ISSN: 2321-8169
427 – 434

Blending of Images Using Discrete Wavelet Transform

Ancy.S[1]
Assistant Professor/Information Technology
Jeppiaar Institute of Technology
Chennai,India
sancyit@gmail.com

Maheswari.M[2]
Associate Professor /Information Technology
D.M.I College of Engineering
Chennai,India
maheshwari.mns@gmail.com

Abstract**—** The project presents multi focus image fusion using discrete wavelet transform with local directional pattern and spatial frequency analysis. Multi focus image fusion in wireless visual sensor networks is a process of blending two or more images to get a new one which has a more accurate description of the scene than the individual source images. In this project, the proposed model utilizes the multi scale decomposition done by discrete wavelet transform for fusing the images in its frequency domain. It decomposes an image into two different components like structural and textural information. It doesn't down sample the image while transforming into frequency domain. So it preserves the edge texture details while reconstructing image from its frequency domain. It is used to reduce the problems like blocking, ringing artifacts occurs because of DCT and DWT. The low frequency sub-band coefficients are fused by selecting coefficient having maximum spatial frequency. It indicates the overall active level of an image. The high frequency sub-band coefficients are fused by selecting coefficients having maximum LDP code value LDP computes the edge response values in all eight directions at each pixel position and generates a code from the relative strength magnitude. Finally, fused two different frequency sub-bands are inverse transformed to reconstruct fused image. The system performance will be evaluated by using the parameters such as Peak signal to noise ratio, correlation and entropy

*****

I. INTRODUCTION

1.1 OVERVIEW OF DIGITAL IMAGE PROCESSING :

Image processing is a method to convert an image into digital form and perform some operations on it, in order to get an enhanced image or to extract some useful information from it. It is a type of signal dispensation in which input is image, like video frame or photograph and output may be image or characteristics associated with that image. The process used for the identification of objects in an image. This process would probably start with image processing techniques such as noise removal i.e., filtering, followed by (low-level) feature extraction to locate lines, regions and possibly areas with certain textures. The clear bits interpret the shapes of single objects, e.g. Cars on a road, boxes on a conveyor belt or cancerous cells on a microscope slide.

One reason, which leads to a problem, is that an object can appear very different when viewed from different angles or under different lighting. Another problem is deciding what features belong to what object and which are background or shadows etc. The human visual system performs these tasks mostly unconsciously but a computer requires skillful programming and lots of processing power to approach with human performance. Manipulating data in the form of an image through several possible techniques is required to process the image. An image is usually interpreted as a two-dimensional array of brightness values, and is most familiarly represented by such patterns as those of a photographic print, slide, television screen, or movie screen. An image can be processed optically or digitally with a computer. Image fusion has become a commonly-used technology to increase the visual interpretation of the images in various applications like enhanced vision system, machine vision, medical diagnosis, robotics, military and surveillance, to name a few. The main aim of any image fusion algorithm is to coalesce all the important visual information from multiple input images such that the resultant image contains more accurate and complete information than the individual source images, without introducing any artifacts. Hence, the fused image is more suitable for machine/human perception as well as for further processing.

Usually image processing system includes treating images as two dimensional signals while applying already set signal processing methods to them. Applications of image processing are Image Sharpening and restoration, Medical field, remote sensing, Transmission and encoding, machine /robot vision, colour processing, pattern recognition, video processing, Microscopic imaging, etc. The two types of methods used for Image Processing are Analog and Digital Image Processing .

i).Analog image processing is done on analog signals. It includes processing on two dimensional analog signals. In this type of processing, the images are manipulated by electrical means by varying the electrical signal.

ii).The digital image processing deals with developing a digital system that performs operations on an digital image. Domains in image processing are:

i).FREQUENCY DOMAIN:

Whereas in frequency domain, we deal with the rate at which the pixel values are changing in spatial domain.

ii).GRADIANT DOMAIN:

Gradient domain image processing is a relatively new type of digital image processing that operates on the differences between neighbouring pixels, rather than on the pixel values directly.

APPLICATION: Gradient shop.

iii).SPATIAL DOMAIN:

In spatial domain, we deal with images as it is. The value of the pixels of the image change with respect to scene.

