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SUPER RESOLUTION OF HYPERSPECTRAL SATELLITE IMAGERY USING 1D, 2D, AND 3D CONVOLUTION

Abstract

Remote sensing technology has undeniable importance in various industrial applications. Some of which include mineral exploration, plant detection, defect detection in aerospace and shipbuilding, and optical gas imaging, to name a few. Remote sensing technology has been continuously evolving, offering a range of image types that can facilitate the aforementioned applications. One such type is Hyperspectral Images (HSIs). Unlike multispectral and natural images, HSIs consist of hundreds of bands, which makes it easier to identify objects through their spectral reflectance signals. Despite its high spectral resolution, HSIs suffer from low spatial resolution. This is a natural tradeoff that occurs due to cameras attempting to capture 3D images using 2D sensors. In order to implement remote sensing applications effectively with satisfying accuracy, HSIs need to have high spectral resolution as well as high spatial resolution. Enhancing HSI using one image is known as Single Image Super Resolution (SISR). In this paper, various SISR techniques will be discussed and a new SISR methodology will be proposed by utilizing, 1D, 2D, and 3D convolution to extract spectral, spatial, and spectral-spatial features. The correlation between adjacent bands is utilized to make the process faster and more efficient. The proposed network is evaluated using Peak Single-to-Noise Ratio (PSNR), Structural Similarity Index Measure (SSIM), and Spectral Angle Mapper (SAM) quantitative metrics, and it is also compared to other state-of-the-art algorithms using ICONES, CAVE, and Harvard datasets.