基于非负矩阵分解的图像复制粘贴伪造检测

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摘 要： 复制粘贴伪造是图像篡改的一种重要手段，由此提出一种利用非负矩阵分解的检测算法来识别图像中存在的复制粘贴伪造.该算法选取重叠分块后的图像子块作为基本比较单元，对图像块进行离散小波变换，提取低频近似分量，利用非负矩阵分解对每个图像子块提取到的低频近似分量进行二次特征提取，得到系数矩阵，并进一步对其进行二值量化，最后将量化后的系数矩阵作为图像块的特征表述，利用 Jaccard 相似度衡量图像块间的相似度进行篡改检测，得到复制粘贴伪造区域.实验结果表明，所提算法在减少运算量、降低复杂度的基础上，可以高效地检测出图像中存在的复制粘贴伪造区域，同时具有鲁棒性.

关键词： 非负矩阵分解; 复制粘贴伪造; Jaccard 相似度

Copy-paste Forgery Detection Based on Non-negative Matrix Factorization

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Abstract：Copy-paste forgery is an important means of image tampering, an efficient and passive approach based on Non-negative matrix factorization is presented to detect the copy-paste forgery in the digital image. Firstly, image is segmented into overlapping blocks as the basic comparing unit, then DWT is applied to each sub-block and the low-frequency component is extracted. Non-negative matrix factorization of the low-frequency component is used to yield a reduced coefficient matrix which will be quantized subsequently as the features of sub-block. At last the detection is measured by the Jaccard similarity between each two sub-blocks. The experimental results show that the proposed algorithm is efficient and robust to the forgery detection of copy-paste image with less amount of computation and complexity.

Key words：non-negative matrix factorization； copy-paste forgery； Jaccard similarity

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