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RESEARCH ONLINE

INTEGRITY MONITORING OF LTE SIGNALS OF OPPORTUNITY-BASED NAVIGATION FOR AUTONOMOUS GROUND VEHICLES

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Proprietary receivers and navigation frameworks for autonomous ground vehicle (AGV) navigation with long-term evolution (LTE) cellular signals demonstrate meter-level accuracy with standalone LTE signals and lane-level accuracy with LTE signals coupled with other sensors (inertial and lidar). As the number of systems that rely on cellular signals for navigation grows, the need for monitoring the integrity of their navigation solution becomes essential. This paper proposes a receiver autonomous integrity monitoring (RAIM) framework for AGV navigation with LTE signals of opportunity. Experimental results evaluate the efficacy and accuracy of the proposed RAIM-based fault detection and exclusion technique, demonstrating a reduction of 22% in the position root-mean-squared error (RMSE). **FIGURE 1** demonstrates the RAIM framework: (a) When GNSS signals are unusable, LTE signals are used for navigation and integrity measures are calculated; (b) simulation results of downtown Riverside, California, where the black regions represent areas where multipath is expected to exceed 0.5 meters; (c) experimental setup; (d) environment and location of LTE towers; and (e) experimental results showing severe multipath being autonomously detected and excluded. The estimation error represents the difference between the ground truth from an RTK GNSS-IMU system and our LTE-IMU system. More information available via **www.aspin.ucr.edu** and **www.ion.org/publications/ browse.cfm**.

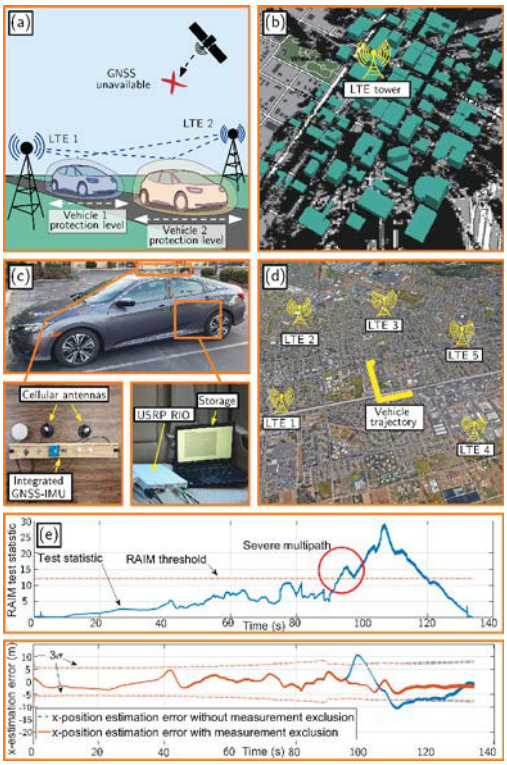

FIGURE 1 RAIM framework for LTE-based navigation without GNSS signals. (Images: Authors)

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