

UTC Project Information	
Project Title	Connected Vehicle-Infrastructure Application Development for Addressing Safety and Congestion Issues Related to Public Transportation, Pedestrians, and Bicyclists
University	Morgan State and Virginia Tech
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Project Duration	2 years
Brief Description of Research Project	<p>The idea that vehicles, travelers, and infrastructure can be “connected” and communicate one another and function as one unit of transportation system will bring about many potential benefits and opportunities to improve human mobility. Traditionally, transportation is viewed as having two basically separate parts: demand and supply. Demand is about the people (and goods) who wish to travel (or needs to be transported). Their motivation is driven by economic and social needs. The supply side of the transportation system consists of the vehicles, the ways, the terminals, the control, and the management, which must function together. This traditional framework of transportation is changing with the introduction of the connected vehicle concept. That is, this concept is an instrument to connect the elements of demand and supply.</p> <p>The traditional problems of transportation are caused by disconnect between supply and demand. In other words, the supply side could not respond to demand, and the demand side could not adjust to the supply side requirements and limitations. Imbalance between supply and demand has been the main cause of congestion and all other problems of transportation.</p> <p>The concept of connected vehicle can change this imbalance. The vehicles do not literally mean the automobiles or trucks. Essentially it means the people, who have the desire to engage in the act of traveling. The automobiles are the means to travel, but people are the units of travel. Hence, the proposed connected vehicle project is about connecting people, vehicles, and transportation infrastructure.</p> <p>What is proposed in this document is application of the connected vehicle concept to public transportation. It is to make the public transportation operation more efficient and productive by making it</p>

	<p>more responsive to the immediate travel needs of the public. Further, it is to improve the access environment of transit passenger (including disabled persons) by improving safety during street crossing before and after the bus trip. The connection refers to people-to-people, people-to-bus, people-to-infrastructure, bus-to-bus, people-to-vehicles on the street, bus-to-vehicle, and bus-to-bus stop.</p> <p>This proposal has the following sections. First, we present three ideas, or scenarios, in which the concept is implemented. These ideas are steps of gradual changes in the modes of transit operations at different levels of passenger demand. Second, necessary elements and specific roles of connection or communications are presented. Third, the research subjects are identified. Fourth, we present how the resources available in the National Capital Region of Northern Virginia can be utilized for the research process. Finally the expected outcome of the project and the schedule will be presented.</p>
<p>Describe Implementation of Research Outcomes (or why not implemented)</p> <p>Place Any Photos Here</p>	<p>Application of the connected vehicle concept to the three <i>Ideas</i> presented above can transform the traditional perception of public transportation, such as the feeling of uncertainty of service, inconvenience, inefficiency, insecurity, discomfort, and longer travel time compared with auto. In order to implement the concept of connected vehicle, however, we need to clarify the function of connection between the system elements, i.e., passengers, buses, road infrastructures, and other highway vehicles.</p> <p>Connection will be the following types:</p> <ul style="list-style-type: none"> -Passengers to Bus (P2B): Passenger informs the bus about details of his/her travel desire including, origin, destination, desired arrival time, disability status, the number of persons traveling together. -Bus to Passenger (B2P): availability of bus at the bus stop, bus arrival time, the level of occupancy, transfer location (if needed), expected arrival time at traveler’s destination, and fare. -Bus to the vehicles traveling near the stop (B2V): impending bus stopping, impending bus departing from the stop. -Passengers to vehicles on the street before street crossing (P2V): impending passenger crossing the street. -Passenger to roadside infrastructure (P2I): street light intensity change, activation of pedestrian crossing alert device. -Bus to bus (B2B): locations of individual buses, occupancy level. -Bus to infrastructure (traffic signal, roadside infrastructure including street light) (B2I): activation of street light intensity, bus operating status information <p>Among these connections P2B and B2P, particularly B2P, are the key to the operation of the three <i>Ideas</i>. They offer the sense of <i>assurance</i> to the passengers. The traditional mechanisms of communications bus-to-bus have been through a central command center. Although bus arrival information is available at select stop locations, such as NEXTBUS, displays the bus arrival times only. The current system does not allow real time communication between buses and passengers. The important feature of the proposed connected vehicle scheme is</p>

	<p>the two-way communication with all involved parties (passengers, buses, infrastructure, and street traffic).</p> <p>The outcome which we aim to achieve is twofold:</p> <ul style="list-style-type: none"> -Performance specification of connected vehicle application to public transportation. -Identification of the field testing process of the concept. <p>The research programs presented above will produce the features of the three <i>Ideas</i> when they are implemented using the connected vehicle concept. The outcome will be the Performance specifications of the connected vehicles to make the three Ideas effective in improving efficiency of operation and the quality of service to the passengers.</p> <p>The specifications will show what each element of the connected vehicle network must perform, including the roles of passengers, bus stops, buses, street crossing warning devices, and the central bus control center with respect to application of the connected vehicle. Further the potential limits of the application of the connected vehicle will be identified in terms of the current technology, due to the current regulations, and the effectiveness in improving transit service.</p> <p>How to utilize the available connected vehicle resource being built in the Northern Virginia will be addressed. Dr. Kikuchi is located in at Virginia Tech’s national capital region in Falls Church, which is within 5 miles of the test bed sites being constructed by VTTI. Hence, his research team has significant logistical advantages to test the concept. Our team can participate in specifications for test bed by presenting the possibility of transit application and its unique requirements and feasibility.</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 Summer 2013 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/70</p> <p>http://rip.trb.org/browse/dproject.asp?n=32365</p>