

论文与报告

基于多假设跟踪的移动机器人自适应蒙特卡罗定位研究

张恒, 樊晓平, 瞿志华

1. 中南大学信息科学与工程学院 长沙 410075

2. 美国中佛罗里达大学电子与计算机工程系 奥兰多 FL 32816-2450

收稿日期 2006-5-26 修回日期 2006-12-15 网络版发布日期 接受日期

摘要

针对移动机器人蒙特卡罗定位(Monte Carlo localization, MCL)算法在含有对称和自相似结构的环境中容易失败的问题, 提出了一种基于多假设跟踪的自适应蒙特卡罗定位改进算法. 该算法根据粒子间空间相似性采用核密度树聚类算法对粒子群进行聚类, 每簇粒子代表一个位姿假设并用一个独立的MCL算法进行跟踪, 总体上形成了一组非等权的粒子滤波器, 很好地克服了普通粒子滤波器由于粒子贫乏而引起的过度收敛问题. 同时运用该核密度树实现了自适应采样, 提高了算法的性能. 针对机器人“绑架”问题对该算法作了进一步的改进. 实验结果证明了该算法的有效性.

关键词 [移动机器人](#) [蒙特卡罗定位](#) [多假设跟踪](#) [核密度树](#)

分类号 [TP24](#)

Mobile Robot Adaptive Monte Carlo Localization Based on Multiple Hypothesis Tracking

ZHANG Heng, FAN Xiao-Ping, QU Zhi-Hua

1. School of Information Science and Engineering, Central South University, Changsha 410075

2. Department of Electrics and Computer Engineering, University of Central Florida, Orlando, FL 32816-2450, U.S.A.

Abstract

This paper presents an improved algorithm that extends Monte Carlo localization (MCL) to solve the problem of localization failure in symmetric and/or self-similar environments. The algorithm clusters the particles adaptively according to their spatial similarity by using a kernel density (kd)-tree-based cluster algorithm. Each cluster of particles denotes a pose hypothesis and is traced by an individual MCL process so as to form a group of unequally weighted particle filters in general, thus overcoming the over-convergence problem due to lack of the particle sets. The kd-trees are also used for adaptive sampling to improve the algorithm performance. Further improvement to the algorithm makes it possible to solve the kidnapped robot problem as well, and the experimental results show that it has higher efficiency than the standard MCL algorithm.

Key words [Mobile robot](#) [Monte Carlo localization](#) [multiple hypothesis tracking](#) [kernel density tree](#)

DOI: 10.1360/aas-007-0941

通讯作者 张恒 hbzhangheng@sohu.com

作者个人主页 张恒; 樊晓平; 瞿志华

扩展功能
本文信息
▶ Supporting info
▶ PDF(773KB)
▶ [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
▶ 文章反馈
▶ 浏览反馈信息
相关信息
▶ 本刊中包含“移动机器人”的相关文章
▶ 本文作者相关文章
· 张恒
· 樊晓平
· 瞿志华