Dimentionality reduction of multispectral images based on coefficients of spatial association

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One common problem in image classication is the high dimensionality of multivariate characteristics which increases the complexity to obtain non-duplicated information. The methodology we propose consists in reducing the dimensionality of the spectral bands associated with a multispectral satellite image. Such dimensionality reduction is accomplished by using the divergence of a modifed Mahalanobis distance. Instead of using the covariance matrix of a multivariate spatial process, the codispersion matrix is considered which under very precise conditions have some desirable asymptotic properties. The results allow one to select a set of spectral bands that produce the highest value of divergence. Then a supervised maximum likelihood method using the selected spectral bands is considered to perform landscape classification. An application with a real LANDSAT image is introduced to explore and visualize how our method works in practice.

Keywords: Multivariate Spatial Process; Spatial Association; Image Classification; Dimensionality Reduction.