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航天电子技术

基于贝叶斯估计噪声相关下的CKF设计

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摘要：

针对常规容积卡尔曼滤波(cubature Kalman filter, CKF)要求系统噪声和量测噪声必须互不相关的局限性，提出了一种带相关噪声的非线性离散系统CKF设计方法。基于贝叶斯估计准则，给出了系统噪声和量测噪声相关时CKF滤波递推公式，并采用三阶球面-相径容积规则来近似计算系统状态的后验均值和协方差。当系统噪声和量测噪声相关时，常规CKF不适用，本文设计的噪声相关下的CKF可以有效地对状态进行估计，拓展了CKF的应用范围。数值仿真验证了算法的有效性。

关键词： 非线性高斯系统　噪声相关的容积卡尔曼滤波　贝叶斯估计　三阶球面-相径容积规则

Design of CKF with correlative noises based on Bayesian estimation

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Abstract：

According to the limitation that the conventional cubature Kalman filter (CKF) requires system and measurement noise to be uncorrelated, a novel CKF with correlative noises for nonlinear discrete time Gaussian systems is designed. A set of recursive filtering equations of CKF with correlative noises are derived based on Bayesian estimation rule, and the third-order spherical-radial cubature rule is utilized to approximate the postrior mean and covariance of the state. The proposed method can estimate the state as a conventional CKF is unavailable when the system and measurement noise are correlative Gaussian white noises, which expends the application of CKF. The effectiveness of the proposed method is verified by a numerical simulation example.

Keywords: nonlinear Gaussian system　cubature Kalman filter （CKF）　with correlative noises　Bayesian estimation　third-order spherical-radial cubature rule

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