

Comparative Study on Hyperspectral Image Enhancement for Low Illumination Outdoor Scenes Images



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Abstract Hyperspectral image is rich with information because it contains spatial and spectral properties of specific objects. However, the image quality may be affected by low lighting conditions caused by non-uniform illumination environments, uncontrollable weather, which tends to darken outdoor scenes. Difficulty arises for high order image processing modalities such as detection, classification and tracking. In this paper, a comparative study was conducted to identify the most appropriate enhancement method for outdoor scenes. Four techniques were investigated: Bio-Inspired Multi-Exposure Fusion (BIMEF), Dehazing, Illumination Estimation, and Multi-deviation Fusion (MF). Experiments revealed that BIMEF is the best approach with the lowest lightness of error.

Keywords Hyperspectral · Low illumination · Enhancement

1 Introduction

In recent years, Hyperspectral imaging (HSI) has been gaining popularity for image analysis due to its capability to capture an image and its content in materials and composition [1]. Its spectrum has a fine structure spanning a wide range of wavelengths unlike RGB which is limited to Red, Green and Blue. For each wavelength, the spatial domain can be used for identifying objects and its features such as shape, size and texture [2]. Shape analysis can be performed in the spatial domain, and as result, the spectral domain can be simplified by dimensionality reduction and therefore decrease the cost of computational power and storage burden [3].

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