Abstract

Classification of high resolution SAR images is difficult due to the strong presence of speckle noise. We propose to use a multiscale decomposition where this decomposition is interpreted as a way to achieve different trade-off between spatial precision (resolution) and radiometric uncertainty (noise reduction). Classification decisions at large scale are certain but spatially imprecise whereas decisions at high resolution are uncertain but spatially precise. We first decompose the SAR images in low and high frequency images at different scales using a stationary wavelet transformation. Then low pass images are classified by maximum likelihood based on a gaussian mixture estimation. Wavelet coefficients in high frequency images enable us to identify stationary homogeneous regions within the image where classification decisions are expected to be stable across scales. Decisions at different scales are merged using Dempster-shafer theory which gives us an adequate framework to manipulate both uncertainty and imprecision. Finally, resulting multiscale decisions are injected in a stochastic classification algorithm (MPM) as a hidden “evidential” Markov random field. The proposed algorithm is evaluated on artificial SAR images. We also propose to filter wavelet coefficients based on the resulting multiscale confidence map.