

本期目录 | 下期目录 | 过刊浏览 | 高级检索

[打印本页] [关闭]

## 论文

### 基于局部峰值的红外弱小目标快速检测

薛松<sup>1,2</sup>, 韩广良<sup>1</sup>

1. 中国科学院长春光学精密机械与物理研究所, 长春 130033;
2. 中国科学院大学, 北京 100049

摘要:

针对红外图像的小目标检测问题,提出了一种基于局部尖峰特性的检测方法.首先分析红外小目标的局部灰度特性,提出了一种红外目标的峰值特性判据;然后依据目标的峰值特性判据和时域特性,设计了一种目标检测的快速算法,算法先基于子块预选出局部极大值点,把后续运算限于各极大值点处以减少运算量,再根据极大值在各方向上的灰度下降判断其尖峰特性;最后利用帧间的连续性滤去噪音引起的伪目标.实验表明本文的算法具有很快的处理速度,且能有效滤去图像中的随机噪音.

关键词: 小目标检测 红外图像 局部梯度 帧间连续性

## Infrared Small Target Fast Detection Based on Local Saliency

XUE Song<sup>1,2</sup>, HAN Guang-liang<sup>1</sup>

1. Changchun Institute of Optics, Fine Mechanics and Physics, Chinese Academy of Sciences, Changchun 130033, China;
2. Graduate University of Chinese Academy of Sciences, Beijing 100049, China

Abstract:

For the problem of small target detection in infrared image, a method based on the local saliency is proposed. The feature on the local gray-scale of small targets in infrared image is analyzed, and a criterion is proposed to check the feature of peak value. Based on the criterion to check peak value and the characteristic of small target on time domain, a fast algorithm is designed. Firstly, local max points are selected and the follow-up computing is limited to these points to reduce the computation. Then peak values are checked based on the decline of gray-scale. Finally, false targets caused by noise are removed based on the continuity between frames. Experiments show that this algorithm has a high processing speed, and can effectively filter out the random noise in the image.

Keywords: Small target detection Infrared image Local gradient Continuity between frames

收稿日期 2012-08-15 修回日期 2012-11-08 网络版发布日期

DOI: 10.3788/gzxb20134202.0228

基金项目:

国家自然科学基金(No.61172111)资助

通讯作者:

作者简介:

## 参考文献:

- [1] ZHOU Hong-wu, ZHU Zhao-da, WU Yi-quan, *et al.* Optimized design of improved TOP-HAT filter based on genetic algorithms of neural network [J]. *Journal of Nanjing University of Aeronautics & Astronautics*, 2007, 39(2): 213-217. 周洪武, 朱兆达, 吴一全, 等. 基于TOP-HAT滤波器算子的红外弱小目标检测算法 [J]. *南京航空航天大学学报*, 2007, 39(2): 213-217.

扩展功能

本文信息

- ▶ Supporting info
- ▶ [PDF\(1332KB\)](#)
- ▶ [HTML](#)
- ▶ 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

