Spectral-Spatial Hyperspectral Image Classification based on Randomized Singular Value Decomposition and 3-Dimensional Discrete Wavelet Transform

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Abstract

Hyperspectral image Classification is one of the most active areas of research and development in the field of hyperspectral image analysis. Recently, many approaches have been extensively studied to improve the classification performance, in which integrating the spectral and the spatial information contained in the original hyperspectral image data is a simple and effective way. In this paper, A novel spectral-spatial Hyperspectral image classification method is proposed, which extract spatial feature before classification by principle component analysis (PCA)/Randomized Singular Value Decomposition (RSVD). The 3-dimensional discrete wavelet transform (3D-DWT) is applied to extract the spatial feature. The local spatial correlation of neighboring pixels is modeled using Markov random field (MRF) based on the probabilistic classification map obtained by applying probabilistic support vector machine (SVM)/Multinomial Logistic Regression (MLRsub) to the extracted 3D-DWT features, and then a maximum posterior (MAP) classification problem can be formulated in a Bayesian perspective. \(\alpha\)-Expansion min-cut-based optimization algorithm is used to solve this MAP problem efficiently. Experimental results on two benchmark HSIs show that the RSVD-3D-DWT based on methods
give better performance than PCA-3D-DWT and 3D-DWT [1] based on methods gain beyond state-of-the-art methods.

References


Index Terms

Computer Science Image Processing

Keywords
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Principle Component Analysis (PCA), Randomized Singular Value Decomposition (RSVD), 3-Dimensional Discrete Wavelet Transform (3D-DWT), Support Vector Machine (SVM), Multinomial Logistic Regression (MLR), and Markov Random Field (MRF).