

Using Locata and INS for indoor positioning

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ABSTRACT

Indoor positioning with high accuracy and reliability is widely needed in many applications, including warehouse automation, product tracking and pedestrian navigation in hospitals, shopping malls, and public buildings. The integration of GNSS and an Inertial Navigation System (INS) is a critical navigation system design for outdoor environments because it can provide high update rate of solution, better accuracy and reliability. However, as GNSS is not available in indoor environments due to signal blockages and attenuation, the accumulated drift error of INS would result in the integration system generating solutions of poor accuracy. One way to address this is to consider alternative technologies which may be able to replicate GNSS performance indoors. Locata is a ground-based “GNSS-like” navigation system which can transmit ranging signals at several frequencies in the 2.4GHz Industrial, Scientific and Medical (ISM) radio bands. Its new innovative correlator beamforming antenna, known as “Timetenna”, now is able to deliver multipath-mitigated attitude and position information. For the first time a range-based positioning technology can give direction/attitude information, a new observable for the solution fusion algorithm.

In this paper, the authors integrate the INS and Locata systems, using Locata’s position, velocity and attitude solutions to calibrate INS observations in order to achieve an accurate, robust and continuous indoor navigation solution. The multi-sensor experiment conducted at Locata’s Numeralla Test Facility, Australia is also described in the paper. The measurement data were collected and post-processed to evaluate the overall positioning performance and to analyse limitations of the integrated system. The test results indicate that Locata can be substitute for GNSS providing positioning service in severe multipath indoor environments, and the integrated system is capable of high accurate, seamless navigation.

KEYWORDS: Indoor positioning, Locata, INS, Multi-sensor integrated system