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多尺度域内改进模糊规则的红外与可见光图像融合

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Fusion of infrared and visible images based on improved fuzzy rules in multi-scale domain

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摘要

提出一种平移不变Shearlet域内改进模糊化规则的图像融合方法。首先分别对红外与可见光图像进行平移不变Shearlet变换获取高频和低频子带系数。然后,根据红外图像特性采用局部区域信息熵规则融合低频子带系数;针对Shearlet变换框架冗余特性,融合高频子带系数。为有效解决高频系数冗余信息,分别计算红外与可见光图像高频子带系数图模糊化后的隶属度、非隶属度和模糊度以及最优熵,将获取的模糊化系数图分块并分别根据黑白度获取混合图像,然后重构系数块图像并进行解模糊操作以获取融合后的高频子带系数。最后,通过平移不变Shearlet反变换得到最终的红外与可见光图像融合结果。实验结果表明,本方法融合结果边缘保持度超过0.85,消除了吉布斯现象,有较好的融合效果。

关键词 : 红外图像, 可见光图像, 图像融合, 平移不变Shearlet变换, 模糊化系数图, 局部区域信息熵

Abstract :

On the basis of shift-invariant Shearlet domain fuzzy processing, an image fusion method with improved fuzzy rules was proposed. First of all, infrared and visible light images were processed by Shift Invariant Shearlet Transformation(SIST)to decomposed into low-pass and high-pass subbands. For low frequency subband coefficients, the rules of local area information entropy was used. For high frequency subband coefficients,the Shearlet transform frame redundancy was considered. To solve the redundant information of the high frequency subbands, the infrared and visible light image membership degree, non-belongingness degree, the hesitation degree of high-frequency sub-band figure and the optimal entropy were calculated. The two coefficient images were decomposed, then the total count of blackness, whiteness of two corresponding blocks are computed. Finally, the block of the blended coefficient image was constructed and the infrared and visible light images were obtained by using the SIST. This method effectively eliminates the Gibbs phenomenon, and offers an edge keeping degree more than 0.85.

Key words : infrared image visible light image image fusion shift-invariant Shearlet transform fuzzification correlation chart local area information Entropy

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