WiFiHonk: Smartphone-based Beacon Stuffed WiFi Car2X-Communication System for Vulnerable Road User Safety

Abstract: Despite various high-tech Vehicle-to-Vehicle (V2V) and Vehicle-to-Infrastructure (V2I) communications that have been developed for enhancing traffic safety, protecting vulnerable road users (VRU), such as pedestrians and bicyclists from the vehicles and trains still heavily relies on the traditional sound warning method. Furthermore, as smart devices continue to become highly ubiquitous, the more VRU are shutting out the safety related warning sounds. A traffic accident study shows the number of headphone-wearing VRU involved in roadside accidents has tripled since 2004. Although recently a few Car2Pedestrian communication methods have been proposed by various car makers, their practical usage is still in question. They assume VRUs' active attention to the communication while walking, and also mostly require special communication devices to cope with the wide range of mobility. In this work, we propose a smartphone based Car2X communication system, named WiFiHonk that can alert of potential collisions to both VRU and vehicles in order to especially protect the distracted VRU. WiFiHonk provides a practical safety means for the distracted VRU without requiring any special device using the WiFi of a smart device. It is novel in that it removes the WiFi association overhead using the beacon stuffed WiFi communication and also provides an efficient collision estimation algorithm to issue appropriate warnings. Our experimental and simulation studies validate that WiFiHonk can successfully alert the VRU within a sufficient reaction time frame.