1.2 WAVELET TRANSFORM:

Wavelet transforms was used to analyze non-stationary signals. It uses the multi-resolution technique by which different frequencies are analyzed with different resolution. The idea of this transform was to represent the signal to be analyzed as a superposition of wavelets.

II. OTHER WAVELET RELATED TRANSFORMS:

i).CONTINUOUS WAVELET TRANSFORM:

The wavelet transform of a signal using CWT is obtained by changing the scale of analysis window, shifting the window in time, multiplying the signal and integrating the result over all time.

ii).MULTI-RESOLUTION ANALYSIS:

It offers an efficient framework for existing information from images at various levels of resolution.

iii).DISCRETE WAVELET TRANSFORM:

DWT is obtained by filtering the signal through a series of digital filters at different scales. The scaling operation is done by changing the resolution of signal by the process of sub-sampling. The DWT can be computed using either convolution based or lifting based procedures. Translation will be done at integer point. Wavelets used are orthogonal and bi-orthogonal.

APPLICATIONS:

a. Compression**:** Compression is a process of minimizing the size of the graphic file without degrading the quality of image to an unacceptable level.
b. De-noising.
c. Transmission.

III. CLASSIFICATION OF IMAGES:

There are 3 types of images used in Digital Image Processing. They are 1. Binary Image 2. Gray Scale Image 3. Color Image.

1. BINARY IMAGE :

A binary image is a digital form of image with is provided with two values for each pixel of the image. Typically the two colors used for a binary image are black and white though any two colors can be used. It contains foreground color as white and background color as black. Bi-level or two-level images are binary image. This means that each pixel is stored as a single bit (0 or 1).This name black and white, monochrome or monochromatic are often used for this concept, but may also designate any images that have only one sample per pixel.

Binary images often occur in digital image processing technique as masks or as the result of certain operations such as segmentation, threshold, and dithering. Some input/output devices, such as laser printers, fax machines, and bi-level computer displays, can only handle bi-level images.

1.3.2 GRAY SCALE IMAGE :

A grayscale Image is a form of digital image in which the value of each pixel represented in the image is a single sample, that is, it carries and explains only the information related to the intensity of the image. Images of this 5 sort, also known as black-and-white, are composed exclusively of shades of color gray (0-255), varying from black (0) at the weakest intensity to white (255) at the strongest. Grayscale images are distinct from one-bit black-and-white images, which in the context of computer imaging are images with only the two colors, black, and white (also called bi-level or binary images). Grayscale images have many shades of gray in between two different colors. Grayscale images are also called monochromatic, denoting the absence of any chromatic variation. Grayscale images are often the result of measuring the intensity of light at each pixel in a single band of the electromagnetic spectrum (e.g. infrared, visible light, ultraviolet, etc.), and in such cases they are monochromatic proper when only a given frequency is captured. But also they can be synthesized from a full color image; see the section about converting to grayscale.

1.3.3 COLOR IMAGE:

A digital color image is also a form of a digital image representation that includes color information for each pixel in the image. Each pixel has a particular value which determines it's appearing color. This value is qualified by three numbers giving the decomposition of the color in the three primary colors Red, Green and Blue. Any color visible to human eye can be represented this way. The decomposition of a color in the three primary colors is quantified by a number between 0 and 255. For example, white will be coded as R = 255, G = 255, B = 255; black will be known as (R,G,B) = (0,0,0); and say, bright pink will be : (255,0,255). In other words, an color image is an enormous two-dimensional array of color values, pixels, each of them coded on 3 bytes, representing the three primary colors.

This allows the image to contain a total of 256x256x256 =16.8 million different colors. This technique is also known as RGB encoding, and is specifically adapted to human vision.

ADVANTAGES:

1) It helps to describe complex scene in the single image.
2) Minimization of edge details loss due to no down sampling.
3) Less computational complexity and better visual perception.

