UTC Project Information	
Project Title	Infrastructure Safety Assessment Using Connected Vehicle Data
University	University of Virginia
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PI Contact Information	Bls2z@virginia.edu
Funding Agencies	CVI-UTC (Tier 1 UTC)
Agency ID or Contract Number	TBD
Project Cost	$79,868.91
Start and End Dates	September 1, 2012 – August 30, 2013
Project Duration	1 year
Brief Description of Research Project	Transportation agencies devote significant resources to analyzing crash data collected by responding police agencies to identify "hot spots" – locations which experience larger than normal numbers of crashes. In many cases, upon identification of a hot spot, field investigation will point to a feature of the infrastructure that is contributing to the crashes. This feature may then be addressed specifically to improve safety. This method, detailed in the *Highway Safety Manual's* Roadway Safety Management Process, has been used for many years, and has proven to be effective. However, this method also has significant shortcomings. One of the key shortcomings is that the agency must wait for a large number of crashes to accumulate before a hot spot may be identified. In other words, this is a very reactive method that requires a number of crashes to occur before corrective action may be taken. Fortunately, there is a reason that crashes are most often referred to as "accidents." They are infrequent, even at most hot spot locations. Thus, for a statistically significant accumulation of crashes to occur requires a rather long period of time. Furthermore, accurate capture of the location of crashes has long been a challenge in the transportation community. Police reports have been notoriously inaccurate in terms of crash location – although this is improving somewhat with the use of GPS. Thus, even when a hot spot is identified, the exact location of the problem is often difficult to pinpoint. Thus, there is a need to develop a more proactive way to accurately identify "hot spots" – locations that require modifications to the transportation infrastructure to improve safety. The premise behind this project is that for every actual crash, there also exist numerous "near misses" where drivers' take last second, extreme evasive action (such as swerving or rapid deceleration) to avoid a crash. These near

	misses may be as significant as actual crashes in terms of indicating potential safety problems. The challenge lies in identifying and compiling these near misses (since they have never been formally reported by individuals or through the police). However, with vehicles in a connected vehicle environment, basic vehicular operation data will be available from the vehicle data bus. If significant evasive maneuvers may be extracted from this data, along with the corresponding GPS location, this near miss data may be analyzed by a transportation agency in a manner similar to current police crash reports to identify hot spots. Using connected vehicles, instead of police reports, offer the potential for a much quicker and more accurate network screening step, which in turn speeds up the entire Roadway Safety Management Process. This project will analyze data from past field tests to develop prototype algorithms for hot spot identification from vehicular operations data. These algorithms will then be demonstrated and tested in the connected vehicle UTC Northern Virginia test bed to determine if they successfully extract "near miss" maneuvers. This data will then be analyzed to determine if hotspots may be identified. Then, finally, these hot spots will be examined in terms of traditional crash data to determine if there is a correlation – thus pointing to the potential of this approach.
Describe Implementation of Research Outcomes (or why not implemented) Place Any Photos Here	The objective of this project is to investigate the feasibility of using connected vehicle data to create a system to identify infrastructure safety problems based on vehicular data indicating a high frequency of evasive driving maneuvers indicative of near-misses. Specific objectives of this study can be summarized as follows: 1. To identify thresholds for vehicle maneuvers (i.e. lateral control and accelerations) that may indicate an evasive maneuver. 2. To delve into statistical tests to combine frequency of maneuvers with location data to identify hot spots. 3. To demonstrate and test this approach using the UTC Northern Virginia test bed. 4. To validate this approach by comparing results to traditional crash data analysis results. The final success of this project will be determined by the ability to identify hot spots more quickly and accurately than using traditional methods. Considering that near misses are much more frequent than collisions, there should be evidence of a hot spot more quickly because of the ability to observe a near miss, combined with the accurate location of the vehicles involved using connected vehicles. Final results of this project will include the development of technique for network screening using connected vehicle technology. The following tasks will be completed in order to meet the objectives of this project. 1. Analyze vehicular data available from connected vehicles to identify measures that may be used to identify evasive maneuvers. 2. Develop threshold values to use in extracting evasive maneuvers

	from vehicular data. 3. Use network kernel density algorithms to identify hot spots from vehicular data. 4. Apply results of tasks 1-3 to demonstrate and test the system on the UTC Northern Virginia test bed. 5. Compare hot spots identified in Task 4 with traditional crash data analysis to determine level of correlation.
Impacts/Benefits of Implementation (actual, not anticipated)	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.
Web Links • Reports • Project Website	http://www.connectedvehicleinfrastructure-utc.org/?q=node/69 http://rip.trb.org/browse/dproject.asp?n=32364