Multimodal Alerting Interface with Short-Range Transmissions

Introduction
The connected vehicles (CV) program is a DOT initiative that uses a dedicated wireless communication technology to enable safer, smarter, and greener surface transportation. While significant efforts are being made to bring motor vehicles and transportation infrastructure onto this CV network, bicycles have been largely overlooked. As a result, a significant need exists to bring cyclists onto this network, to enable connected vehicles and infrastructure to be made aware of their presence, and enable cyclists to take advantage of safety and transportation benefits available when receiving data from other connected entities.

Project Summary
Under a Phase I DOT FWHA-funded SBIR effort (Contract No. DTRT5716C10023), Charles River Analytics and our partners at Virginia Tech Transportation Institute (VTTI) designed a prototype Multimodal Alerting Interface with Networked Short-Range Transmissions (MAIN-ST). Our Phase I MAIN-ST prototype demonstrated the feasibility of bringing cyclists onto the vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) networks using a hardware-agnostic approach, to sourcing and transmitting a robust basic safety message for bicycles (BSM-B). This capability required a COTS radio transmitter, which can be optionally tethered to a custom smartphone application to enable cyclists to take advantage of being on the CV networks. The figure below shows the MAIN-ST system architecture, with key system capabilities including:

Automated hazard assessment:
- Enables detection of potential upcoming V2V and V2X hazards to drive alerting

Multimodal hazard alerting:
- Empirically-grounded audio, haptic, and visual alerting symbologies

Speech-based hazard reporting:
- Enables crowdsourced cyclist-specific hazard reporting & sharing (i.e., Waze for cycling)

Hardware-agnostic approach:
- Enables cyclists to ride only with the equipment they want

Safe-ride planning:
- Enables cyclists to plan a route that aligns with their skill level and minimizes risk

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