

Abstract

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An Efficient Ultra-Tight GPS/RISS Integrated System for Challenging Navigation Environments

The Global Positioning System (GPS) provides an accurate navigation solution in the open sky. However, in some environments such as urban areas in the presence of signal jamming, GPS signals cannot be easily tracked since they could be harshly attenuated entirely blocked. This often requires the GPS receiver to go into a signal re-acquisition phase for the corresponding satellite. To avoid the intensive computations necessary for the signal re-lock in a GPS receiver, a robust signal-tracking mechanism that can hold and/or rapidly re-lock on the signals and keep track of their dynamics becomes a necessity. This paper augments a vector-based GPS signal tracking system with a Reduced Inertial Sensor System (RISS) to produce a new ultra-tight GPS/INS integrated system that enhances receivers' tracking robustness and sensitivity in challenging navigation environments. The introduced system is simple, efficient, reliable, yet inexpensive. To challenge the proposed method with real jamming conditions, real experiment work was conducted inside the Anechoic Chamber room at the Royal Military College of Canada (RMC). The Spirent GSS6700 signal simulator was used to generate GPS signals, and an INS Simulator is used for simulating the inertial measurement unit (IMU) to generate the corresponding trajectory raw data. The NEAT jammer, by NovAtel, was used to generate real jamming signals. Results show a good performance of the proposed method under real signal jamming conditions.