

Abstract Details

Session title: G05f - Multi-Signal Positioning, Remote Sensing and Applications

Session type: IAG (Geodesy)

Symposium: G05

Presentation number: IUGG19-2832

★ Abstract title:

A Benchmarking Measurement Campaign to Support Ubiquitous Cooperative Platform Localization in GNSS Denied and Indoor Environments

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Localization in GNSS-denied/challenged indoor/outdoor and transitional environments represents a challenging research problem. As part of the joint IAG/FIG Working Groups 4.1.1 and 5.5 on Multi-sensor Systems, a benchmarking measurement campaign was conducted at The Ohio State University. Initial experiments have demonstrated that Cooperative Localization (CL) is extremely useful for positioning and navigation of platforms navigating in swarms or networks. In the data acquisition campaign, multiple sensor platforms, including vehicles, bicyclists and pedestrians were equipped with combinations of GNSS, Ultra-wide Band (UWB), Wireless Fidelity (Wi-Fi), Raspberry Pi units, cameras, Light Detection and Ranging (LiDAR) and inertial sensors for CL. In the outdoor tests, the GPSVan of The Ohio State University was used as the main reference vehicle. Pedestrians wore a specially designed helmet equipped with some of these sensors. An overview of the experimental configurations, test scenarios, characteristics and sensor specifications is given. The presented results include descriptions of the benchmarking datasets, preliminary data processing, UWB sensor calibration and Wi-Fi indoor positioning with room-level granularity as well as platform trajectory determination. It has been demonstrated that all involved sensor platforms in the different test scenarios have gained a significant increase in positioning accuracy by using ubiquitous user localization. For example, in the indoor environment, success rates of approximately 97% was obtained using Wi-Fi fingerprinting for correctly detecting the room-level location of the user. Using UWB, decimeter-level positioning accuracy is demonstrable achievable under certain conditions. The full sets of data is being made available to the wider research community through the WG.