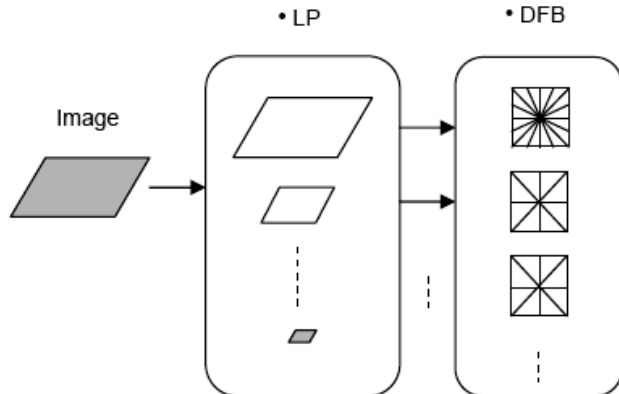




attractive computational framework for various image processing applications. However, a major drawback of the original contourlet construction is that its basis images are not localized in the frequency domain.

A despeckling technique has been proposed, based on the use of a homomorphic framework with a stage of a filter being replaced by the contourlet thresholding. The despeckled images from such method possess good qualities.



**Figure 1:** A flow graph of the contourlet transform. Image is first decomposed into subbands by LP and then each detail image is analyzed by DFB.

### c) Wavelet Transform

In this paper they introduced new wavelet based algorithm for speckle reduction of synthetic aperture radar images, which uses combination of undecimated wavelet transformation, wiener filter (which is an adaptive filter) and mean filter. Furthermore instead of using existing thresholding techniques such as sure shrinkage, Bayesian shrinkage, universal thresholding, normal thresholding, visu thresholding, soft and hard thresholding, They use brute force thresholding, which iteratively run the whole algorithm for each possible candidate value of threshold and saves each result in array and finally selects the value for threshold that gives best possible results. That is why it is slow as compared to existing thresholding techniques but gives best results under the given algorithm for speckle reduction.

### d) Wavelet Transform Using Neighbouring Wavelet Coefficients

The basic idea of the wavelet speckle suppression filter is:

- 1) Decompose a SAR image into the wavelet subspaces images with a pyramidal structure.
- 2) Reduce the amplitude of each pixel in the detail images of each subspaces by using the soft or hard thresholding.
- 3) Reconstruct an output image from the modified subspaces images.

Under the two-dimensional wavelet transformation, at every decomposition level, four frequency subbands can be obtained, namely, LL, LH, HL, and HH. The next level should be applied to the low frequency subband LL only. The denoising is done only on the detail wavelet coefficients of LH, HL, and HH, which capture the horizontal, vertical and diagonal features in the images, respectively. Then we can utilize this nature of the detail images for identifying

edges. In this paper, we study SAR image despeckle by incorporating neighbouring wavelet coefficients. By using this method we can learn from the experimental results that their proposed algorithm gives better results than the conventional wavelet thresholding algorithm. It should be note that in this paper they only investigate the relationship of the neighbouring wavelet coefficients at the same wavelet decomposition level.

### 3. Conclusion

Curvelet transform illustrates that the curvelet based despeckling algorithm using Particle Swarm optimization (PSO) performs much better in several aspects than other wavelet based method and filtering technique. The results using real SAR images show that this transform method can reduce the speckle to a great extent while preserving texture and strong radiometric scatter points. Aiso curvelet transform has Poor performance in smooth areas, produce curve let-like artifacts and not efficient if noise is more.

Using Contourlet transform it has despeckled images that possess good qualities. Because the mean of log-transformed speckle noise does not equal to zero, thus a d.c correction is required to avoid extra distortion in the restored image. It should be noted that the proposed technique is accomplished with acceptable computational complexity. It deals effectively with piecewise smooth images with smooth contours, edges, boundaries and can capture the intrinsic geometrical structure of an image.

In Wavelet Transform Artifacts are introduced if the selection of threshold of the wavelet is not proper. It Supports MRA, provides both time & frequency information.

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