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Polarimetric SAR Data for Urban Land Cover Classification Using Finite Mixture Model

Masoud Mahdianpari (1), Vahid Akbari (2), Fariba Mohammadimanesh (1), and Mohammad Alioghli Fazel (1)

(1) Department of Geomatics Eng., University of Tehran, Tehran Iran, (m.mahdian@ut.ac.ir), (2) Department of Physics and Technology, University of Tromsø, Norway, (vahid.akbari@uit.no)

Image classification techniques play an important role in automatic analysis of remote sensing data. This paper demonstrates the potential of polarimetric synthetic aperture radar (PolSAR) for urban land cover mapping using an unsupervised classification approach. Analysis of PolSAR images often shows that non-Gaussian models give better representation of the scattering vector statistics. Hence, processing algorithms based on non-Gaussian statistics should improve performance, compared to complex Gaussian distributions. Several distributions could be used to model SAR image texture with different spatial correlation properties and various degrees of inhomogeneity [1-3]. Statistical properties are widely used for image segmentation and land cover classification of PolSAR data. The pixel-based approaches cluster individual pixels through analysis of their statistical properties. Those methods work well on the relatively coarse spatial resolution images. But classification results based on pixelwise analysis demonstrate the pepper-salt effect of speckle in medium and high resolution applications such as urban area monitoring [4]. Therefore, the expected improvement of the classification results is hindered by the increase of textural differences within a class. In such situation, enhancement could be made through exploring the contextual correlation among pixels by Markov random field (MRF) models [4, 5]. The potential of MRF models to retrieve spatial contextual information is desired to improve the accuracy and reliability of image classification. Unsupervised contextual polarimetric SAR image segmentation is addressed by combining statistical modeling and spatial context within an MRF framework. We employ the stochastic expectation maximization (SEM) algorithm [6] to jointly perform clustering of the data and parameter estimation of the statistical distribution conditioned to each image cluster and the MRF model. This classification method is applied on medium resolution L-band ALOS data from Tehran, Iran. Clustering results are presented and discussed in the full paper, also comparing the classification approach with other commonly used algorithms.

References:

[1] J.-S. Lee, M. Grunes, and R. Kwok, “Classification of multi-look polarimetric SAR imagery based on the complex Wishart distribution,” Int. J Remote Sens., vol. 15, no. 11, pp. 2299–2311, Jul. 1994.

[2] C. C. Freitas, A. C. Frery, and A. H. Correia, “The polarimetric G0 distribution for SAR data analysis,” Environmetrics, vol. 16, no. 1, pp. 13–31, Feb. 2005.

[3] A. P. Doulgeris, S. N. Anfinsen, and T. Eltoft, “Automated non-Gaussian clustering of polarimetric synthetic aperture radar images,” IEEE Trans. Geosci. Remote Sens., vol. 49, no. 10, pp. 3665–3676, Oct. 2011.

[4]. V. Akbari, A. P. Doulgeris, G. Moser, S. N. Anfinsen, T. Eltoft, and S. Serpico, “A textural-contextual model for unsupervised segmentation of multi-polarization synthetic aperture radar images,” IEEE Transactions on Geoscience and Remote Sensing, in press.

[5] S. Li, “Markov Random Field Modeling in Image Analysis,” 3rd ed. London, U.K., Springer-Verlag, 2009.