A METHOD OF BANDS SELECTION BASED OF INDEPENDANT COMPONENT ANALYSIS APPLIED TO REMOTE SENSING HYPERSPECTRAL IMAGES

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Abstract: Hyperspectral imaging is an optical acquisition process that enables the collection of images on a huge number and contiguous narrow bands covering a wide spectral range. In addition to high radiometric and spatial resolutions, remote sensing images are generally taken on hundreds of bands covering the spectral regions of the visible, near infrared and short-infrared wave. The produced images are characterized by a large volume which increases in most cases the usual operations such as visualization, storage, transmission and processing.
To remedy the problem, we focus on the reduction of hyperspectral dimensionality by reducing redundancies. This is usually achieved by the feature extraction which is to project the original data in a new representation space of lesser dimension. In this case, the spectral data is completely lost. For this, we propose to adopt a different approach that preserves the meaning and informative spectral selected bands. We then propose to develop a selection algorithm which is based on independant component analysis to estimate the contribution of each of the original informative spectral bands. This will allow us to establish a schedule providing information on the degree of importance of each.
The selection means the preservation of a small number of bands among the most relevant through a threshold based on the objectives.
We apply the independant component analysis over the entire hyperspace using the fastest algorithm (known as the FastICA). This transformation generates components independent as possible based on criteria optimization using higher statistics of order two (kurtosis, negentropy). We propose to estimate the transformation matrix by considering symmetric orthogonalisations (global) or deflation (sequential, which approaches the principle of further projections). In addition and for fear of producing noisy components, we provide an adjustment to the original data before implementing the separation algorithm.
The tests, made on AVIRIS and Spectir hyperspectral images, have shown up at the effectiveness of the method to go from hyperspace original to a low dimensional space, less redundant and that preserves both the representativeness of their spectral sense.