

# An Advanced Pansharpening Approach for Level-1A Satellite Remote Sensing Imagery

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In recent decades, satellite remote sensing techniques have become increasingly significant in the field of data collection. Satellite imagery plays an importance role for people in enhancing our understanding of the Earth. However, a challenge encountered in satellite remote sensing tasks is the inability to provide images with high spatial and high spectral resolution simultaneously due to hardware limitations. To address this problem, pansharpening algorithms have been developed to fuse a panchromatic (PAN) image and a multispectral (MS) image, which provide high spatial resolution and high spectral resolution, respectively. In this paper, we propose a pansharpening model with fidelity term and a spatial-similarity term to perform on Level-1A data. The fidelity term penalizes differences between pansharpened and MS images by considering down-sampling, blurring and shift operator. In Level-1A data, it is necessary to consider a pixel-wise shift operator which is based on the misalignment between PAN and MS images. The spatial-similarity term is used to maintain image gradient information between the pansharpened and the PAN image. Additionally, the intensity component of the MS image is derived through a color space transformation. To mitigate spectral distortion, the proposed pansharpening model is applied to only the intensity component, rather than the separate bands of the MS image. By focusing on the intensity component, the model exhibits high executive effectiveness and can effectively achieve a balance between spectral and spatial information.

**Keywords:** pansharpening, image fusion, multispectral image