



## Design and Analysis of 2-D Wavelet Based GUI Image Fusion System Approach for restoring Image by Performing Wavelet Decomposition

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**Abstract:** In this paper, we have shown image fusion technique to merge two images and then their effect is analyzed with inspection of fusion tree. The traditional image fusion schemes performed the fusion right on the source images, which often have serious side effects such as reducing the contrast. Image fusion is an image processing method that can synthesize a new image from several images that are derived from different sensors. Here in this paper, in the first image some portion of the image was missing and in the another image some other portion of image was missing. The fused image contains complete information for better human or machine perception and computer-processing tasks, such as segmentation, feature extraction, and object recognition. Wavelet transform fusion involves decomposition of the original images into wavelet coefficients and combining them into a single image using a fusion scheme. Image Registration (IR) is the determination of a geometrical transformation that aligns points in one view of an object with corresponding points in another view of that object or another object. Image fusion provides an efficient way to merge the visual information from different images. Image fusion can be done in pixel level, signal level and feature based. Image fusion technique takes the advantage of information and features that possess by each image, so the fused image contains more accurate descriptions of the scene than any of the individual source images. After image fusion, the image quality can be improved, and it is fit for visual perception or subsequent computer processing.

**Keywords-** GUI; DWT; IR.

### I. INTRODUCTION

Wavelet transform fusion may evolve into feature level or decision level fusion when further processing of the image is done, or extraction of information pertinent to the image is done at its decomposition level [1]. Fusion of images is an integrated approach where the reduction of noise is essential. Discrete Wavelet Transform (DWT) has a wide range of application in fusion of noise images. Image fusion has been used in many application areas. In remote sensing and in astronomy, multisensory fusion is used to achieve high spatial and spectral resolutions by combining images from two sensors, one of which has high spatial resolution and the other one high spectral resolution. Image fusion may involve manipulating the original captured images from different devices and combining them [2]. It may also involve adjusting image attributes for further processing prior to fusion. Often these processes require high speed computers, which are currently too bulky to be incorporated as hand portable devices. The level of wavelet decomposition considered is selective and can be application-oriented. However this approach requires that the fusion step be done only at the same level of decomposition of each of the images. The wavelet transform fusion method is a form of pixel level fusion if surrounding pixels are not considered in the fusion scheme [3]. Processing and information extraction such as segmentation into regions, characterization into shape, size, contrast texture and intensity from the image means that the fusion method logically develops into the feature level. An image can usually be segmented according to the objects and features combined within, which also applies to low contrast images such as night vision and thermal images.

### II. Block diagram of image fusion

The block diagram of fusion flow is shown in figure 1. At the first input side we will provide image number one and at the second input side we provide image number two and then we decompose both images and at the last we fuse the two images and then after reconstruction we will obtain the desired output which contains complete information for better human and machine perception [4]. In wavelet based image fusion, first any one of the Wavelet applied to the image, after that we used one of the fusion rule for fusing the wavelet coefficients. Presently, the image fusion method using wavelet transform has been stepping into the main trend in the research of the image fusion field, where its advantage could be extracted: decomposing image into different frequency zones, adopting different fusion rules in those zones, reserving more significant characteristics of the image.

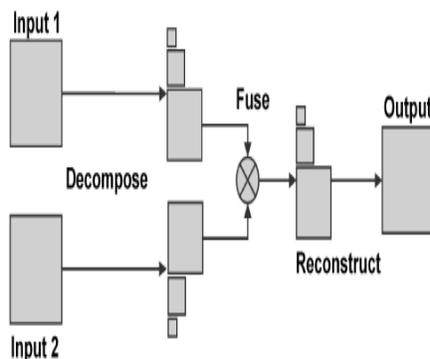


Fig 1: Fusion Flow Diagram.

For images represented in the wavelet domain, diversity is used to obtain multiple data streams of the image at the receiver where these data streams are fused to obtain a composite image [5].

### III. Categories of image fusion

Image fusion can be categorized into three categories: pixel level, feature level, and decision level.

