

论文

确定性核粒子群的粒子滤波跟踪算法及其CRLB推导

刘亚雷, 顾晓辉

南京理工大学 机械工程学院

摘要:

针对运动声阵列在有色噪声环境中的非线性滤波跟踪问题, 提出一种确定性核粒子群的粒子滤波算法. 该算法通过确定性初始化核粒子集、确定性后验概率密度函数及粒子群与核粒子集更新方式来提高跟踪的精度, 并推导出该算法的理论误差性能下界. 与传统的粒子滤波算法相比, 仿真结果表明了所提出算法的有效性和优越性.

关键词: 确定性核粒子群 粒子滤波 运动声阵列跟踪 非线性滤波

Deterministic core particle swarm and derivation of CRLB in particle filter tracking algorithm

Abstract:

In order to study the nonlinear filter tracking problem of dynamic acoustic array in colored noise environment, the deterministic core particle swarm particle filter algorithm is proposed. The accuracy of the maneuvering target tracking is obviously enhanced by initialized deterministic core particle, deterministic probability density function and the renewed method of particle swarms and core particle, and the Cramér Rao low bound(CRLB) is also deduced. Compared with the traditional particle filter algorithm, the simulation results show the effectiveness and superiority of the presented algorithm.

Keywords: Deterministic Core Particle Swarm Particle filter Dynamic Acoustic Array Tracking Non-linear Filter

收稿日期 2010-11-16 修回日期 2011-03-31 网络版发布日期 2012-04-24

DOI:

基金项目:

通讯作者: 刘亚雷

作者简介:

作者Email: liuyalei820@163.com

参考文献:

[1] Kirubarajan T, Bar-Shalom Y. Kalman filter versus IMM estimator: When do we need the latter[J]. IEEE Trans on Aerospace and Electronic Systems, 2003, 39(4): 1452-1457. [2] 吕娜,冯祖仁.非线性交互粒子滤波算法[J].控制与决策, 2007,22(4):378-383. LV Na, FENG Zuren. Nonlinear interacting particle filter algorithm[J],Control and Decision, 2007,22(4): 378-383. [3]胡振涛,潘泉,梁彦等. 基于粒子滤波的模型自适应机动目标跟踪算法[J].控制与决策, 2008, 22(12):1333-1337. Hu Zhentao,Pan Quan,Liang Yan.Model adaptive maneuvering target tracking algorithm based on particle filtering [J]. Control and Decision, 2008, 22(12):1333-1337. [4] 刘健,刘忠.UKF算法在纯方位目标运动分析中的应用[J].南京理工大学学报.2008,32(2): 222-223. Liu Jian,Liu Zhong. Application ofUKF in Bearings-only TargetMotion Analysis[J], Journal of Nan jing University ofScience and Technology (NaturalScience), 2008,32(2): 222-223. [5] N.J.Gordon,D.J.Salmond,A.F.M.Smith..Novel approach to non-linear/non-gauss Bayesian state estimation [J]. IEE proceeding on Radar Signal proessing,1993,140(2): 107-113. [6] Arnaud Doucet. On the sequential simulation-based methods for Bayesian filtering[R].Technical Report CUED/F-INFENG/TR 310, Department of Engineering, Cambridge University,1998. [7] Rudolph van der Merwe, Arnaud Doucet,

扩展功能

本文信息

- ▶ Supporting info
- ▶ PDF(397KB)
- ▶ [HTML全文]
- ▶ 参考文献[PDF]
- ▶ 参考文献

服务与反馈

- ▶ 把本文推荐给朋友
- ▶ 加入我的书架
- ▶ 加入引用管理器
- ▶ 引用本文
- ▶ Email Alert
- ▶ 文章反馈
- ▶ 浏览反馈信息

本文关键词相关文章

- ▶ 确定性核粒子群
- ▶ 粒子滤波
- ▶ 运动声阵列跟踪
- ▶ 非线性滤波

本文作者相关文章

- ▶ 刘亚雷
- ▶ 顾晓辉

PubMed

- ▶ Article by Liu, E. L.
- ▶ Article by Gu, X. H.

