

# Study of Image Fusion Using Discrete Wavelet and Multiwavelet Transform with MATLAB Simulink

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**Abstract:** -Image processing is the field of vision based technology and visual information more impactful from other information. In this field image fusion takes its spatial space in this field. Image fusion is the technique in which we combine the two images for their information. The new image contains more information over the single image, this image more useful for the study of image about their pixel level, objects in the image for example, medical image, a satellite image, cc-TV image, capture image click by user etc.

**Keywords:** Discrete Wavelet Transform (DWT), Multi Wavelet Transform (MWT), MATLAB & Simulink.

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## I. INTRODUCTION

Image fusion is pan-sharpening technique. This image fusion technique is used to combine the geographical details of a high pixel image and low pixel image to produce a high resolution multispectral image. The developments in the field of sensing technologies, artificial intelligence, satellite sensing, medical imaging, etc. The multi sensor system has become a reality in these fields. Use the results of these techniques is to increase the level of data availability.

The image fusion provides an effective way of increasing or decreasing volume of information while at the same time extracting all the useful data from the source images. In the image fusion single sensor data and multi-sensor data presents complementary information so this technique provides an effective method to enable analysis of data. The objective of image fusion is to recreate the new output which is more approachable, distinct and unique.

The target of image fusion is to develop the environment for image analyzing to the satellite, robotic engineering, automation field, etc. For image fusion many techniques are available as a spatial domain fusion method and transform based fusion method. In this paper main focus on wavelet based image fusion technique and its results.

## II. IMAGE FUSION: DISCRETE WAVELET TRANSFORM (DWT)

Wavelet transform technique is used to observe local feature of a signal. This transforms technique also use to decompose the signal level which is may be 2D-signal or multilevel signal. In this transform technique, frequency band split into low- band and high-band. The discrete wavelet technique is most successive phenomenal for image fusion, because the

degradation level of pixel of any image at every discrete point is possible by DWT method. DWT process carries mallat algorithm or mallat-tree degradation. Mallet algorithm is used for data classification and information extraction. The mallat algorithm significance is, it creates a connection between continuous time multi-resolution of discrete time filters.

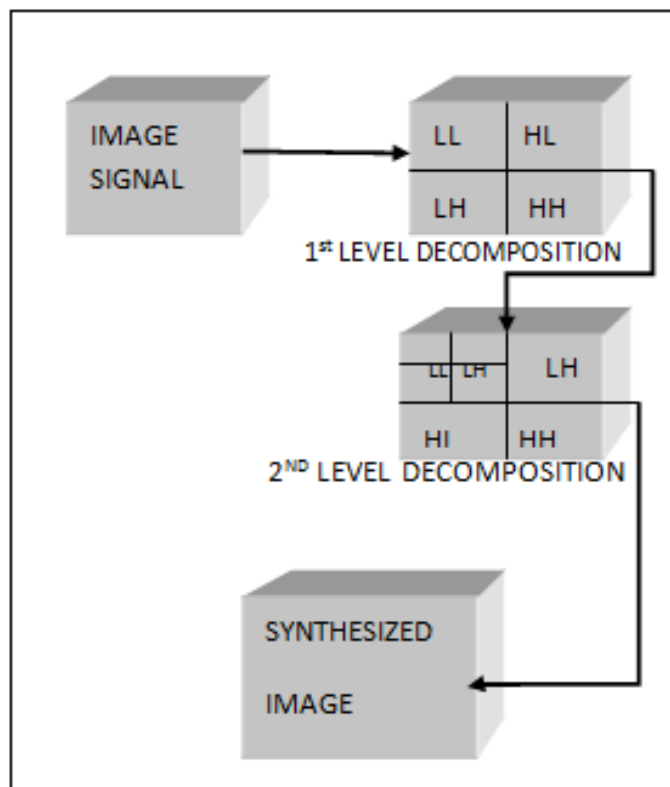


Fig1.Discrete wavelet transforms

### III. MULTI-WAVELET TRANSFORM

Multi-wavelet transform is another level of image fusion process. This process uses multi-resolution analysis. Multi-resolution analysis, also called multi-scale approximation (MSA). Multi-wavelet transform is designed method which is used to design image filters. This method justified with fast wavelet transform and represent the real and complex values of the single scale image. multi-wavelet decomposition level creates 16 sub-bands with different image fusion method max-min, max-max, min-min, UD-fusion, LR-fusion etc.

