Vehicle localization using V2X communication

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The future of transportation systems is going towards autonomous and assisted driving, aiming to reach full automation. There is huge attention toward communication technologies expected to offer vehicular application services, while most of them are location-based services. These application services require precise, reliable, and secure positioning with sub-meter level accuracy, especially in the areas where the GNSS system does not provide the required positioning accuracy.

This work seeks to examine localization accuracy limits using RTK GNSS and vehicle-to-infrastructure communication channels provided by IEEE 802.11p and LTE-V. Real data measurements obtained on our highway testbed are used to model and simulate the propagation losses, position of base stations, the route followed by the vehicle, and the geometry of the vehicular network. Cramer-Rao lower bound, geometric dilution of precision, and least square error for time difference of arrival localization technique are investigated. Based on our analyses and findings providing larger signal bandwidth dedicated to localization, having network sites at both sides of the highway, and considering the geometry between vehicle and network sites improve vehicle localization accuracy.