- 1) For having high quality raw images we use pixel level fusion. In pixel level fusion, the input images are fused pixel by pixel followed by the information extraction. To implement the pixel level fusion, arithmetic operations are widely used in time domain and frequency transformations are used in frequency domain. The main goal of pixel level fusion is to enhance the raw input images and provide an output image with more useful information than either input image [6]. The main disadvantage of pixel level fusion is that it is not suitable for images with unbalanced quality level because information from one physical channel might be impeded by the other.
- 2) In above we have one limitation that we cannot use pixel level fusion for images with unbalanced quality level but in this kind of fusion technique the fusion of the raw images with unbalanced quality level is effective. In feature level fusion, the information is extracted from each input image separately and then fused based on features from input images. It requires a feature-extraction algorithm effective for both physical channels The feature detection is typically achieved through edge enhancement algorithms.
- 3) If we compare two above used fusion techniques then we come to know that decision level fusion is better because in decision level fusion, the information is extracted from each input image separately and then decisions are made for each input channel [7]. Decision level fusion is effective for complicated systems with multiple true or false decisions but not suitable for general applications. At the last, those decisions are fused to form the final decision.

### IV. Methodology of GUI based Image Fusion System.

GUI components include menus, toolbars, push buttons, radio buttons, list boxes, sliders and so forth The user of a GUI doesn't need to understand the technical details of how the tasks are performed or how to create a script or type commands at the command line to accomplish the tasks. Here in this section we use MATLAB software to find out resulting image that contains complete information of image that is easy and better for human and machine perception.

A graphical user interface is a graphical display in one or more windows containing controls and indicators that enable the end user to perform interactive tasks [8].

The GUI based programming is referred to as event-driven programming. In event-driven programming, callback execution is triggered by events external to the software.

GUIs created using MATLAB can also perform any type of computation, read and write data files, communicate with other GUIs, and display results as tables or as plots The GUI waits for the end user to manipulate a control and then responds to each action in turn [9]. We have found that GUI is one of the best option to know how our result displayed with our requirement .Graphical user interface is the friendly environment for displaying results.

Following are the steps for Image Fusion Process

- 1) First of all open the image fusion tool and with the help of matlab prompt press wave menu in order to represent main menu of toolbox of wavelet as shown in figure 2 and figure 3.

