Design of Kalman filter of attitude measurement of spinning projectile based on magnetic sensors and inertial sensors

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Abstract: The low accuracy of MEMS inertial sensors cannot provide long-time steady attitude due to large attitude error caused by drift, and the attitude error calculated by magnetic sensors is not accumulated with time, the speed of attitude update is slowly. In order to solve these questions, a low cost scheme of full attitude detection system composed of inertial sensors and magnetic sensors is presented, and the Kalman filter is adopted to merge the information comed from inertial sensors and magnetic sensors. The difference between attitude angles calculated by magnetic sensors and method of equivalent rotation vector is used as the observed value, and the drift of inertial sensors and the error of attitude angles are used as state vector. The geomagnetic field strength needn't be known in solution. The effectiveness of this algorithm is demonstrated by simulation, and the high accuracy attitude measurement can be achieved by the composition of magnetic sensors and inertial sensors.

Author Keywords: Attitude determination; Kalman filter; Magnetic sensors; MEMS inertial sensors; Spinning projectile

Year: 2010

Source title: Zhongguo Guanxing Jishu Xuebao/Journal of Chinese Inertial Technology

Volume: 18

Issue: 1

Page : 76-80

Link: Scorpus Link

Document Type: Article

Source: Scopus

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