

改进的多模型粒子PHD和CPHD滤波算法

欧阳成, 姬红兵, 郭志强

西安电子科技大学电子工程学院 西安 710071

收稿日期 2010-12-15 修回日期 2011-11-20 网络版发布日期 接受日期

摘要

多模型粒子概率假设密度(Probability hypothesis density, PHD)滤波是一种有效的多机动目标跟踪算法, 然而当模型概率过小时, 该算法存在粒子退化问题, 而且它对目标数的泊松分布假设会夸大目标漏检对其势估计的影响. 针对上述问题, 本文提出一种改进算法. 该算法并不是简单地对模型索引进行采样, 而是用粒子拟合目标状态的模型条件PHD强度, 在不对噪声做任何先验假设的前提下, 通过重采样实现存活粒子的输入交互, 提高了滤波性能. 在此基础上, 进一步将算法在Cardinalized PHD (CPHD)的框架下加以实现, 提高其目标数估计精度. 仿真实验表明, 所提算法在滤波性能和目标数估计精度方面均优于传统的多模型粒子PHD算法, 具有良好的工程应用前景.

关键词 [多模型](#) [粒子滤波](#) [概率假设密度滤波](#) [机动目标跟踪](#)

分类号

Improved Multiple Model Particle PHD and CPHD Filters

OUYANG Cheng, JI Hong-Bing, GUO Zhi-Qiang

School of Electronic Engineering, Xidian University, Xi'an 710071

Abstract

The multiple model probability hypothesis density (PHD) filter is an effective algorithm for tracking multiple maneuvering targets. However, when the conditional mode probabilities have small values, there is a particle degenerate problem and the Poisson assumption for the target number distribution will lead to an exaggerating effect of missed detections on the target number estimation. To solve these problems, an improved algorithm is proposed in this paper, which approximates the model conditional probability hypothesis density of target states by particles, and makes the interaction between survival targets by resampling, without any a priori assumption of the noise. Further more, the improved algorithm is implemented in the framework of the cardinalized PHD (CPHD) filter, so as to improve the accuracy of target number estimation. The simulation results show that the improved algorithm has better performance in terms of state filtering and target number estimation, so that this algorithm will have good application prospects.

Key words [Multiple model](#) [particle filter\(PF\)](#) [probability hypothesis density \(PHD\) filter](#) [maneuvering target tracking](#)

DOI: 10.3724/SP.J.1004.2012.00341

通讯作者 欧阳成, 西安电子科技大学电子工程学院博士研究生. 主要研究方向为数字信号处理, 目标跟踪, 数据融合. E-mail: ouoyc@yahoo.com.cn oindent ouoyc@yahoo.com.cn oindent

作者个人主页 欧阳成; 姬红兵; 郭志强

扩展功能

本文信息

- ▶ [Supporting info](#)
- ▶ [PDF\(445KB\)](#)
- ▶ [\[HTML全文\]\(OKB\)](#)
- ▶ [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](#)
- ▶ [复制索引](#)
- ▶ [Email Alert](#)

相关信息

- ▶ [本刊中 包含“多模型”的 相关文章](#)
- ▶ 本文作者相关文章
 - [欧阳成](#)
 - [姬红兵](#)
 - [郭志强](#)