基于参数模糊变换的非均匀照度图像增强算法

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摘　要：针对非均匀照度图像中对比度和清晰度低的问题，提出了一种基于参数模糊变换的图像对比度增强算法，能够极大改善图像的主观和客观品质.该算法首先将彩色图像从 RGB 空间转换成 HSV 和 LUV 颜色空间，其次在 LUV 空间上利用模糊变换平滑原始图像的亮度分布，为了增强图像的对比度和提高暗区的细节，在隶属度函数中引入一个与 HSV 空间值层有关的参数，然后在 HSV 空间值层中采用像素加权策略用来保留大量纹理信息，最后将平滑的图像与加权的图像在 HSV 空间上进行组合，并转换回 RGB 空间，得到保留有自然度的高质量增强图像.实验结果表明，所提方法能够有效增强非均匀照度图像对比度，且整体性能要优于其他算法.

关键词：　图像增强；对比度；参数模糊变换；颜色空间

Non-uniform illumination image enhancement algorithm based on parametric fuzzy transformation

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Abstract：Aiming at the problem of low contrast and low definition in non-uniform illumination images, an algorithm for enhancing image contrast using parametric fuzzy transform in luminance domain was proposed. The algorithm converts the color image from RGB space to HSV color space and LUV color space firstly, and secondly applies the fuzzy transform in the luminance domain of LUV to smooth the brightness distribution of the original image. In order to enhance the contrast of the image and improve the detail of the dark region, we introduce a parameter related to the HSV spatial value layer in the membership function. Then the proposed algorithm utilizes the pixel weighting strategy in the HSV spatial value layer to preserve a large amount of texture information. Finally, both the images are combined to form the enhanced image in HSV space and transformed to RGB space, which obtained a high quality image with naturalness preservation. The experimental results show that the overall performance of the proposed method is better than other algorithms. While effectively enhancing the contrast of non-uniform illumination images, the subjective and objective quality of the image is also greatly improved.

Key words：　image enhancement; contrast; parametric fuzzy transform; color space

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