自动化学报 2009 35 (10): 1302-1309 ISSN: 0254-4156 CN: 11-2109/TP

论文与报告

误差准则的信息论解释

陈霸东, 胡金春, 朱煜, 孙增圻

1. Institute of Manufacturing Engineering, Department of Precision Instruments and Mechanology, Tsinghua University, Beijing 100084, P.R. China

2. State Key Laboratory of Intelligent Technology and Systems, Department of Computer Science and Technology, Tsinghua University, Beijing 100084, P.R. China

收稿日期 2008-4-7 修回日期 2008-12-20 网络版发布日期 接受日期

摘要

Error criteria (or error cost functions) play significant roles in statistical estimation problems. In this paper, we study error criteria from the viewpoint of information theory. The relationships between error criteria and error's entropy criterion are investigated. It is shown that an error criterion is equivalent to the error's entropy criterion plus a Kullback-Leibler information divergence (KL-divergence). Based on this result, two important properties of the error criteria are proved. Particularly, the optimum error criterion can be interpreted via the meanings of entropy and KL-divergence. Furthermore, a novel approach is proposed for the choice of p-power error criteria, in which a KL-divergence based cost is minimized. The proposed method is verified by Monte Carlo simulation experiments.

关键词 Estimation error criteria entropy Kullback-Leibler information divergence (KL-divergence) adaptive filtering

分类号

扩展功能

本文信息

- Supporting info
- PDF(1182KB)
- [HTML全文](0KB)
- 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“Estimation”的 相关文章
- 本文作者相关文章
  - 陈霸东
  - 胡金春
  - 朱煜
  - 孙增圻

Information Theoretic Interpretation of Error Criteria

CHEN Ba-Dong, HU Jin-Chun, ZHU Yu, SUN Zeng-Qi

1. Institute of Manufacturing Engineering, Department of Precision Instruments and Mechanology, Tsinghua University, Beijing 100084, P.R. China

2. State Key Laboratory of Intelligent Technology and Systems, Department of Computer Science and Technology, Tsinghua University, Beijing 100084, P.R. China

Abstract

Error criteria (or error cost functions) play significant roles in statistical estimation problems. In this paper, we study error criteria from the viewpoint of information theory. The relationships between error criteria and error's entropy criterion are investigated. It is shown that an error criterion is equivalent to the error's entropy criterion plus a Kullback-Leibler information divergence (KL-divergence). Based on this result, two important properties of the error criteria are proved. Particularly, the optimum error criterion can be interpreted via the meanings of entropy and KL-divergence. Furthermore, a novel approach is proposed for the choice of p-power error criteria, in which a KL-divergence based cost is minimized. The proposed method is verified by Monte Carlo simulation experiments.

Key words Estimation error criteria entropy Kullback-Leibler information divergence (KL-divergence) adaptive filtering

DOI: 10.3724/SP.J.1004.2009.01302

通讯作者 陈霸东 chenbd04@mails.tsinghua.edu.cn

作者个人主页 陈霸东; 胡金春; 朱煜; 孙增圻