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Unsupervised Classification of PolSAR Images using the K-means algorithm based on stochastic distances

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Nowadays there is a growing gamma of images generated by satellite that uses SAR Synthetic Aperture Radar) sensors, due to that, many algorithms have been developed for handle this kind of data. The SAR systems act in the microwave range and could generate images in a single polarization, in a single frequency or in multiples polarizations and multiples frequencies. The images generated by a mixture of polarizations horizontal and vertical are called PolSAR (Polarimetric Synthetic Aperture Radar) and are the focus of this work. The classification of PolSAR images provides a thorough characterization of the targets allowing a better segmentation of the area. Image classification consists in separating the data into groups based on their similarity, and the unsupervised approach does do that automatically by finding clusters based on a certain criterion. In this work, we propose to perform an unsupervised classification method to classify the PolSAR images, using the k-means algorithm with the statistical approach which objective is associate a given sample to a cluster according to a probability distribution, and this association depends on the stochastic distance of this sample and the center of mass of the cluster. In general, the Gaussian distribution is the model widely used, running on several occasions as a standard model for modeling data, especially when the probability distribution of a group is not known, but for PolSAR classification the parameter used is a multilook covariance matrix which obeys the complex Wishart distribution. Therefore, in this work, we compare five stochastic distances: Bhattacharyya, Kullback-Leibler, Hellinger, Renyi of order β e Chi-square. And the results showed that the proposed version of K-means reaches higher accuracy values compared to the classic version, which uses the Euclidian distance.

Stochastic distance. PolSAR. k-means