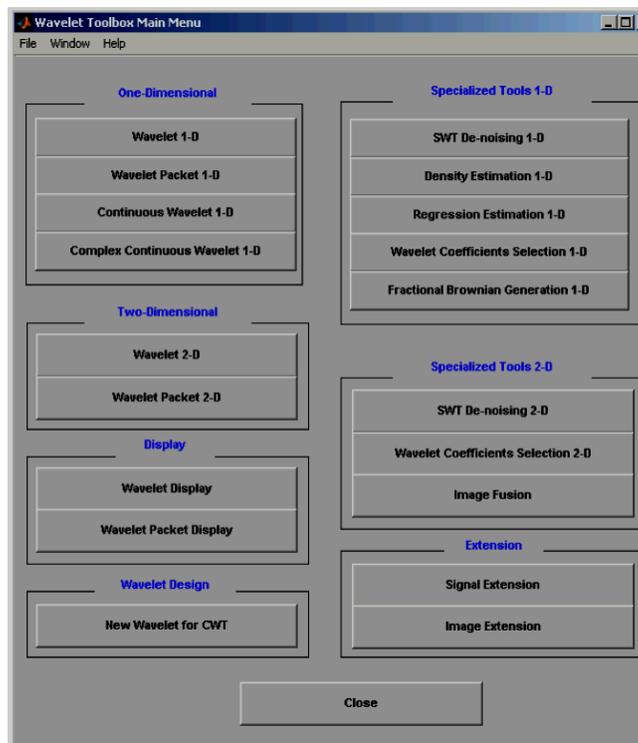


Fig.2 Wavelet Toolbox Main Menu

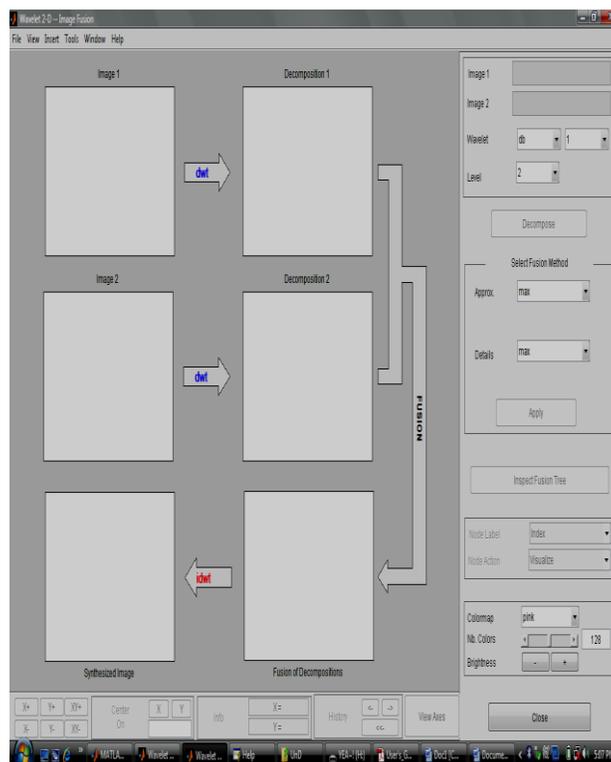


Fig. 3: Wavelet Image Fusion Toolbox

- 2) Click file menu and load the image one and when dialog box of the image one appears we will select the demo MAT-file mask.mat and that file should be in the directory of the mat lab .toolbox/wavelet/wave demo [10]. Press ok. Use same procedure for the image second and for second image we will select the demo MAT-file bust.mat.

- 3) By doing wavelet decomposition with the help of wavelet, level menu that is located at the Upper right, [11] after that we will find out wavelet family, the type of the wavelet and also the number of levels for doing analysis. Select db2 wavelet at level five for doing analysis. Press decompose tab[12]. Put a little pause during computational process, the tool will show the analysis of two images as shown in figure 4.

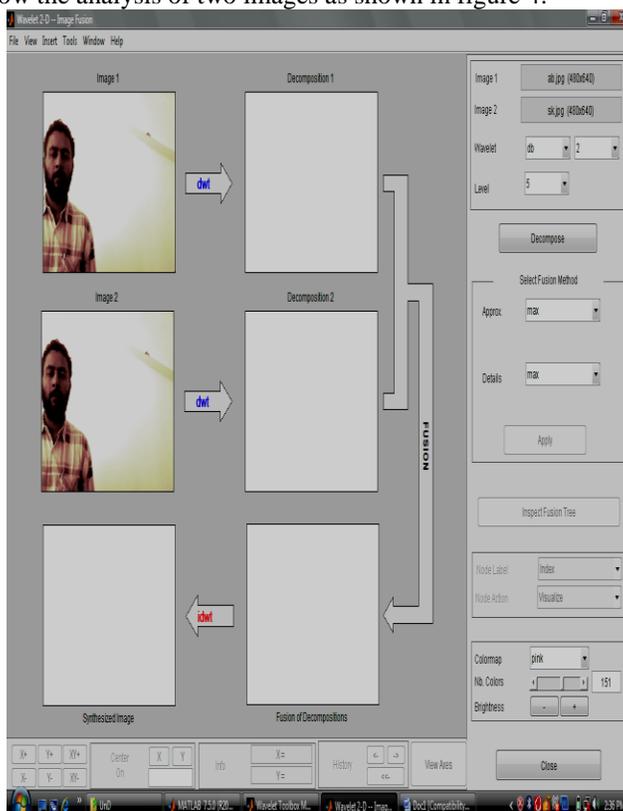


Fig. 4: Wavelet Image Fusion Toolbox With loaded Images.

- 4) By performing decomposition two images will be merged, [12] then select mean for approximation and detail and then select apply button. Result of that image will be produced by fusion that exhibits the features of two original images.

