航空学报 » 2011, Vol. 32 » Issue (5) :891-899 DOI: CNKI:11-1929/V.20110316.1339.007

基于力场转换理论的图像粗大边缘检测方法

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Image Edge Detection Algorithm Based on Force Field Transformation

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摘要 基于粗大边缘的异源图像匹配在导航制导等领域具有广阔的应用前景,但是现有边缘检测方法很难提取出异源图像中的粗大边缘。根据异源图像成像原理和灰度分布特点,提出一种基于力场转换理论的异源图像粗大边缘检测新方法。首先,根据引力概念计算图像中各像素点受到合力的大小和方向;其次,为了去除光照和异源图像灰度不同的影响,对图像中像素点所受合力的大小进行归一化处理;然后,对归一化后的图像进行二值化分割以获得边缘像素点所在的区域;最后,通过实验研究粗大边缘像素点的合力大小和方向特征,由此得到了粗大边缘点的确定方法。实验结果表明:与Canny边缘检测方法相比,该方法对异源图像间的粗大边缘具有很好的边缘检测效果,与先分割再提取边缘的方法相比,该方法可以提取灰度值分布较集中且噪声较大的红外(IR)图像粗大边缘。

关键词: 异源图像 边缘检测 力场转换理论 力场大小 力场方向

Abstract: Multi-modality image matching based on gross edges has a wide application prospect, but traditional edge detection algorithms are not able to extract good gross edge features. In this paper, a novel edge detection algorithm based on force field transformation is proposed according to the imaging principle and the gray distribution of multi-modality images. Firstly, the force field magnitude and direction of each pixel can be calculated by the concept of gravitational force. Secondly, in order to eliminate the impact of changeable illumination and the difference between gray distributions, the force field magnitude of each pixel is normalized. Then, the region of the edge can be obtained through binary processing of the normalized image. Finally, the properties of the force magnitude and the direction at the gross edge region are analyzed, and the gross edge detection method is proposed accordingly. Experimental results show that the proposed algorithm performs better than the traditional algorithms, and it performs better than the method of detecting the edge on segmenting images for ifrared (IR) image.

Keywords: multi-modality image edge detection force field transformation force field magnitude force field direction

Received 2010-08-06;

Fund:

国家自然科学基金(60974105,61074161); 航空科学基金(20100152003); 南京航空航天大学研究生创新基地(实验室)开放基金(201001007)

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引用本文:

曹传东, 徐贵力, 陈欣, 冷雪飞, 李开宇, 叶永强. 基于力场转换理论的图像粗大边缘检测方法[J]. 航空学报, 2011, 32(5): 891-899.

CAO Chuandong, XU Guili, CHEN Xin, LENG Xuefei, LI Kaiyu, YE Yongqiang. Image Edge Detection Algorithm Based on Force Field Transformation[J]. Acta Aeronautica et Astronautica Sinica, 2011, 32(5): 891-899.