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成像技术与图像处理

基于人眼视觉灰度识别特性的图像动态范围小波变换处理方法

唐艳秋^{1,2}, 张星祥¹, 李新娥¹, 任建岳¹

1. 中国科学院 长春光学精密机械与物理研究所, 吉林 长春 130033;

2. 中国科学院 研究生院, 北京 100039

摘要: 常用的图像传感器由于电荷耦合器(CCD)和模数转换器(ADC)的限制,动态范围大约只有60 dB,与人眼的动态范围(110 dB)不符,导致获取的图像丢失部分细节信息。针对这一问题,提出了基于小波变换的图像动态范围扩展技术。通过对同一场景进行多次拍摄,获得不同曝光时间的源图像,对源图像运用多尺度小波变换分解为高频部分和低频部分。将基于人眼的视觉灰度识别特性的方法应用于低频部分的处理中,运用不同的权重值进行处理,尽可能保留图像的背景信息。对高频部分运用局部最大方差准则进行融合,尽量保留图像的边缘特性。将融合后的高频部分和低频部分利用逆小波变换进行重构。试验结果表明,重构后的图像与适度曝光的图像相比,在高亮度区域和低亮度区域的细节信息得到了复原,动态范围得到了显著的扩展。

关键词: 动态范围 小波变换 图像融合

Image Processing Method of Dynamic Range With Wavelet Transform Based on Human Visual Gray Recognition Characteristics

TANG Yan-qiu^{1,2}, ZHANG Xing-xiang¹, LI Xin-e¹, Ren Jian-yue¹

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 100039, China

Abstract: Due to a CCD and ADC restriction, the dynamic range of the commonly used image sensor is only about 60 dB, which does not coincide with the dynamic range(110 dB) of eyes, leading to the loss of partial details of the image. In this paper, an image extended dynamic range technique based on the wavelet transform would be proposed. By means of taking pictures of the same scene repeatedly, the source images of different exposure time were procured, which were further divided into high frequency part and the low frequency part by using multi-scale wavelet transform. The method based on human visual gray recognition features was applied to the processing of low frequency part. By using different weights for processing, the most background information possible of the image was retained. For the high frequency part, the local maximal variance criteria for fusion was used to maintain the image edges' characteristics to the greatest extent. Reconstruction is proceeded by using inverse wavelet transform to the merged high frequency part and low frequency part. Test results showed that comparing the reconstructive image and moderately exposed image, the details of information in the high brightness area and low light area was recovered, and the dynamic range got significant expansion.

Keywords: dynamic range wavelet transform image fusion

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通讯作者: 任建岳, E-mail: reny@sohu.com

作者简介:

作者Email: reny@sohu.com

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