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SPATIAL-SPECTRAL FEATURE EXTRACTION FOR HYPERSPECTRAL IMAGE BASED ON THE SPECTRAL SIMILARITY MEASURE

Abstract

The spatial or spectral features presented by different classes of interest in remote sensing images represent their unique properties, and by extracting these features, qualitative or quantitative analysis can be performed, which would be used in the monitoring via remote sensing. Compared with multispectral image data, hyperspectral image data has more spectral channels and can obtain more fine spectral features, which is widely used in the fields of fine agriculture, geological survey, environmental monitoring and target identification. The traditional pixel-wise hyperspectral image classification method is based on the spectral curve of a single pixel to identify its class, but due to the phenomenon that two different classes of interest may present the same spectral characteristics, the accuracy of pixel-wise method will be affected. With the continuous improvement of Hyperspectral imaging spectrometers, the spatial resolution of hyperspectral image data is increasing, and better classification can be obtained by combining spectral and spatial features. Therefore, with reference to the Gray Level Co-occurrence Matrix, this paper proposes a method for extracting the spatial-spectral features of hyperspectral image data based on the spectral similarity measure. First, the spectral similarity measures between the center pixel of the window and all other neighboring pixels are calculated to form the measure image. After that, the number of pixels whose spectral similarity measures are less than the threshold θ with the center pixel is counted along different directions to construct the spectral similarity co-occurrence matrix. Finally, the attributes are calculated based on the spectral similarity co-occurrence matrix, which include contrast, entropy and correlation. In this paper, two types of spectral similarity measures are used to analyze and compare which include Euclidean distance and spectral angle. The classification accuracy of the method proposed in this paper is compared with PCA, SVM and EMAP classification methods through Houston dataset, and the results show that the overall accuracy of the method are higher than those of other methods, which proves that the combined spatial-spectral feature extraction method used in this paper has better performance in hyperspectral image classification; the classification accuracy of the spatial -spectral feature extraction method based on spectral angle is higher than that of Euclidean distance extraction results, indicating that the spectral angle is better than Euclidean distance in representing the relationship of spectral features between pixels.