

算法研究

非局部相似性去马赛克算法

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摘要:

单传感器数码相机得到的色彩图像在每一个像素点处只有一种色彩值, 为了得到一幅全彩色图像, 需要在每一个像素位置上估计出另外两个缺失的色彩值。现有主要算法都是利用像素的相关性进行估计和插值, 在那些边缘色彩跳变处和色彩高饱和度处容易估计失误, 出现所谓的马赛克失真。为了克服这类马赛克现象, 本文提出了一种利用图像的非局部相似性, 即利用处于图像中不同位置处的像素点往往表现出很强的相关性这一特点, 结合图像内容的局部平坦度自适应去马赛克的插值算法。该算法, 首先根据相似度函数搜索与被插像素最相似的像素, 然后利用区域水平和垂直方向的梯度组算子来计算区域的平坦度, 从而根据相似程度和平坦度自适应地选择图像块进行插值。实验结果表明, 相对于传统插值算法, 该算法提高了图像的峰值信噪比, 锐化了图像的纹理和边缘, 减少了虚假色和锯齿现象, 改善了图像的视觉效果。

关键词: 去马赛克; 图像插值; 非局部相似性; 彩色梯度

Nonlocal-Similarity Algorithm for Color Image Demosaicing

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Abstract:

Image demosaicing is the process by which from a single CCD sensor recording only one color sample at each pixel, a full color information per pixel can be inferred. Most image demosaicing methods assume the high local spectral correlation in estimating the missing color components. However, such an assumption may fail for images with high color saturation and sharp color transitions. Meanwhile, self-similarity, which means that the pixels at different locations resemble with each other, is a fundamental property of an image. In this paper, the non-local similarity information provided by an image itself is made use of demosaicing on the McMaster dataset with lower local redundancy. First, the most similar nonlocal pixels to the estimated pixel are searched. Then, according to the similar degree and the smooth degree, the image patch is adaptively chosen to estimate the missing color samples. Experimental results show that the presented algorithm is able to improve the PSNR, sharpen texture and edge of the image and lead to higher visual quality of reproduced color images.

Keywords: demosaic; image interpolation; nonlocal similarity; multi-color gradient

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