信息科学

四元数曲波变换多源多聚焦彩色图像融合

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摘要： 为了改善已有多源多聚焦彩色图像融合算法存在的模糊效应问题，提出一种基于四元数曲波变换的彩色图像融合算法。首先，把传统曲波变换推广到四元数，定义了四元数曲波变换，并给出了该变换的离散化算法。接着，以四元数矩阵的形式对待融合的彩色图像建模，通过四元数曲波变换对图像的四元数值进行多分辨率分析。然后，采用"最小、最大"融合规则来完成融合图像的多分辨率分析。最后，采用逆四元数曲波变换得到融合后的彩色图像。实验结果表明：提出的方法能够有效地去除图像模糊，无论是在主观评价还是在客观评价上都优于已有的算法。与最新文献中基于二维经验模式分解(BEMD)的融合算法相比，其图像锐利度(ISM),图像对比度(ICM)，彩色信息丰富度(CCM) 等3项客观评价指标上都有较大幅度的提升。

关键词： 彩色图像 图像融合 四元数 四元数曲波变换

Multiple Multifocus color image fusion using quaternion curvelet transform

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Abstract: To solve the image blur problem existed in multiple sources and multi-focus color image fusion algorithms, a novel fusion algorithm based on the quaternion curvelet transform was proposed. First, the traditional curvelet transform was generalized to a quaternion algebra from a real and complex number, and the definition of quaternion curvelet transform and its discrete algorithm were given. Then, the original color image was molded in a quaternion matrix form, and the quaternion-value of the image was analyzed in a multiresolution through quaternion curvelet transform. Furthermore, the "min, max" selection rule was adopted to form a multiresolution of the fused color image. Finally, the fused color image was obtained from the inverse quaternion curvelet transform. The competing multiple multifocus color image fusion methods and the proposed method were compared by the subjective and objective analysis. The experimental results indicate that the proposed method significantly solve the image blur problem, and its Image Sharpness Metric(ISM), Image Contrast Metric (ICM) and Color Colorfulness Metric(CCM) are raised considerably as compared with those of Bidimensional Empirical Mode Decomposition(BEMD)).

Keywords: Color image Image fusion quaternion Quaternion curvelet transform

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