

基于MIMU和磁强计的在线实时定姿方法

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基金项目：

摘要：

针对航姿参考系统(AHRS)小型化、低成本工程实现的需要, 基于微惯性测量单元(MIMU)及磁强计, 提出了一种在线实时定姿方法。采用四元数法描述系统模型, 采用优化的梯度下降算法对加速度计和磁强计测得的数据进行处理, 并通过互补滤波器与陀螺仪测得的结果融合, 提高姿态解算精度。给出了详细的算法推导。通过在线测试对算法的静态及动态性能进行了评估, 并与Kalman滤波算法进行了比较。结果表明设计的定姿方法实现简单, 参数调整方便, 姿态跟踪误差小, 运算量小, 便于在嵌入式微处理器中实现在线实时定姿, 具有较强的实用性。

关键词：MIMU; 磁强计; 定姿; 梯度下降法; 互补滤波器

On-line Real-time Attitude Determination Method Using MIMU and Magnetometer

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Abstract:

For the requirements of miniaturized and low-cost engineering implementation of the Attitude and Heading Reference System (AHRS), a real-time attitude determination method based on MIMU and magnetometer is proposed. Quaternion is used to describe the system, accelerometer and magnetometer data is disposed by an optimized gradient descent algorithm and Complementary Filter is used to fuse the data with gyroscope measurement to improve the accuracy. Detailed algorithm derivation is introduced. The on-line experiment was conducted to evaluate the performance of the algorithm, and it's compared with Kalman Filter. The results indicate that the designed method has the characteristics of easy realization, convenient parameter adjustment, low error of tracking, low computational load and is apt to implement in embedded microprocessor, so it has good practicality.

Keywords: MIMU; magnetometer; attitude determination; gradient descent algorithm; complementary filter

投稿时间：2012-12-09

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