TECHNOLOGY

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Efficient Performance Evaluation of Low-Cost MEMS Inertial Navigation Sensors

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Background

A team of researchers from the University of Calgary's Department of Geomatics have developed a new method for efficiently evaluating the performance of any MEMS Inertial Measuring Unit (IMU) in navigation applications. Traditionally, an IMU's navigation performance can only be effectively assessed through field testing; however, this newly developed method can **accurately emulate a MEMS IMU's navigation performance based only on static IMU data**, collected in a lab or field environment. The developed method emulates field test data by treating the MEMS sensor static data as sensor errors, which are then grafted onto IMU data collected from a high-grade IMU field test. This high-grade IMU data only needs to be collected a single time and can be used on all MEMS IMUs under test. Using several testing scenarios, this method has been shown to provide time-efficient, cost-effective, and accurate performance evaluation of MEMS IMUs, as well as the flexibility to analyze several MEMS sensors using the same kinematic high-grade IMU data.

Commercial navigation systems are trending towards the implementation of integrated low cost sensor technology. Advances in Micro-electro-mechanical systems (MEMS) have made it possible to produce chip-based inertial sensors for use in navigation systems which are small, lightweight, reliable, and consume very little power. However, due to low-cost and bulk productivity, manufacturers of MEMS sensors are unable to provide comprehensive specifications of the navigation performance of each model of sensors. Current methods of evaluating MEMS sensor performance all have individual drawbacks. Lab testing generally cannot accurately predict a sensor performance in actual navigation systems, while it can be difficult to model sensor errors accurately in Inertial Navigation System (INS) simulation. Field kinematic testing is the only accurate way to evaluate a sensor's performance in a realistic environment, however this method is time consuming and costly.

Areas of Application
- Inertial Navigation Systems.
- Multi-Sensor Integrated Navigation Systems

TECH TO BUSINESS

Competitive Advantages
- Shortened sensor evaluation time.
- Accurate MEMS sensor evaluation.
- Cost-savings.
- Flexibility to analyze several MEMS sensors

Intellectual Property Status
- Issued US 8,359,182

Publications
- US 20090319228
- X. Niu, C. Goodall, S. Nassar, and N. El-Sheimy, "An Efficient Method for Evaluating the Performance of MEMS IMUs," IEEE/ION Position Location and Navigation Symposium, PLANS 2006, San Diego, USA, April 25-27, 2006, pp. 766-771.