Foucher, S., Farage, G. and G. B. Bénié. “Polarimetric SAR Image Filtering with Trace-Based Partial Differential Equations” In *Proceedings of the 6th Advanced SAR Workshop (ASAR 2005)*. Longueil, Quebec, Canada, November 15-17, 2005.

Abstract

In this article, we propose to explore the potential of a new class of PDE-based regularization method for multi-valued images. Partial Differential Equations (PDE) formalism enables to regularize an image through successive iterations where pixel values are gradually diffused according to a local diffusion tensor field. The local diffusion tensor field specifies the local smoothing geometry that should drive the regularization process. Most diffusion based filtering methods are based on a divergence formulation for the diffusion term (for instance) the Yu filter) which does not produce an optima geometry preserving regularization. A new trace-based PDE approach was recently proposed by Tschumperlé *et al.* [6, 7] and has been applied to the filtering of color images and other multivalued data. Compared to a classical divergence based formulation approach, a trace based formulation enables a better preservation of the image geometric content. It can be shown that this approach is equivalent to a local filtering with spatially adaptive Gaussian kernels. We propose to apply this new framework to the filtering of Polarimetric SAR images (PolSAR). In particular, the calculation of the local geometry, originally derived from a Sobel gradient, is modified in order to be robust to the speckle noise. Speckle reduction performances are evaluated on both artificial and real PolSAR images and are compared to other standard speckle reduction filters in terms of radiometric resolution improvement and meaningful details preservation.