept test. This task will use the AV and CV facilities at USF to test the feasibility of extracting and sharing sensor data relevant to mobility, environment and safety with the lab vehicles. We will summarize the data types and relevant characteristics (e.g., accuracy, update frequency, and range) of both diagnosis sensors for the target vehicle information but also AV sensors for surrounding environment information. Plans for how to utilize such information on AV control and traffic control will be investigated. This task will be led by PI Li. PI Mannering and PI Bertini will provide advice on this task.</p> <p>Task 3. Case study. Based on the information and findings from previous tasks, a case study will be performed to illustrate the utilization of the vehicle-based sensing data in vehicle and traffic control for improved benefit in environment and/or safety. The case study will focus on the traffic flow on a multi-lane highway segment and investigate how it may be controlled (e.g., in terms of speed and platoon) with consideration of the relationship among vehicle operating features and pavement condition (e.g., smoothness and friction), fuel consumption, emission, and safety. This task will be led by PI Lu. PI Mannering and PI Bertini will provide advice on this task.</p> <p>Task 4. Dissemination. The research team will complete the progress reports and final report as according to the CTECH UTC project requirements. Further, the project team will try to complete one or more technical articles to be submitted to a conference or peer-reviewed journal. This task will be led by PI Li and PI Lu assisted by PI Mannering and PI Bertini.</p>
<p>Describe Implementation of Research Outcomes (or why not implemented)</p> <p>Place Any Photos Here</p>	
<p>Impacts/Benefits of Implementation (actual, not anticipated)</p>	
<p>Web Links</p> <ul style="list-style-type: none"> • Reports • Project website 	<p>http://ctech.cee.cornell.edu/final-project-reports/</p>