机器学习与数据挖掘

基于稀疏表示和PCNN的多模态图像融合

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摘要：

提出一种基于稀疏表示和脉冲耦合神经网络(pulse coupled neural network, PCNN)的新方法。首先将原图像进行bandelet变换,提取出图像中的几何流和bandelet系数等重要信息,再利用PCNN进行几何流融合、根据稀疏相似度优化融合后的几何流,然后更新部分bandelet系数并根据最大绝对值规则进行融合,最后通过bandelet逆变换得到融合后的图像。仿真实验结果表明,本算法有效改善了融合效果,融合图像边缘、纹理清晰,整体效果极佳;与现有的平均值融合算法、拉普拉斯金字塔算法以及基于小波变换和PCNN的WT-PCNN算法相比,本算法得到的融合图像的灰度均值、标准差、平均梯度、互信息等指标都得到了提高。

关键词： 信号稀疏表示　bandelet变换　几何流　脉冲耦合神经网络　图像融合

Multi-modality image fusion based on sparse representation and PCNN

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Abstract:

A novel algorithm for image fusion was proposed based on sparse representation and PCNN (pulse coupled neural network). The bandelet transform was used to extract important information such as geometric flows and bandelet coefficients of the source image.Then geometric flows were fused by PCNN and optimized according to similarity of sparseness. Then, the bandelet coefficients were updated and fused according to a rule of maximum absolute. Finally, the inverse bandelet transform was applied for the fused image. The experimental results showed that this algorithm could effectively improve the fusion effect. The fusion image had clear edges, texture and excellent overall effect. Compared with the average algorithm, the Laplace pyramid algorithm and the WT-PCNN algorithm based on wavelet transform and PCNN, a proposed algorithm achieved the better average gray, standard deviation, average gradient and mutual information.

Keywords: sparse representation for signal　bandelet transform　geometry flow　pulse coupled neural network　image fusion

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