

算法研究

噪声环境下光流场估计方法

马龙, 王鲁平, 陈小天, 李旻

国防科技大学ATR重点实验室

摘要:

图像在采集、传输过程中可能会受到噪声污染, 噪声干扰是准确进行光流场估计必须考虑的技术难题。为解决这一难题, 首先, 对传统光流法的两条基本假设进行了讨论, 指出了灰度恒定假设的局限性; 然后, 在MUKAWA推论的基础上, 根据噪声约束对基于灰度恒定假设的光流基本方程进行了修正; 而后, 在新的基本方程基础上, 引入全局平滑约束使光流估计问题正则化; 最后, 采用变分方法推导了噪声环境下光流场的估计算式。为测试算法性能, 对CAVIAR视频数据加入不同水平的高斯噪声, 而后分别采用传统光流方法和本文方法进行鲁棒性实验, 最后对实验结果进行了分析比较。实验和分析结果证明本文方法具有更好的抗噪性能。

关键词: 光流场 噪声约束 迭代方法 图像处理

Determining optical flow field in the presence of noise

MA Long, WANG Lu-Ping, CHEN Xiao-Tian, LI Biao

ATR Key Lab, National University of Defense Technology

Abstract:

Noise disturbance is a key problem which should be taken into account in accurate optical flow estimation, since image data may be blurred in capture and transmission process. To resolve this problem, firstly, the two hypotheses of traditional optical flow method were discussed, through which the limitations of the luminance constant hypothesis were unveiled; and then, according to the noise constraint, the basic optical flow equation was corrected based on the MUKAWA's results; after that, the global smoothness constraint of optical flow field was introduced to regularize the problem of optical flow estimation, based on the new basic optical flow equation; finally, the arithmetic expressions of determining optical flow field were deduced from the new basic optical flow equation and the global smoothness constraint using the variational approach. The CAVIAR video data were used to test our method. Firstly, the test data were added in the Gaussian noise with different levels; and then, the optical flow fields of these blurred data were determined using traditional methods and our method, respectively; finally, the experiment results with different methods were analyzed and compared. Both of the test results and comparative results showed that our method outperforms the others in the presence of noise.

Keywords: Optical flow field Noise constraint Iterative method Image processing

收稿日期 2011-07-20 修回日期 2011-10-14 网络版发布日期 2012-01-25

DOI:

基金项目:

国家部委基金资助, 基金编号: 9140A010107KG01

通讯作者:

作者简介:

作者Email: junfeiml@126.com

参考文献:

本刊中的类似文章

1. 黄宗福, 王宏义, 韩建涛, 陈曾平.天文全帧CCD图像拖尾的快速去除方法[J]. 信号处理, 2010,26(4): 607-611

扩展功能

本文信息

- ▶ Supporting info
- ▶ PDF(1318KB)
- ▶ [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

- ▶ 光流场
- ▶ 噪声约束
- ▶ 迭代方法
- ▶ 图像处理

本文作者相关文章

- ▶ 马龙
- ▶ 王鲁平
- ▶ 陈小天
- ▶ 李旻

PubMed

- ▶ Article by Ma, L.
- ▶ Article by Wang, L. B.
- ▶ Article by Chen, X. T.
- ▶ Article by Li, B.

2. 马龙, 王鲁平, 沈振康.基于MRF的复杂背景下缓动目标分割方法[J]. 信号处理, 2010,26(6): 911-916
3. 吴一全, 张金矿.二维直方图 θ -划分Tsallis熵阈值分割算法[J]. 信号处理, 2010,26(8): 1162-1168
4. 黄宗福, 王卫华, 韩建涛, 熊运生, 陈曾平.一种天文光电图像序列弱小目标实时检测算法[J]. 信号处理, 2010,26(9): 1379-1384
5. 胡谋法, 陈尚锋, 肖山竹, 张志勇.一种低能见度下红外机场区域识别新方法[J]. 信号处理, 2011,27(11): 1687-1690

文章评论

反馈人	<input type="text"/>	邮箱地址	<input type="text"/>
反馈标题	<input type="text"/>	验证码	<input type="text"/> 3763