International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 1, Issue 1, September 2014

Impact of Dual Tree Complex Wavelet Transform in Synthetic Aperture Radar

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Abstract: Synthetic Aperture Radar (SAR) is a coherent technology, recording both the amplitude and phase of the backscattered radiation. SAR images are inherently affected by a signal dependent and multiplicative noise, known as speckle. Speckle degrades the visual appearance of the image and severely diminishing the effectiveness of the automated scene analysis. The Dual Tree Complex Wavelet Transform (DTCWT) is a form of discrete wavelet transform which generates the complex coefficients by using two trees of wavelet filters in parallel. The DTCWT has improved directional selectivity, approximate shift invariance and perfect reconstruction over traditional discrete wavelet transform. In this project, the speckle noise is removed from the Synthetic Aperture Radar images using Dual Tree Complex Wavelet Transform and Maximum A Posteriori (MAP) Shrinkage rule, by exploiting the inter and intra scale dependencies across the wavelet coefficients. A comparative study is made on the performance of the Lee filter, Gamma MAP (GMAP) filter, Spatially Adaptive wavelet based method exploiting intrascale dependency and Bivariate Cauchy Maximum Aposteriori (BCMAP) exploiting the interscale dependency. Experimental results show that the proposed method is superior to the conventional methods in terms of PSNR, MSE and ENL.

Keywords: Synthetic Aperture Radar, DTCWT, Gamma MAP, Bivariate Cauchy Maximum Aposteriori