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交互式容积卡尔曼滤波及其应用 交互式容积卡尔曼滤波及其应用

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Interaction cubature Kalman filter and its application

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摘要

针对非线性系统模型参数未知情况下的状态估计问题, 提出一种融合极大后验估计的交互式容积卡尔曼滤波算法(InCKF). 该算法利用二阶斯特林插值公式和无迹变换对非线性函数的近似思想, 实现对模型未知参数的确定, 从而使滤波算法摆脱对模型参数精确已知的依赖, 并通过容积卡尔曼滤波算法完成状态估计和量测更新. 仿真结果表明, 相比于经典的参数扩维方法, InCKF 算法具有更高的精度和更强的数值稳定性.

关键词 : 非线性滤波, 容积卡尔曼滤波, 极大后验估计, 模型不确定性

Abstract :

For the problem of states estimation of nonlinear systems with respect to unknown parameters, a filter named interaction cubature Kalman filter(InCKF) is proposed. The novel filter is consisted of multiple concurrent CKFs interlacing with a maximum posteriori(MAP) estimator. By taking advantage of special properties of second order of Stirling's interpolation and unscented transformation to approximate nonlinear functions, the unknown parameters are estimated and the performance of InCKF does not depend on the precision of model parameters. Furthermore, the states of system are estimated by using the cubature Kalman filter(CKF). The simulation results show that the InCKF is more accurate and stabilized than the classical method of state augmentation in the situation that model parameters are unknown.

Key words : nonlinear filter cubature Kalman filter maximum a posteriori model uncertainty

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