IV. LITERATURE REVIEW :

Blending of various images of same scene helps to have both the key information in a single blended picture. The accuracy of the blende image have been increased without losing the key information. The paper called A Universal Image Quality Index proposed a new universal objective image quality index, which is easy to calculate and applicable to various image processing applications. Instead of using traditional error summation methods, the proposed index is image distortion designed by modeling a combination of three factors: loss of correlation, luminance distortion, and contrast distortion. No human visual system model is explicitly employed, our experiments of image distortion using various image types indicate that it performs significantly better than the widely used distortion metric mean squared error. In this paper Image Quality Assessment: From Error Visibility to Structural Similarity, have summarized the traditional approach to image quality assessment based on error-sensitivity, and its limitations have been enumerated. They have proposed structural similarity as an alternative motivating principle for image quality measures of design. To demonstrate our structural similarity concept, we developed an SSIM index have showed that other methods are favorably compared with in accounting for our experimental measurements of subjective quality of 344 JPEG and JPEG2000 compressed images. Fusing Images with different focuses using support vector machines is a paper which improved the fusion procedure by applying the discrete wavelet frame transform (DWFT) and the support vector machines (SVM).

Unlike Discrete wavelet transform, Discrete wavelet Fourier Transform yields a translation-invariant signal representation. Using features extracted from the DWFT coefficients, the source images are selected from a SVM which is trained for the best focus at each pixel location, and the corresponding DWFT coefficients are then incorporated into the composite wavelet representation. The proposal of extending the depth of field in microscopy through curvelet-based frequency –adaptive image fusion had given a curvelet-based image fusion method that is frequency-adaptive. Because of the high directional sensitivity of the curvelet transform (and consequentially, its extreme sparseness), the average performance gain of the new method over state-of-the-art methods is high.

Using recent complex extensions of EMD which guarantees the same number of decomposition levels, that is the uniqueness of the scales. The methodology is used to address multifocus image fusion, whereby two or more partially defocused images are combined in automatic fashion so as to create all in focused image have been proposed in Multiscale Image Fusion Using Complex Extensions of EMD. In A Total Variation-Based Algorithm for Pixel-Level Image Fusion paper, a total variation (TV) based approach is proposed for pixel-level fusion to fuse images acquired using multiple sensors. In this approach, fusion is posed as an inverse problem and a locally affine model is used as the forward model. A TV seminorm based approach in conjunction with principal component analysis is used iteratively to estimate the fused image. A Combination of images with diverse focuses using the spatial gives an approach of which combines image with diverse focuses by decomposing the image of source into blocks first and after that combining them with the help of the spatial frequency. The algorithm is simple and will be performed in real-time applications. Wide experiments on studying the performance of fusion with different block size and threshold need to be made have been proposed. The resultant image in Multifocus image fusion using region segmentation and spatial frequency consists of more precise description of the scene than the other individual image. A new region proposed was based on the multi-focused image fusion method. The method proposed exists in the fact in which the region-based image fusion method will be more meaningful than the pixel-based fusion method. The combining groups of pixels forms an image region was based on the fusion rules. The proposed JPEG still picture compression standard for JPEG was generic, for continuous tone image an wide variety of applications are supported. The emerging JPEG continuous-tone image compression standard solves the myriad issues must be addressed before.

An approach for the multi-focused images fusion based on the calculation of the variance in the DCT domain is presented. The merit of this proposed technique was efficiency which was improved in both output quality and complexity reduction on comparison with the recently proposed technique. The Utilization of the variance in the proposed algorithm gives the better quality of the fused image. Various experiments was done to calculate the fusion performance and the results proves that it outperforms the previous DCT based methods on both quality and complexity reduction have been mentioned in Multimodal image fusion in visual sensor networks .

Here a new quality metric for image fusion focuses on the general performance measures which was computed independently of the simultaneous task. They concentrated on the measures that expresses the flourishing of an image fusion method to an extent it gives a composite image which consists the significant information from the source images and it minimizes the number of artifacts or distortion that could interfere with interpretation. It is based on a non-reference image fusion metric based on mutual information of image features. Mutual Information which calculates the entire amount of information conducted from the source images are convert to fused image. This method of estimating the joint probability from marginal distributions. When the amount of information image features are carried from the source image to fused image they considered from the measure of fusion algorithm performance. This amount are calculated by mutual information. This types of approach are only estimated by the 4-D joint Probability distribution.

When the fused image contains more accurate and comprehensive data that also contained in the individual image. In this paper they proposed to fuse the multifocus image in the multiresolution DCT domain or the wavelet domain to reduce the complexity. When the multiresolution decomposition of source images are otherwise by treating each 8*8 DCT block as a three-scale tree with include ten subband decomposition and mentions as multiresolution DCT(MDCT). This subband are used only in wavelet sub-bands to fuse the multifocus images have been proposed in

Multiresolution DCT decomposition for multifocus image fusion.

