UNIVERSITY TRANSPORTATION CENTER

RESEARCH BRIEF

# Connected Vehicle Safety Applications using V2X Under Consideration of Bicycles, Pedestrians and Persons with Special Needs

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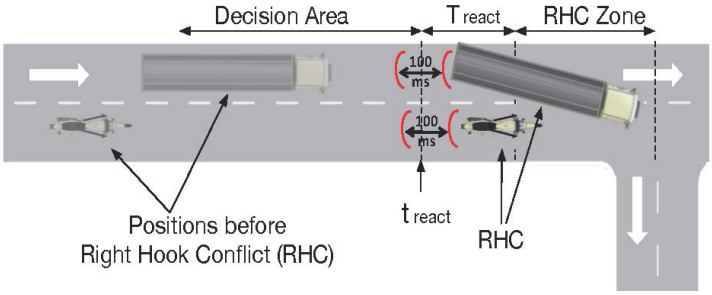
## Background

One of the essential goals of Intelligent Transportation Systems is to increase safety and reduce accidents. Lately, in the context of connected vehicles, Safety Applications (SA) were introduced that rely on communication between vehicles and with the infrastructure, such as traffic lights in an intersection, to alert drivers to potential hazards. These safety applications are expected to reduce road accidents by up to 82% and eventually will save thousands of lives in the United States. Whereas significant research has considered motorized vehicles, little research has focused on the unique needs of bicycles, pedestrians or people with special needs, e.g. wheelchair operators. What they have in common is that they often move at lower speed, occupy limited space, and are frequently overlooked by the drivers of vehicles. Most importantly, they are much more vulnerable and susceptible to injuries in an accident.

An example of an application with unique needs is the avoidance of the so-called Right Hook Conflict (RHC) for bicycles. The RHC is a common source of accidents, where a right-turning vehicle causes a crash with a bicycle to its right. The drivers of the turning vehicles are mostly unaware of the bicycle to its right.






## Research Project

The current research effort investigates the feasibility and reliability of bicycle Safety Applications (SA) that use the same basic communication capabilities as vehicles, thus allowing vehicle-to-bicycle (V2B) communication. However, just like in the case of SA for vehicles, their reliability of SA may be affected by natural phenomena that degrades communication and malicious act. This may affect the accuracy of data in general, as in the case of GPS errors and timing errors, but it may be the result of malicious act like jamming of the communication.

In the context of the project a bicycle safety application to reduce accidents due to Right Hook Conflict is designed and implemented. The bicycle safety application uses information that is exchanged in periodic beacon messages emitted by all vehicles, including bicycles. There are several issues that are being investigated, as they have the potential to negatively affect the SA. First, the impact of GPS errors and their impact on the potential short distances between bicycles and vehicles are studied. Second, the mitigation to malicious act and benign message omissions are investigated. This is supported by field experiments with off-the-shelf communication equipment. For this purpose vehicles were equipped with Arada LocoMate Classic OBUs and the bicycle with a mobile Arada LocoMate ME.

### ABOUT THE AUTHORS

The research team consisted of Axel Krings of the University of Idaho.

### ABOUT THE FUNDERS

This research was funded by the Pacific Northwest Transportation Consortium, with additional support from the University of Idaho.

### EXPECTED DATE OF COMPLETION

August 2021

### FOR MORE INFORMATION

http://depts.washington.edu/pactrans/research/projects/connected-vehicle-safety-applications-using-v2x-under-consideration-of-bicycles-pedestrians-and-persons-with-special-needs/