These allowed many scaling function such as orthogonality, symmetry and high order vanishing moments into a multi-wavelet transform. Its matrix element provides more degrees of freedom so sub-band structure occur due to its multi-channel nature.

The multi-wavelet function is represented by

$$\Psi(t)=[\Psi_1(t), \Psi_2(t), \dots, \Psi_r(t)]^T$$

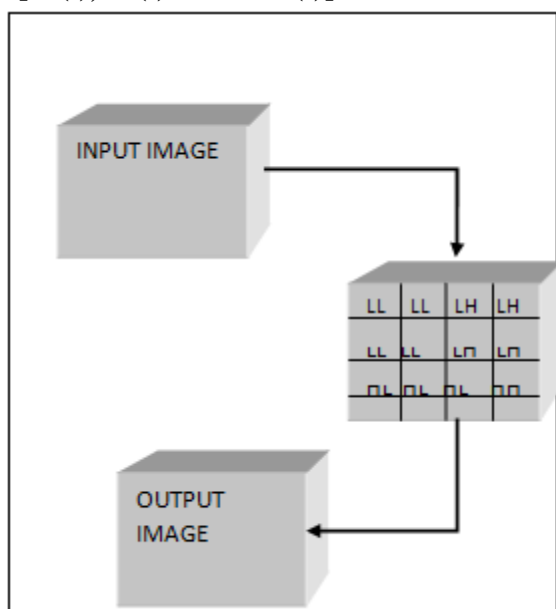


Fig2. multi-wavelet decomposition

### IV. MATLAB & SIMULINK

The MATLAB application provides a matrix environment for image processing. Which is described below step by step.

Step1: -open MATLAB tool box and then process with the image processing toolbox.

Step2: -wavelet tool box to provide different graphical user interface method.

Step3: -2-D specialization tool box provides an image fusion environment.

Step4: -load image set for image fusion and apply different filters and level of decomposition and study the results.



Fig4: -true color image with 750\*500 pixel based process with diabetes filter, min-max fusion method and 2 level of decomposition.

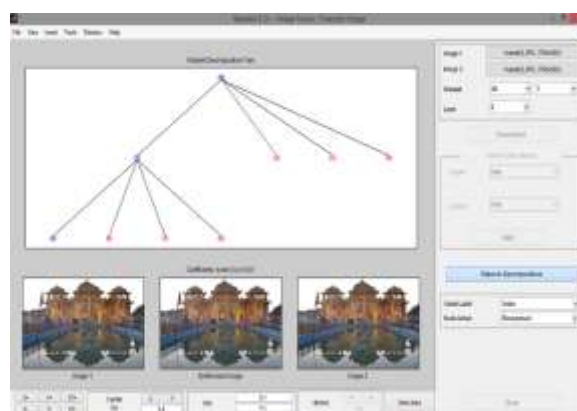


Fig5: -wavelet decomposition tree with synthesized image.



Fig6: -true color image with 750\*500 pixel, process with diabetes filter, 1 level of decomposition and linear image fusion method.

### V. CONCLUSION

In this paper, we focused on two different types of wavelet transform method which is a discrete wavelet transforming and multi wavelet transform with the help of MATLAB & Simulink. MATLAB software provides different type of filters

for example Fig4 and Fig 5. Fig4 use min-max fusion method and Fig5 used linear fusion method.

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