- ▶ 小目标检测
- ▶ 红外图像
- ▶ 局部梯度
- ▶ 帧间连续性

本文作者相关文章

- [2] ZENG Ming, LI Jian-xun. The small target detection in infrared image based on adaptive morphological Top-Hat filter  
[J]. *Journal of Shanghai Jiaotong University*, 2006, 40(1): 90-97. 曾明, 李建勋. 基于自适应形态学Top-Hat滤波器的红外弱小目标检测方法  
[J]. 上海交通大学学报, 2006, 40(1): 90-97.
- [3] ZHANG Qiang, CAI Jing-ju, ZHANG Qi-heng, *et al.* Dim infrared targets segmentation method based on local maximum  
[J]. *Infrared Technology*, 2011, 33(1): 41-44. 张强, 蔡敬菊, 张启衡, 等. 基于局部极大值的红外弱小目标分割方法  
[J]. 红外技术, 2011, 33(1): 41-44.
- [4] WAN Ming, ZHANG Feng-ming, LEI Hong-li, *et al.* A novel detection method of infrared dim and small target based on cross window  
[J]. *Acta Photonica Sinica*, 2011, 40(5): 764-768. 万明, 张凤鸣, 雷洪利, 等. 一种利用十字窗口识别红外弱小目标的新方法  
[J]. 光子学报, 2011, 40(5): 764-768. 
- [5] LIAN Ke, YAN Ming, LI Dan, *et al.* A novel infrared small and dim target detection method based on feature analysis of local grey level  
[J]. *Telecommunication Engineering*, 2001, 51(1): 49-52. 连可, 严明, 李丹, 等. 利用局部灰度特征分析实现红外弱小目标检测  
[J]. 电讯技术, 2001, 51(1): 49-52.
- [6] ZHOU Run-zhi, MA Liang-li, WANG Jiang-an, *et al.* New method for detecting and tracking small moving target based on target frame-correlation  
[J]. *Journal of Naval University of Engineering*, 2010, 22(1): 78-82. 周润芝, 马良荔, 王江安, 等. 一种基于帧间相关的红外弱小目标运动轨迹检测方法  
[J]. 海军工程大学学报, 2010, 22(1): 78-82.
- [7] LIAN Ke, WANG Houjun, LI Dan. Pipeline filtering method based on feature analysis of local grey level of small infrared target  
[J]. *Journal of Projectiles, Rockets, Missiles and Guidance*, 2011, 31(4): 200-206. 连可, 王厚军, 李丹. 基于红外目标局部灰度特性分析的管道滤波方法  
[J]. 弹箭与制导学报, 2011, 31(4): 200-206.
- [8] HUANG He-wen, JIN Tao. Dim small targets detection with noise suppression utilizing adjacent relevant pixels information  
[J]. *Acta Photonica Sinica*, 2012, 41(5): 596-601. 黄鹤汶, 金韬. 利用相邻相关像素进行噪音抑制的模糊小目标检测算法  
[J]. 光子学报, 2012, 41(5): 596-601. 
- [9] GUO Zhang-ting, XIN Yun-hong. Small IR target detection algorithm based on classified background prediction and image blocking  
[J]. *Laser & Infrared*, 2012, 42(5): 572-578. 郭张婷, 辛云宏. 红外小目标的分类背景预测与图像分块技术  
[J]. 激光与红外, 2012, 42(5): 572-578.
- [10] YILMAZ A, SHAFIQUE K, SHAH M. Target tracking in airborne forward looking infrared imagery  
[J]. *Optical Engineering*, 2003, 42(8): 2182-2189. 
- [11] XIA Ren-bo, ZHAO Jin-bin, HUI Bin, *et al.* A simple and efficient saliency extraction method based on multi-scale horizon-directional filter for infrared dim small target detection  
[C]. *SPIE*, 2011, 8004: 80041D-1.
- [12] MA Wen-wei, ZHAO Yong-qiang, ZHANG Guo-hua, *et al.* Infrared dim target detection based on multi-structural element morphological filter combined with adaptive threshold segmentation  
[J]. *Acta Photonica Sinica*, 2011, 40(7): 1020-1024. 马文伟, 赵永强, 张国华, 等. 基于多结构元素形态滤波与自适应阈值分割相结合的红外弱小目标检测  
[J]. 光子学报, 2011, 40(7): 1020-1024. 
- [13] LIU Guang, ZHANG Qian-qian, HUANG Tao. Detecting for the aerial small target in infrared image based on the correlation coefficients of nonsubsamped contourlet transform  
[C]. Zhengzhou, China: Proceeding of the IEEE International Conference on Automation and

[14] ZHANG Ying, WANG Min, NIU Shao-qiang. A novel small dim infrared target detecting method based on grayscale merging and connected components analysis [C]. Wuhan, China: Proceeding of International Conference on Modelling, Identification and Control, 2012: 454-459.

本刊中的类似文章

1. 吴一全 吴文怡 罗子娟.基于最小一乘和混沌遗传算法检测红外小目标[J]. 光子学报, 2009,38(3): 736-740
2. 郑刚;贾振红.同态技术在红外图像处理中的应用[J]. 光子学报, 2005,34(9): 1401-1403
3. 惠建江;刘朝晖;刘文.数学形态学在红外多弱小目标提取中的应用[J]. 光子学报, 2006,35(4): 626-629
4. 李怀琼;陈钱.基于灰度冗余的红外图像自适应输出窗技术[J]. 光子学报, 2006,35(9): 1426-1430
5. 王炳健; 刘上乾; 周慧鑫; 李庆.基于平台直方图的红外图像自适应增强算法[J]. 光子学报, 2005,34(2): 299-301
6. 过润秋;李大鹏;林晓春.红外点目标检测的小波变换方法研究[J]. 光子学报, 2004,33(4): 464-468
7. 袁慧晶;王涌天.一种抗干扰的弱小目标检测方法[J]. 光子学报, 2004,33(5): 609-612
8. 郝伟 苏秀琴 李哲.基于灰度变换的红外图像实时分割算法[J]. 光子学报, 2008,37(5): 1077-1080
9. 何泰诚 朱红 全勇.一种基于边缘特征的亚像素投影配准算法[J]. 光子学报, 2008,37(11): 2346-2349
10. 管志强 陈钱 王忠林 钱惟贤 胡永生.基于模糊集的自适应红外图像边缘锐化算法[J]. 光子学报, 2008,37(6): 1281-1284
11. 郭伟 赵亦工 谢振华.一种改进的红外图像归一化互相关匹配算法[J]. 光子学报, 2009,38(1): 189-193
12. 苏秀琴,梁金峰,陆陶,杨露.海天复杂背景下红外目标的检测跟踪算法[J]. 光子学报, 2009,38(5): 1309-1312
13. 娄越 相里斌 刘波3 .基于背景粗糙度估计的红外目标检测算法[J]. 光子学报, 2007,36(9): 1759-1763
14. 倪超 李奇 夏良正 .基于广义混沌混合PSO的快速红外图像分割算法[J]. 光子学报, 2007,36(10): 1954-1959
15. 祁飞 李言俊 张科.基于Bandelets变换的红外图像去噪[J]. 光子学报, 2008,37(12): 2564-2567

文章评论 (请注意:本站实行文责自负, 请不要发表与学术无关的内容!评论内容不代表本站观点.)

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" value="6697"/>
<input type="text"/> 