

论文与报告

## 一种用于移动机器人状态和参数估计的自适应UKF算法

宋崎, 韩建达

1. 中国科学院沈阳自动化所 沈阳 110016

2. 沈阳航空工业学院 沈阳 110136

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摘要

为了提高 UKF 的估计精度和收敛性, 提出了一种新的自适应滤波方法. 新息方差阵的测量值和其相应的估计/预测值的差被用于构造指标函数. MIT 规则被用于构造自适应机制以指标函数最小来在线更新过程不确定性的方差值. 更新后的方差反馈给常规 UKF. 这种自适应机制主要用于补偿过程噪声分布的先验信息不足以及提高 UKF 状态和参数的主动估计性能. 讨论了自适应 UKF 的渐进稳定性. 在全方位移动机器人上进行了仿真, 结果表明与常规的 UKF 相比自适应 UKF 更有效更精确.

关键词 [自适UKF](#) [新息](#) [MIT规则](#) [过程方差](#)

分类号

## An Adaptive UKF Algorithm for the State and Parameter Estimations of a Mobile Robot

SONG Qi, HAN Jian-Da

1. Robotics Laboratory, Shenyang Institute of Automation, Chinese Academy of Sciences, Shenyang 110016, P.R. China

2. Department of Auto-control, Shenyang Institute of Aeronautical Engineering, Shenyang 110136, P.R. China

Abstract

For improving the estimation accuracy and the convergence speed of the unscented Kalman filter (UKF), a novel adaptive filter method is proposed. The error between the covariance matrices of innovation measurements and their corresponding estimations/predictions is utilized as the cost function. On the basis of the MIT rule, an adaptive algorithm is designed to update the covariance of the process uncertainties online by minimizing the cost function. The updated covariance is fed back into the normal UKF. Such an adaptive mechanism is intended to compensate the lack of a priori knowledge of the process uncertainty distribution and to improve the performance of UKF for the active state and parameter estimations. The asymptotic properties of this adaptive UKF are discussed. Simulations are conducted using an omni-directional mobile robot, and the results are compared with those obtained by normal UKF to demonstrate its effectiveness and advantage over the previous methods.

Key words [Adaptive Unscented Kalman filter \(UKF\)](#) [innovation](#) [MIT rule](#) [process covariance](#)

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通讯作者 宋崎 [songqim@163.com](mailto:songqim@163.com)

作者个人主页 宋崎; 韩建达

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