2 - PRELIMINARY DATA HANDLING

2.1 - Reading Data, Building the Covariance Matrices, Filtering Speckle

Each of the provided data sets, consists of the elements of the main diagonal (hhhh, hvhv, vvvv) and those above it (hhvv, hhhv, hvvv), with reference to the covariance matrices, for each pixel. The former are real numbers whereas the latter are complex numbers. These elements are stored in separate binary files (one for every combination of channels) that are separately reshaped into 6 different arrays 1x(1024x1024). The arrays are then used to build a 3x3x(1024x1024) three-dimensional covariance matrix where for a certain value of the third dimension, say k, we have a 3x3 submatrix representing the covariance matrix of the k-th pixel. Lastly, the elements below the main diagonals are formed by taking the complex conjugate of the arrays of hhvv, hhhv, and hvvvv following the order shown below:

hhhh	hhhv	hhvv
hhhv*	hvhv	hvvv
hhvv*	hvvv*	vvvv

Fig 4 – 3 x 3 matrix correspondent to the k-th position in the third dimension.

Although this data had already been through speckle filtering, we have performed further filtering using a 3x3 box filter, to demonstrate its effect on the change detection images. In this case the algorithm is quite straightforward: a 3x3 window scans a 1024x1024 matrix and at each step the central pixel of the new picture is set equal to the mean value in the window, as shown in Fig.5. As for the border of the averaged image, the pixel values are set to 0, therefore no filtering is performed for them. Note that the border includes only the peripheral pixels, since a 3x3 averaging window was used. In general, if an n*n window is used (n being an odd number) the width of the border is equal to $\lfloor n/2 \rfloor$ (Fig. 6).

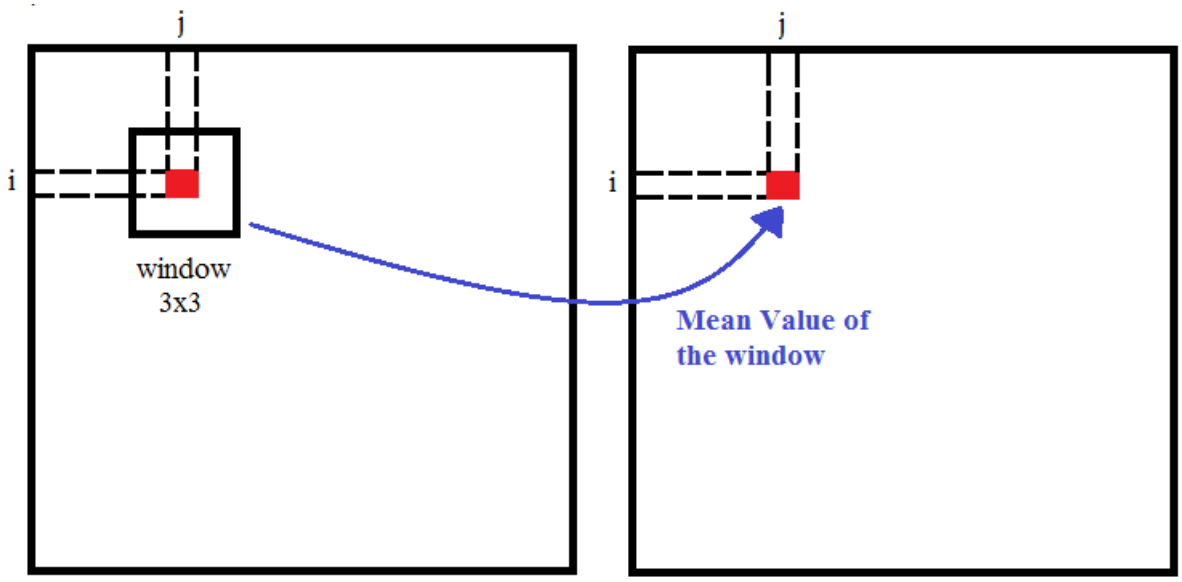

Fig 5 – Filtering operation

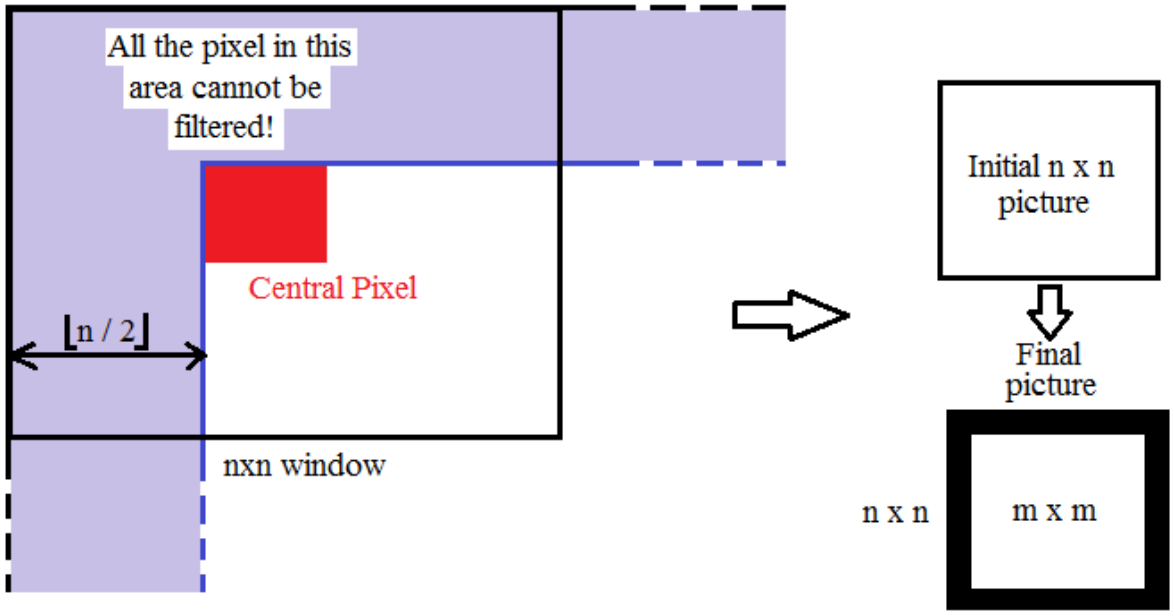

Fig 6 – Treatment of the border during the filtering