Improved IHS image fusion technique using differential evolution algorithm for spectral fidelity

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Abstract: In past decades remote sensing applications have covered a wide variety ranging from civilian to surveillance serving military purposes. The increase in applications is due to the availability of high quality images for a reasonable price and improved computation power. Image fusion is an important tool for remote sensing data processing technology. The fusion of a panchromatic (PAN) image with a high spatial and low spectral resolution had become a powerful tool in many remote sensing applications. In the remote sensing community, probably the most popular image fusion method is the intensity-hue-saturation (IHS) fusion technique which has been used as a standard procedure. Unlike the pan images of SPOT and IRS sensors, IKONOS Pan images, have an extensive range of wavelengths from visible to near-infrared. This difference obviously induces the color distortion problem in IHS fusion as a result of the mismatches; that is the Pan and Intensity spectrum are spectrally dissimilar. There have been efforts taken to reinforce the fusion methods to minimize the spectral distortion by way of introducing weighted functions. This study helps to calculate the weighing parameter by the evolutionary algorithm irrespective of the rule that spectral signature of PAN should cover all the bands of MS data completely. The fused image produced by the proposed method improves the spatial details and preserve the fidelity to the lower resolution image spectral properties. The efficiency of proposed method is compared with standard methods by computing the correlation coefficient.

Keywords: Fast IHS, Spectral fidelity, Weightage, Differential evolution