

Classification of Polarimetric SAR Data Using an Alpha – Entropy Representation

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Abstract

This paper examines the classification of Polarimetric SAR imagery, acquired over the Mount Lofty Ranges in South Australia, via two methods. Firstly a SAR magnitude image consisting of two wavelengths (L and P Bands) was classified using a standard supervised statistical classifier (Maximum Likelihood). In this method particular attention was paid to the collection of training such that they exhibited statistically normal distributions. A large number of independent ground / object truth data were used to provide genuine accuracy assessment of the classification. Whilst results were promising with an overall accuracy of 61%, they did show errors of commission with many buildings being placed in the class of tall trees. This is understandable as both objects potentially present double bounce of the SAR signal and both wavelengths. Secondly, the Polarimetric SAR data for both L and P bands (HH, VV and HV) was transformed into alpha – entropy coordinate space and new training data was collected for the same objects as used in the SAR magnitude classifications. It has been argued that the alpha – entropy representation of Polarimetric SAR better describes SAR scattering mechanisms than magnitude representations. In this space the alpha – entropy training data was again used for input to maximum likelihood classification and accuracy assessment was redone using the same ground truth data as was used for the magnitude classification. Results showed general improvement over the classification of magnitude data. In particular the confusion exhibited in the magnitude classification between tall trees and buildings was less pronounced. Volume scattering (at L band) from branches in the tree canopy now produced differing alpha – entropy values from the clear double bounce alpha – entropy values associated with the sides of buildings, and thus provided a difference and enabling discrimination.

Keywords: Polarimetric; SAR; Classification; Alpha; Entropy; Accuracy.

Preferred Presentation: Oral

Suggested Topic: Data processing – image classification