The information which is extracted from a review on various image fusion technique several images by fusing them together which gives same scene to obtain resultant image having more information for perception of human visual and become more useful of other vision processing. Because of fusing image it may lead to degrade the sharpness of edges in digital images so to overcome this a new method of edge preserving smoothing is integrated with a proposed algorithm to enhance the results. As a novel multiscale geometric analysis tool, contourlet is more advantages then using conventional method of representing methods. In this paper of Multimodality medical image fusion based on multiscale geometric analysis of contourlet transform has proposed a contourlet transformation algorithm of fusing images of multimodal medical contourlet domain performs all fusion operation. A novel contourlet contrast measurement is developed, which is more suitably proved for human vision system. By applying inverse contourlet transform directly to fuse low-pass, high-pass and subbands from which final fusion image is obtained.

Image fusion involves merging two or more images in such a way as to retain the most desirable characteristics of each. When multispectral imagery is fused with panchromatic image, hence the result is obtained with special resolution and quality of the panchromatic imagery and the spectral resolution and quality of the multispectral imagery. In this paper of Wavelet based image fusion techniques. An introduction, review and comparison, which introduced wavelet transform theory and overview of image fusion technique are given, and the result from a number of wavelet-based image fusion schemes are compared Wavelet-based schemes performs better standards schemes is found in particularly in minimizing color distortion.

The image fusion has various applications, in those some includes medical imaging, remote sensing, night time operations and multi-spectral imaging. DWT (Discrete Wavelet Transforms) and pyramids like Laplacian, ratio, contrast, gradient are effective and used methods. After the analysis of the pyramids performance has four measures namely an advanced wavelet transform, principal component analysis (PCA) is presented. The advanced wavelet transform method was compared to the other six commonly used methods and the four quantitative measures performs better on testing with the four input image types. The four quantitative measures are Root Mean Square error (RMSE), the entropy, spatial frequency and image quality index has been summarized in Advanced Image Fusion Algorithm Based on Wavelet Transform - Incorporation with PCA and Morphological Processing. Fusion based on different fusion rules of wavelet gives that the local area energy of each pixel is presented with the help of the fusion method using the Wavelet transform. The wavelet coefficients of fused image are constructed using the wavelet transform using multiple operators based on the different fusion rules. The fusion results for the visual and infrared images are evaluated by comparison of the statistical parameters of the fused images. The proposed method enhances the quality of the image and the proposed method is suitable for the properties of the human vision systems. The proposed method gives better fusion performance on local area energy of each pixel.

Wavelet based fusion of optical and SAR image data over urban area has proposed fusion method proposed provides the map of the urban area integrated starts from the images like SAR, panchromatic and multi-spectral. The proposed method idea was to produce an integrated amp that consists of information about from the data of SAR which will be injected into the optical data. The SAR image was selected because the SAR points targets and transforms the characterized urban areas.

The Comparative Image Fusion Analysis, summarizes that the method proposed was to compute the image fusion algorithms performance. They defined a set of measures for analysis of the performance and then used it on the number of fusion algorithms output which will be applied to a real passive infrared sets and visible band imagery. They give the results on a study of quantitative comparative analysis of a typical set of image fusion algorithm. The results would be about the applications on two sets of collocated visible and infrared imagery based on the algorithm. The quantitative comparison of the performance analysis was done using the five different measures of effectiveness.

V.SYSTEM ANALYSIS:

5.1. EXISTING SYSTEM:

Wavelet multi-resolution expression maps the image to different level of pyramid structure of wavelet coefficient based on scale and direction. To implement wavelet transform image fusion scheme, first, to construct the wavelet coefficient pyramid of the two input images. Second, to combine the coefficient information of corresponding level. Finally, to implement inverse wavelet transform using the fused coefficient.

DISADVANTAGES OF EXISTING:

Losses of useful key information hidden in the original images after fusing images of same scene using Discrete Wavelet Transform.

