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SUPER RESOLUTION OF DS-2 SATELLITE IMAGERY USING DEEP CONVOLUTIONAL NEURAL NETWORK

Abstract

Nowadays, Satellite images are used for various analysis, including building detection and road extraction, which are directly beneficial to governmental applications, such as urbanization and monitoring the environment. Spatial resolution is an element of crucial impact on the usage of remote sensing imagery. High spatial resolution means satellite images provide more detailed information. To improve the spatial resolution at the sensor level, many factors are ought to be taken into consideration, such as the manufacturing process. Moreover, once the satellite is launched, no further action can be taken from the perspective of hardware. Therefore, a more practical solution to improve the resolution of a satellite image is to use Single Image Super Resolution (SISR) techniques.

This research proposal deals with the re-design, implementation, and evaluation of SISR technique using Deep Convolutional Neural Network with Skip Connections and Network in Network (DCSCN) for enlarging multispectral remote sensing images captured by DubaiSat-2 (DS-2) and estimating the missing high frequency details. The goal is to achieve high performance in terms of quality, and to test whether training the network using luminance channel only, which is extracted from YCbCr domain, can achieve high quality results. For this purpose, DCSCN is trained, evaluated, and tested using a dataset collected from DS-2. A single low resolution DS-2 image is used to construct its high resolution version by training the model from scratch and fine-tuning its hyper-parameters to produce optimal results. The performance is evaluated using various quality indices, such as Structural Similarity Index Measurement (SSIM), Peak Signal-to-Noise Ratio (PSNR), and Wavelet domain Signal-to-Noise Ratio (WSNR). The performance is compared to other state-of-the-art methods, such as Bil-inear, Bi-cubic, and Lanczos interpolation.