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Abstract

This paper proposes a new image super-resolution restoration algorithm. The development of the algorithm is based on the improvement of the classical projection onto convex set (POCS) algorithm and the stationary wavelet transform (SWT) to restore a super-resolution image from Egyptsat-1 low resolution (LR) images. Egyptsat-1 bands have inconsistent sub-pixel shift. This inconsistent shift between the bands is changed into reliable shift by adaptive interpolation. Then, decomposition of high frequency sub-bands is generated using (SWT). The POCS iteration is used to restore high-resolution (HR) image from every LR wavelet decomposed images. The HR image is reconstructed by inverse wavelet transform. The result showed that the proposed method achieved significant spatial resolution improvements from 7.8 m to 4 m by using (POCS). The reconstructed image is evaluated by several quantitative measures: the peak signal-noise ratio (PSNR), root mean square error (RMSE), entropy, and Objective Fusion Measure. These measures of the proposed method were also assessed and tested with some implemented commonly used SR methods. The experimental results of the processed

Egyptsat-1 images showed that the proposed method can improve the ability of fusing different image information, and the visual and quantitative evaluations verify its usefulness and effectiveness.

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Index Terms

Computer Science

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Keywords

Super-resolution; Projection on convex set; Stationary wavelet transforms; Egyptsat-1 images; Peak signal-noise ratio; Root main square error; Entropy; Objective fusion measure.