5.2 PROPOSED SYSTEM:

Image fusion is the process to select the useful information from different sources, so the quality of the source images has a crucial role on the fusion. In this project, we will enhance the source images before fusion. The source images would be enhanced through wavelet transform. The clarity based selection algorithm can be used to fuse the high-frequency coefficients obtained from the source images and the high-frequency enhanced coefficients. The low frequency coefficients obtained from the source images and the low-frequency enhanced coefficients can be fused in terms of weighted fusion algorithm. Reconstruct the high-frequency coefficients and low frequency coefficients obtained and get the fused image.

VI.SYSTEM DESIGN

6.1 SYSTEM ARCHITECTURE:

System architecture represents the overall view of the entire project and the basic activity that has to be done to get the expected data. Here, the system architecture contains the user and the database as the two different terminals along with the mining process as the overall centralized process.

6.2 IMPLEMENTATION:

Implementation is the step by step process of the project where the overall working system is being drawn from theoretical design.

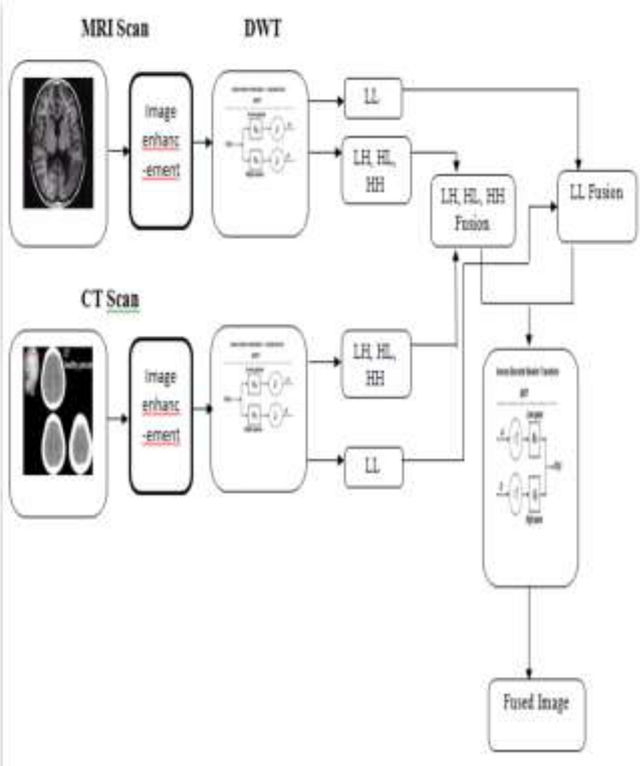

Figure 6.1 System Architecture

6.3 SELECTION OF IMAGE:

a. Images recorded digitally on disk.
b. Images can be downloaded to a computer.
c. Input images will be CT scan image and MRI scan image of the human body parts like brain for the verification of the brain tumor and cancer.

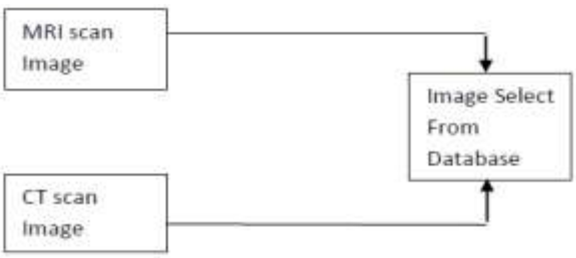

Figure 6.3 Selection of images

MRI scan Image CT scan Image Select from Database.

6.4 CONTRAST ENHANCEMENT:

In spite of increasing demand for enhancing remote sensing images, existing histogram-based contrast enhancement methods cannot preserve edge details and exhibit saturation artefacts in low- and high-intensity regions. In this section, we present a novel contrast enhancement algorithm for remote sensing images using dominant brightness level-based adaptive intensity transformation. If we do not consider spatially varying intensity distributions, the correspondingly contrast-enhanced images may have intensity distortion and lose image details in some regions. For overcoming these problems, we decompose the input image into multiple layers of single dominant brightness levels. To use the low-frequency luminance components, we perform the DWT on the input remote sensing image and then estimate the dominant brightness level using the log-average luminance in the LL sub band. Since high-intensity values are dominant in the bright region, and vice versa.

