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# Super-Resolution of Hyperspectral Image via Superpixel-Based Sparse Representation

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*Abstract*—In this paper, a novel superpixel-based sparse representation (SSR) model is proposed for hyperspectral image (HSI) super-resolution. Specifically, given a HSI with low spatial resolution and a multispectral image (MSI) with high spatial resolution, the proposed SSR approach first learns a spectral dictionary from HSI and constructs a transformed dictionary corresponding to MSI. Then, the SSR method clusters the MSI into superpixels, whose shape and size can be adaptively adjusted according to the local structures. Since pixels within each superpixel have strong similarities, the SSR method simultaneously decomposes them on the transformed dictionary to generate the corresponding fractional abundance coefficient matrix, which can exploit the similarities within the superpixel to improve the sparse decomposition. Finally, the high resolution hyperspectral image can be reconstructed with the obtained fractional abundance coefficient matrix. Experimental results show that the proposed approach is superior to some well-known HSI super-resolution methods.

**Index terms:** hyperspectral image, super-resolution, sparse representation, superpixel.

## I. Introduction

Hyperspectral sensor can acquire images in many contiguous and very narrow spectral bands from visible to infrared spectrum. Recently, hyperspectral image (HSI) has been widely applied in many tasks, such as classification [1], [2], detection [3],

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