Nnado de Freitas,etal. The unscented Particle filter[R]. Technical Report CUED/F-INFENG/TR 380, Department of Engineering, Cambridge University,2000. [8] 刘云龙,林宝军. 一种基于小生境技术的群智能粒子滤波算法[J].控制与决策,2010,25(2):316-320. Liu Yunlong,Lin Baojun. Swarm intelligence particle filtering based on niching technique [J], Control and Decision,,2010,32(6):1271-1276. [9]Wang Jian,Jin Yonggao,Dai Ningzhang,etal.Particle filter initialization in non-liner non-Gaussian target tracking [J].Journal of Systems Engineering and Electronics.2007,18(3):491-496. [10]刘亚雷,顾晓辉.改进的辅助粒子滤波当前统计模型跟踪算法[J].系统工程与电子技术,2010,32(6):1206:1209. LIU Ya-lei, GU Xiao-hui. Current statistical model tracking algorithm based on improved auxiliary particle filter[J]. Systems Engineering and Electronics,2010,32(6):1206:1209. [11] B.RISTIC, S.ARULAMPALAM, N.GORDON.Beyond the Kalman Filter[M].Boston,London: Artech House,2004. [12] Xin ZHANG, P.WILLETT, Y.Bar-SHALOM.Dynamic Cramér-Rao Bound for Target Tracking in Clutter[J].IEEE Trans.on AES, 2005, 41(4): 1154-1167. [13] B.RISTIC, M.S.ARULAMPALAM.Tracking a Manoeuvring Target Using Angle-only Measurements: Algorithms and Performance[J].Signal Processing, 2003, 83: 1223-1238. [14]郭云飞,韦巍,薛安克.非线性滤波CRLB推导及在目标跟踪中的应用[J].光电工程:2007,34(4):26-29. GUO Yun-fei,WEI Wei,XUEAn-ke. Derivation of the CRLB in nonlinear filter and application to target tracking[J], Opto-Electronic Engineering: 2007,34(4):26-29. [15]赵长胜,陶本藻.有色噪声作用下的卡尔曼滤波[J]. 武汉大学学报.信息科学版,2008,33(2):180-182. Zhao Changsheng,Tao Benz ao. Kalman Filtering of Linear System with Colored Noises, Geomatics and Information Science of Wuhan University[J], 2008,33(2):180-182. [16] 权太范.目标跟踪新理论与技术[M].北京:国防工业出版社, 2009. Quan Taifan.Target Tracking Advanced Theory and Techniques[M],BeiJing,National Defense Industry Press,2009

本刊中的类似文章

1. 方正;佟国峰;徐心和.基于贝叶斯滤波理论的自主机器人自定位方法研究[J]. 控制与决策, 2006,21(8): 841-847
2. 杨小军, 潘 泉, 张洪才.基于粒子滤波和似然比的联合检测与跟踪[J]. 控制与决策, 2005,20(7): 837-840
3. 潘 泉, 杨 峰, 叶 亮, 梁 彦, 程咏梅.一类非线性滤波器——UKF 综述[J]. 控制与决策, 2005,20(5): 481-489
4. 方正;佟国峰;徐心和.粒子群优化粒子滤波方法[J]. 控制与决策, 2007,22(3): 273-277
5. 彭志专!,冯金富,钟咏兵,伍友利,梁晓龙.基于IMM-PF的分布式估计融合算法[J]. 控制与决策, 2008,23(7): 837-840
6. 张琪;王鑫;胡昌华;蔡!曦.人工免疫粒子滤波算法的研究[J]. 控制与决策, 2008,23(3): 293-296
7. 张琪;胡昌华;乔玉坤.基于权值选择的粒子滤波算法研究[J]. 控制与决策, 2008,23(1): 117-120
8. 胡振涛,潘泉,梁彦,程咏梅.基于粒子滤波的模型自适应机动目标跟踪算法[J]. 控制与决策, 2008,23(12): 1333-1337
9. 黄艳;梁犇;于海斌.基于粒子滤波的无线传感器网络目标跟踪算法[J]. 控制与决策, 2008,23(12): 1389-1394
10. 柳明;刘雨;苏宝库.改进的UKF在惯导平台误差模型辨识中的应用[J]. 控制与决策, 2009,24(1): 129-132
11. 吕娜;冯祖仁.非线性交互粒子滤波算法[J]. 控制与决策, 2007,22(4): 378-383
12. 姜雪原;马广富;胡庆雷.基于Marginalized粒子滤波的卫星姿态估计算法[J]. 控制与决策, 2007,22(1): 39-44
13. 李安平;敬忠良;胡士强.基于自适应表面模型的概率视频跟踪算法[J]. 控制与决策, 2007,22(1): 53-58
14. 庄严;战洪斌;王伟;王珂.基于加权颜色直方图和粒子滤波的彩色物体跟踪[J]. 控制与决策, 2006,21(8): 868-872
15. 方帅 迟健男 徐心和.视频监控中的运动目标跟踪算法[J]. 控制与决策, 2005,20(12): 1388-1391