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A Spatial Hypergraph Based Semi-Supervised Band Selection Method for Hyperspectral Imagery Semantic Interpretation

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Abstract : Hyperspectral imagery (HSI) typically provides a wealth of information captured in a wide range of the electromagnetic spectrum for each pixel in the image. Hence, a pixel in HSI is a high-dimensional vector of intensities with a large spectral range and a high spectral resolution. Therefore, the semantic interpretation is a challenging task of HSI analysis. We focused in this paper on object classification as HSI semantic interpretation. However, HSI classification still faces some issues, among which are the following: The spatial variability of spectral signatures, the high number of spectral bands, and the high cost of true sample labeling. Therefore, the high number of spectral bands and the low number of training samples pose the problem of the curse of dimensionality. In order to resolve this problem, we propose to introduce the process of dimensionality reduction trying to improve the classification of HSI. The presented approach is a semi-supervised band selection method based on spatial hypergraph embedding model to represent higher order relationships with different weights of the spatial neighbors corresponding to the centroid of pixel. This semi-supervised band selection has been developed to select useful bands for object classification. The presented approach is evaluated on AVIRIS and ROSIS HSIs and compared to other dimensionality reduction methods. The experimental results demonstrate the efficacy of our approach compared to many existing dimensionality reduction methods for HSI classification.

Keywords : dimensionality reduction, hyperspectral image, semantic interpretation, spatial hypergraph
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