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Kolloquium Satellitennavigation

Deep Urban Unaided Precise GNSS Vehicle Positioning

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Collaborative sensing and traffic coordination require vehicles to know and share their own position. How accurately? The proposed DSRC basic safety message, a first step in V2V coordination, does not yet define a position accuracy requirement, effectively accepting whatever accuracy a standard GNSS receiver provides. But automated intersection management, tight-formation platooning, and unified processing of sensor data - all involving vehicles of different makes that may not share a common map - will be greatly facilitated by globally-referenced positioning with sub-30-cm accuracy.

Carrier-phase-based GNSS positioning (CDGNSS) can meet the most demanding accuracy requirements envisioned for automated and connected vehicles, but has historically been either too expensive or too fragile for widespread adoption.

The University of Texas Radionavigation Laboratory is engaged in developing a high-integrity CDGNSS-vision-radar-inertial system for precise all-weather vehicular positioning in rural and urban environments.

As a step toward this goal, it is of interest to evaluate the performance of stand-alone CDGNSS techniques - those unaided by IMUs, odometry, or vision - in urban environments. Such a study will reveal why and when aiding is necessary, and how a CDGNSS positioning system might behave if aiding were somehow impaired or unavailable, whether due to sensor faults or poor visibility conditions.

This talk presents the most thorough study to date of vehicular carrier-phase differential GNSS positioning performance in a deep urban setting.

Introduction of the author: Prof. Todd E. Humphreys

Todd E. Humphreys is an associate professor in the department of Aerospace Engineering and Engineering Mechanics at the University of Texas at Austin, Director of the UT Radionavigation Laboratory and associate director of the UT SAVES center, which works at the intersection of sensing, communication, and data analytics for automated vehicles. He received a B.S. and M.S. in Electrical and Computer Engineering from Utah State University and a Ph.D. in Aerospace Engineering from Cornell University. He specializes in the application of optimal detection and estimation techniques to problems in satellite navigation, automated systems, and signal processing. His recent focus has been on secure perception for automated systems, including navigation, timing, and collision avoidance, and on centimeter-accurate location for the mass market. Dr. Humphreys received the University of Texas Regeants' Outstanding Teaching Award in 2012, the National Science Foundation CAREER Award in 2015, and the Institute of Navigation Thurlow Award in 2015.

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