

UTC Project Information	
Project Title	Develop and Test Connected Vehicle Freeway Speed Harmonization Systems
University	Virginia Tech Transportation Institute
Principal Investigator	Hesham Rakha
PI Contact Information	HRakha@vtti.vt.edu
Funding Agencies	CVI-UTC (Tier 1 UTC)
Agency ID or Contract Number	TBD
Project Cost	\$150,001.00
Start and End Dates	February 1, 2013 – January 31, 2014
Project Duration	1 year
Brief Description of Research Project	<p>The objective of speed harmonization is to dynamically adjust and coordinate maximum appropriate vehicle speeds in response to downstream congestion, incidents, and weather or road surface conditions in order to prevent/reduce vehicle crashes and maximize traffic throughput. The proposed research effort builds on and extends existing research efforts being conducted at FHWA by developing a novel speed harmonization algorithm that is predictive as opposed to reactive in nature. Specifically, the speed harmonization algorithm extends research being conducted at the Saxton Traffic Operations Laboratory (STOL) by developing an algorithm that predicts the occurrence of shockwaves up to five minutes before their occurrence using a combination of macroscopic traffic modeling and Bayesian filtering techniques. The wireless communication between vehicles and vehicle to roadside equipment (RSE) provide a unique environment to collect traffic data in addition to traditional sensor data. Traffic data gathered from connected vehicles as probes will be combined with fixed-location traffic sensor data to predict downstream recurrent and non-recurrent traffic conditions including speed and shockwave temporal-spatial evolutions. Based on the predicted traffic conditions, as well as weather and road surface conditions, the speed harmonization algorithm will make recommendations on the optimum course of action in an attempt to reduce vehicle crashes, maximize traffic throughput, and reduce vehicle emissions. A field test will be conducted to validate the proposed algorithm using the test vehicles that will be developed as part of the FHWA STOL effort and the connected vehicle test-bed in Northern Virginia.</p>

<p>Describe Implementation of Research Outcomes (or why not implemented)</p> <p>Place Any Photos Here</p>	<p>The goal of this research effort is to develop a dynamic speed harmonization application (SPD-HARM) that makes use of the frequently collected and rapidly disseminated multi-source data drawn from connected travelers, roadside sensors, and infrastructure, as depicted in Figure 1. The application may be a vehicle-integrated device (e.g., a vehicle manufacturer-installed or aftermarket integrated device), a personal wireless application (e.g., a smartphone or other handheld device), or another application capable of collecting, receiving, and disseminating movement and locational information. The goal of SPD-HARM would be to improve the nature, accuracy, precision, and speed of dynamic decision making by both system managers and system users.</p> <p>In achieving the identified goal the objective of the project is to develop speed decision algorithms to achieve the mobility, safety, and environmental goals of dynamic speed harmonization. A connected vehicle environment will enable systems and algorithms that can generate traffic condition predictions, alternative scenarios, and solution evaluations in real-time. This would entail developing a simulation-based optimization tool to compute the optimum speed recommendations. Note that this requires an increase in computational capability as well as long-term storage of historical data. Performance measurement will play an important role in evaluating and improving dynamic speed harmonization algorithms and methods.</p>
<p>Impacts/Benefits of Implementation (actual, not anticipated)</p>	<p>This study is still in progress, actual impacts and benefits of implementation will be determined in Winter 2014 when the study is completed. This page will be resubmitted in the next round of reporting to state these actual impacts and benefits.</p>
<p>Web Links</p> <ul style="list-style-type: none"> • Reports • Project Website 	<p>http://www.connectedvehicleinfrastructure-utc.org/?q=node/21</p> <p>https://rip.trb.org/browse/dproject.asp?n=33462</p>