

# **A Comparison Study on Fusion Methods Based on Multi-resolution Analysis**

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## **ABSTRACT:**

Image fusion is a very useful technique in various applications of remote sensing for integrating a high resolution panchromatic image with a low resolution multi-spectral image to generate a high resolution multi-spectral image. In recent years, some studies showed that wavelet-based image fusion method provides high quality of the spectral content of the fused image. However, most of wavelet-based methods have the spatial quality less than that of the Brovey, IHS, and PCA fusion methods. Since edges play a fundamental role in image understanding, one good way to enhance spatial quality is to enhance the edges. Hence, in this paper, we introduce the fusion methods based on the curvelet and the contourlet transforms which are also belonging to the multi-resolution analysis and represent edges well. The fusion methods based on wavelet, curvelet and contourlet transforms are compared. The image pre-processing such as sampling approaches that might affect the fused image quality are also compared and analyzed. Comparing the performance of three multi-resolution analysis based fusion methods, it is shown that the curvelet and contourlet methods can get higher spatial quality than wavelet method. In addition, keeping the fusion method same, the different sampling approaches can affect the fused result. The objective quantitative evaluation indexes also illustrate this phenomenon.

**Keywords:** Multi-resolution analysis, Wavelet transform, Curvelet transform, Contourlet transform, Image fusion

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