[2009-0187] PolSAR Image Segmentation by Mean Shift Clustering in the Tensor Space

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[2009-0187] PolSAR Image Segmentation by Mean Shift Clustering in the Tensor Space

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Abstract

We present an unsupervised segmentation algorithm for the fully polarimetric synthetic aperture radar (PolSAR) data by employing the mean shift clustering. The previous work using the span values of the PolSAR data as the features in the mean shift clustering, however, does not sufficiently exploit the full information carried by the polarimetric covariance matrix. When regarding the polarimetric covariance matrices as the feature vectors, the traditional mean shift clustering in the Euclidean space is not applicable any more, since these matrices do not form a Euclidean space. We first show that by regarding each Hermitian positive definite polarimetric covariance matrix at per pixel as a tensor, the tensor space can be represented as a Riemannian manifold. Then the mean shift clustering is extended to the Riemannian manifold to explain the theoretical meanings of the tensor clustering and a practical segmentation algorithm based on the metric lying on the manifold is proposed. Experimental results using the real fully PolSAR data and simulated data verify the effectiveness of the proposed method.
Key words

Polarimetric synthetic aperture radar (PolSAR)　image segmentation　mean shift clustering　Riemannian manifold　tensor

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