Figure 6.4 Contrast enhancement

Collect Two LL Bands Images

6.5 DISCRETE WAVELET TRANSFORM (DWT):

The discrete wavelet transform (DWT) was developed to apply the wavelet transform to the digital world. Filter banks are used to approximate the behaviour of the continuous wavelet transform. The signal is decomposed with a high-pass filter and a low-pass filter. The coefficients of these filters are computed using mathematical analysis and made available to you. It is a local transformation from time and frequency domain and easily generate a variety of different resolution images. It decomposes the image into different subband images, namely, LL, LH, HL, and HH. A high-frequency subband contains the edge information of input image and LL subband contains the clear information about the image. Enhancing the appearance of the image with help of this subbands information for fusion process. The transformation being applied in the form given below, where the original image will be sampled into four parts :

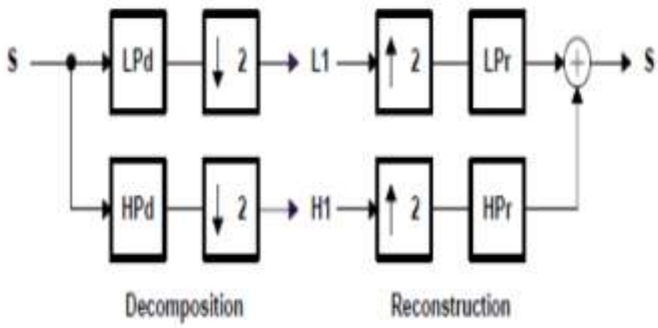

Figure 6.5.1 Decomposition and Reconstruction

Where,
LPd: Low Pass Decomposition Filter
HPd: High Pass Decomposition Filter
LPr: Low Pass Reconstruction Filter
HPr: High Pass Reconstruction Filter

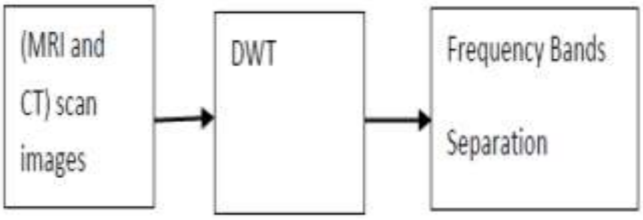

Figure 6.5.2 Overview of Discrete Wavelet Transform

6.5.1 1-D DISCRETE WAVELET TRANSFORM:

The discrete wavelets transform (DWT), which transforms a discrete time signal to a discrete wavelet representation. The first step is to discretize the wavelet (MRI and CT) scan images DWT Frequency Bands Separation.

6.5.1 1-D DISCRETE WAVELET TRANSFORM:

The discrete wavelets transform (DWT), which transforms a discrete time signal to a discrete wavelet representation. The first step is to discretize the wavelet parameters, which reduce the previously continuous basis set of wavelets to a discrete and orthogonal / orthonormal set of basis wavelets.

- m, n(t)=2m/2
- (2mt-n); m, n such that <m, n<-----(3.5)

The 1-D DWT is given as the inner product of the signal x(t) being transformed with each of the discrete basis functions.

- Wm, n = < x(t), m, n(t)>;m, nZ------(3.6)

The 1-D inverse DWT is given as:

x (t) = ; m, n Z-------------(3.7) (m n n m n m t W);

6.5.2 2-D DISCRETE WAVELET TRANSFORM:

The 1-D DWT can be extended to 2-D transform using separable wavelet filters. With separable filters, applying a 1-D transform to all the rows of the input and then repeating on all of the columns can compute the 2-D transform. When one-level 2-D DWT is applied to an image, four transform coefficient sets are created. As depicted in Figure 3.2.1(c), the four sets are LL, HL, LH, and HH, where the first letter corresponds to applying either a low pass or high pass filter to the rows, and the second letter refers to the filter applied to the columns.

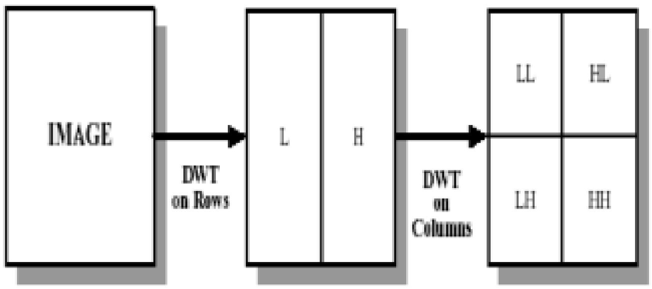

Figure 6.5.2.1 Block Diagram of DWT (a) Original Image (b) Output image after the 1-D applied on Row input (c) Output image after the second 1-D applied on row input.

