

论文与技术报告

递归Bayes模型粒子滤波方法

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摘要:

针对粒子滤波算法中存在的粒子退化、粒子多样性匮乏和计算量大等问题, 本文提出一种基于递归Bayes模型的粒子滤波方法, 该方法通过利用系统的状态方程和随机变量概率密度之间的转换关系, 将状态的预测概率密度变换为后验概率密度相应的递归形式, 并且用于下一次迭代过程的粒子根据当前状态估计重新采样, 使新粒子尽可能地分布在真实状态的邻域内, 增大粒子有效利用率, 提高滤波精度。理论分析和仿真结果表明, 与经典的粒子滤波算法和其它重采样算法相比, 本文所提算法不仅滤波精度得到了改善, 而且计算复杂度也得到了有效的降低。

关键词: 粒子滤波; 后验概率密度; 递归Bayes模型

Recursive Bayes Model Particle Filter Method

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Abstract:

Aimed at the issue of the particles degeneracy, the loss of the diversity among the particles and a heavy computational burden in particle filter algorithm, this paper has proposed a particle filter method based on recursive bayes model (Recursive-Bayes-PF). The basic idea is to utilize the system state function and the transition relationship of the probability density of stochastic variable, making that the prediction of probability density function of the state is transferred to the posterior probability density function with an efficient recursive form. Besides, the particles for next iterative course are drawn again according to the current state estimation, so that the new particles distribute in the neighborhood area of the true state as much as possible, increasing the utilizing efficiency of the particles and improving the filtering accuracy. Theoretical analysis and simulation results show that comparing with the classical particle filter and the other various resampling approaches, the proposed method has a much better filtering accuracy but with lower computational cost.

Keywords: particle filter posterior probability density recursive bayes model

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