

论文

## 基于二维小波变换的独立分量分析方法及其在图像分离中的应用

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摘要

该文提出了一种新的基于二维小波变换的独立分量分析方法。研究表明, 当各个源信号的概率密度分布相同时, 自然梯度算法的稳态误差与源信号峭度的平方成反比。因此, 对峭度更大的小波域高频子图像进行独立分量分析可以获得更高的分离精度。同时, 高频子图像的大小为源图像的1/4, 计算量大大减小, 因此算法收敛的速度更快。最后, 将该方法用于混合图像的盲分离, 通过一系列实验, 证实该方法是有效的。

关键词 [小波变换](#) [独立分量分析](#) [自然梯度算法](#) [图像分离](#)

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## ICA Method Based on 2-D Wavelet Transform and Its Application to Image Separation

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Abstract

In this paper, a kind of new Independent Component Analysis (ICA) method based on 2-dimensional wavelet transform is proposed. According to the research, the steady-state error of the Natural Gradient Algorithm (NGA) is inverse proportional to the quadratic of the kurtosis of the sources when the probability distribution function of each source is the same. In addition, the kurtosis of the detail coefficients in wavelet domain is always bigger than that of the original images, so the separation precision of ICA method based on 2-dimensional wavelet transform is higher than that of the traditional ICA method. Furthermore, the size of the sub-image in 2-dimensional wavelet domain is a quarter of the source image, so the convergence speed of the proposed method is faster. Finally, this method is used to separate the mixed images. A set of experiments in different situations is done and the simulation results show that the proposed method is effective.

Key words [Wavelet transform](#) [Independent Component Analysis \(ICA\)](#) [Natural Gradient Algorithm \(NGA\)](#) [Image separation](#)

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