A FRAMEWORK OF POLARIMETRIC SAR FILTER BASED ON INDEPENDENCY OF INTENSITY AND POLARIMETRIC INFORMATION

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ABSTRACT:

The usual polarimetric speckle filters optimally combine the polarization channels into a single-channle image or only restore the radiometric information. The phase differences and the polarization channel correlation coefficients are lost. Though simple boxcar filter and extended Lee filter for covariance matrix can be used to preserve polarimetric information without changing the data form, the results are not satisfying enough. In this study, we proposed a new framework for polarimetric SAR filter in which phase and intensity information are filtered independently based on the independence of intensity and polarimetric information. Firstly, polarimetric covariance matrix is divided into the product of a scalar z and a matrix C0. The sum of diagonal elements in C0 is 1 and z denotes the sum of diagonal elements in covariance matrix which is also called total power or SPAN. SPAN z and C0 include intensity or texture information and polarimetric information respectively which both are relatively independent. Secondly, SPAN image is filtered as singly polarized imagery, for example using Lee filter. To preserve the polarimetric information, the boxcar filter is applied to C0, which can be considered as averaging pixels in a moving window using equal weights for each pixel. Also, the filtered C0 must be normalized by dividing each element by the sum of its diagonal elements. Finally, the filtered result is obtained by multiplying the filtered SPAN and filtered C0. Experiment results show that the proposed filter is valid, and polarimetric information is well preserved. And compared with extended Lee filter, the performance of the proposed method is better.

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