The Two-Dimensional DWT (2D-DWT) converts images from spatial domain to frequency domain. At each level of the wavelet decomposition, each column of an image is first transformed using a 1D vertical analysis filter-bank. The same filter-bank is then applied horizontally to each row of the filtered and sub sampled data. One-level of wavelet decomposition produces four filtered and sub sampled images, referred to as sub bands. The upper and lower areas of Figure. 6.5.2.1(b) respectively, represent the low pass and high pass coefficients after vertical 1D-DWT and sub sampling. The result of the horizontal 1D-DWT and sub sampling to form a 2D-DWT output image is shown in Figure.6.5.2.1(c).

We can use multiple levels of wavelet transforms to concentrate data energy in the lowest sampled bands. Specifically, the LL sub band in figure 6.5.2.1(c) can be transformed again to form LL2, HL2, LH2, and HH2 sub bands, producing a two-level wavelet transform. An (R-1) level wavelet decomposition is associated with R resolution levels numbered from 0 to (R-1), with 0 and (R-1) corresponding to the coarsest and finest resolutions. The straight forward convolution implementation of 1D-DWT requires a large amount of memory and large computation complexity. An alternative implementation of the 1D-DWT, known as the lifting scheme, provides significant reduction in the memory and the computation complexity. Lifting also allows in-place computation of the wavelet coefficients. Nevertheless, the lifting approach computes the same coefficients as the direct filter-bank convolution.

6.5.3 2-D TRANSFORM HEIRARCHY:

The 1-D wavelet transform can be extended to a two-dimensional (2-D) wavelet transform using separable wavelet filters. With separable filters the 2-D transform can be computed by applying a 1-D transform to all the rows of the input, and then repeating on all of the columns.

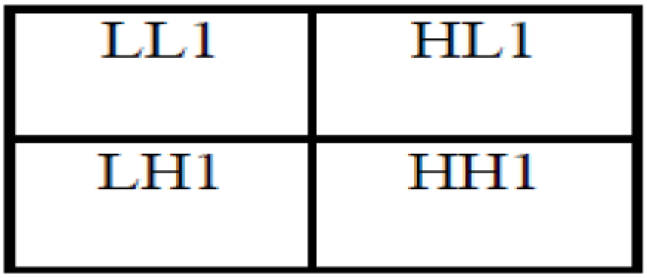

Figure 6.5.3.1 Subband Labelling Scheme for a one level, 2-D Wavelet Transform .

The original image of a one-level (K=1), 2-D wavelet transform, with corresponding notation is shown in Figure.6.5.3.1. The example is repeated for a three-level (K =3) wavelet expansion in Figure. 6.5.3.2. In all of the discussion K represents the highest level of the decomposition of the wavelet transform.

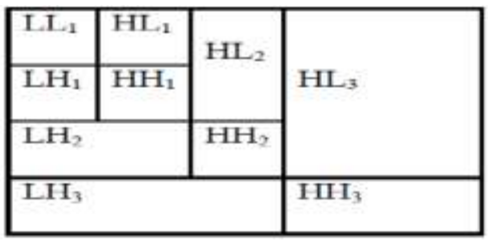

Figure 6.5.3.2 Sub band labeling scheme for a Three-level, 2D Wavelet transform.