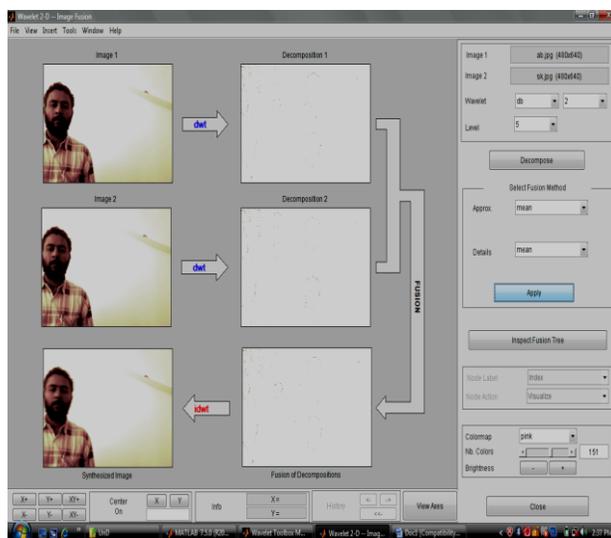


Fig. 5 Wavelet Image Fusion Toolbox with Decomposition.

- 5) With the help of image fusion technique we can restore the image. Use file menu, and load image number 1 by selecting demo MAT-file abhishek\_1.mat, and image two by selecting demo MAT-file abhishek\_2.mat.

- 6) Select sym4 wavelet at level 5 from the wavelet and level menu and then press decompose button.
- 7) With the help of select fusion method frame, press item max. For both approximation and detail and then again press apply button as shown in figure 6.

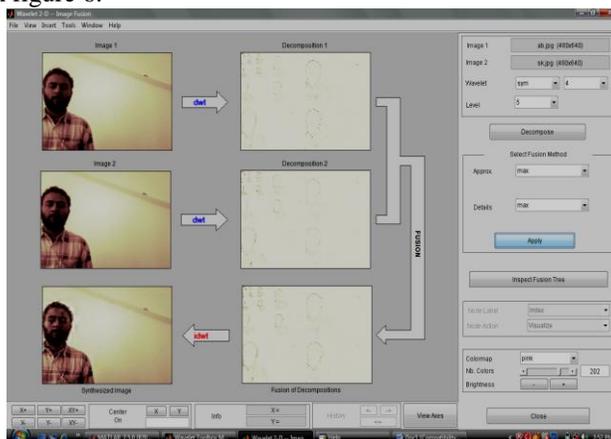


Fig.6:Image Fusion Toolbox with fusion Method frame.

- 8) At the last we will inspect fusion tree as shown in figure 7.

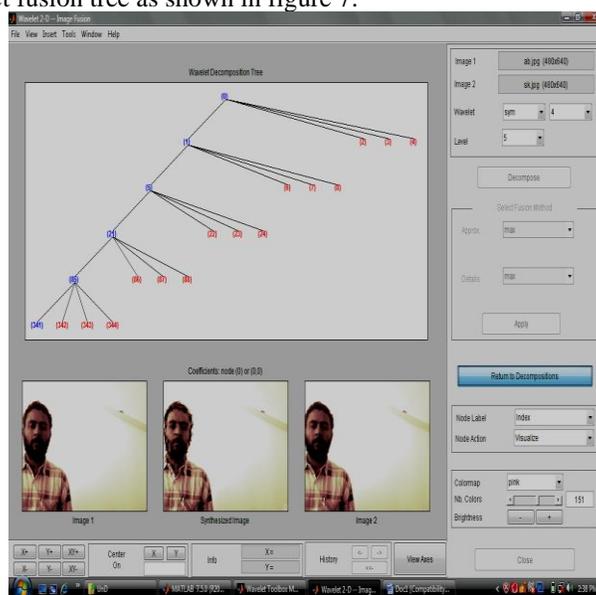


Fig. 7 Wavelet Image Fusion Toolbox with fusion Tree.

## V. Conclusion

Our objective was to find complete information of the image for better human and machine perception .The Fusion Toolkit used in this research paper intends to perform fusion of two source images using the methods studied in this research, in a user-friendly environment. As a result the detail information of the image are reserved. So the overall clear fusion image is obtained the standard deviation of image reflected scatter degree for each pixel. Two images of each user's face were captured over two sessions. Resulting image have improved the image quality and obtained excellent results. This restoration of image data is very likely to find potential applications in a number of different areas such as electromagnetic imaging of objects, medical diagnostics, remote sensing, robotics, etc.

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