

## 小型尾坐式飞行器自适应SRUKF姿态算法

作者: 武斌, 陈鹏, 胡永江, 王长龙

单位: 军械工程学院

基金项目:

摘要:

针对小型尾坐式飞行器姿态估计问题, 设计了由陀螺、加速度计、磁强计组成的姿态测量系统。为了抑制MEMS陀螺漂移导致的姿态误差, 以四元数为状态变量, 以加速度计和磁强计的输出作为观测变量, 建立了滤波模型。采用平方根无迹卡尔曼滤波(SRUKF)对传感器信息进行融合, 保证了滤波算法的数值稳定性。由于小型尾坐式飞行器抗干扰能力弱, 引入自适应算法, 解决了量测信息受到干扰时滤波精度下降的问题, 提高了系统的鲁棒性和可靠性。仿真结果表明, 存在外界磁场干扰时, 姿态误差小于 $1^\circ$ 。通过实际飞行实验, 验证了算法的可行性。

关键词: 姿态估计; 尾坐式飞行器; 平方根UKF; 自适应

## Attitude Algorithm of Small Tail-sitter Aircraft Based on Adaptive SRUKF

**Author's Name:**

**Institution:**

**Abstract:**

For attitude estimation of small tail-sitter aircraft, the attitude measurement system composed of gyroscope, accelerometer and magnetometer is designed. In order to prevent the attitude error caused by drift of MEMS gyroscope, the filter model is established with quaternion as state variables and the output of accelerometer and magnetometer as measurement information. Square root kalman filter (SRUKF) is carried out on the sensor information fusion to guarantee the numerical stability of filtering algorithm. Due to the weak anti-interference ability of small tail-sitter aircraft, the adaptive algorithm is introduced, which solves the problem of the decline of the filtering precision when measurement information is interferenced and improves the robustness and reliability of the system. Simulation results show that attitude error is less than  $1^\circ$  under the condition of magnetic disturbance. Actual flight test verifies the feasibility of the algorithm.

**Keywords:** attitude estimation; tail-sitter aircraft; SRUKF; adaptive

投稿时间: 2014-03-21

[查看pdf文件](#)