 ISSN: 2321-8169
427 – 434

The 2-D sub band decomposition is just an extension of 1-D sub band decomposition. The entire process is carried out by executing 1-D sub band decomposition twice, first in one direction (horizontal), then in the orthogonal (vertical) direction. For example, the low-pass sub bands (Li) resulting
from the horizontal direction is further decomposed in the vertical direction, leading to LLi and LHi sub bands. Similarly, the high pass sub band (Hi) is further decomposed into HLi and HHi. After one level of transform, the image can be further decomposed by applying the 2-D sub band decomposition to the existing LLi sub band. This iterative process results in multiple transform levels. In Figure. 6.5.3.2 the first level of transform results in LH1, HL1, and HH1, in addition to LL1, which is further decomposed into LH2, HL2, HH2, LL2 at the second level, and the information of LL2 is used for the third level transform. The sub band LLi is a low-resolution sub band and high-pass sub bands LHi, HLi, HHi are horizontal, vertical, and diagonal sub band respectively since they represent the horizontal, vertical, and diagonal residual information of the original image. To obtain a two-dimensional wavelet transform, the one-dimensional transform is applied first along the rows and then along the columns to produce four sub bands: low-resolution, horizontal, vertical, and diagonal. (The vertical sub band is created by applying a horizontal high-pass, which yields vertical edges.) At each level, the wavelet transform can be reapplied to the low-resolution sub band to further decorrelate the image. Defining level and sub band conventions used in the AWIC algorithm. The final configuration contains a small low-resolution sub band. In addition to the various transform levels, the phrase level 0 is used to refer to the original image data.

6.6 Inverse DWT (IDWT):

DWT is used to separate the input low contrast satellite image into different frequency sub bands, where the LL sub band concentrates the illumination information. That is why only the LL sub band goes through the process, which preserves the high-frequency components (i.e., edges). Hence, after inverse DWT (IDWT), the resultant image will be sharper with good contrast.

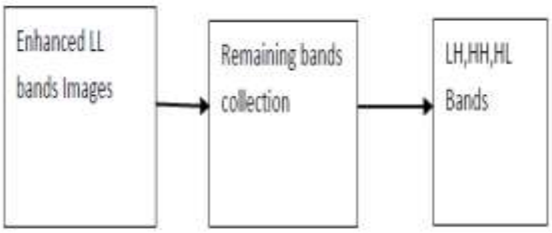

Figure 6.6 Overview of IDWT

6.7 Fusion:

Image fusion is a data fusion technology which keeps images as main research contents. It refers to the techniques that integrate multi-images of the same scene from multiple image sensor data or integrate multi images of the same scene at different times from one image sensor. The image fusion algorithm based on Wavelet Transform which faster developed was a multi-resolution analysis image fusion method in recent decade.

VII. CONCLUSION:

7.1 SUMMARY:

Image fusion is the process of combining relevant information from minimum two images into a solo image. The aim of this algorithm is that the resulting image will be more informative than the source image and also relay on the performance of the image after fusion. From the above papers surveyed, most of the papers focuses on improving the quality of the resultant image.

7.2 FUTURE ENHANCEMENTS:

We have proposed a system of Image Fusion technique of DWT and the size of image which is going to be fused can be increased .Since our technique focus on the pixel range of 256x256.In future the pixel value can be increase to have image fusion of pixel greater than 256x256.

REFERENCE

[1] Wang, Zhou. and Bovik,C Alan. ‖A universal image quality index.‖ IEEE Signal Processing Letters, 9 (2002): 81-84.

[2] Wang, Zhou. , Bovik,C Alan. and Hamid, Rahim Sheikh. ―Image quality assessment :from error visibility to structural similarity.‖ IEEE Transaction on Image Processing , 13.4 (2004):600-612.

[3] Li,Shutao. ,KwoK,Tin-yau James. ,Tsang,Wai-Hung Ivor. and Wang,Yaonan. ―Fusing images with different focuses using vector machines.‖ IEEE Transaction On Neural Network, 15.6 (2004):1555-1561.

[4] Tessens,Linda. ,Ledda,Alessandro. ,Zuricat,Pi Aleksandra. And Philips,Wilfried. ―Extending the depth of field in microscopy through curvelet-based frequency-adaptive image fusion.‖ IEEE International Conference, 1 (2007): I-861 – I-864.

[5] Looney,David. And Danilo,P Mandic.‖MultiScale image Fusion Using Complex Extension of EMD.‖ IEEE Transaction On Signal Processing, 57.4 (2009):1626-1630.

[6] Mrityunjay,kumar. and sarat,Dass. ―A total variation-based algorithm for pixel-level image fusion.‖ IEEE Transaction on Image processing, 18.9 (2009):2137-2143.

[7] Li,Shutao. ,KwoK,Tin-yau James. and Wang,Yaonan. ―Combination of images with diverse focuses using the Spatial Frequency.‖ Information Fusion, 2.3 (2001):169-176(8).

[8] Li,Shutao. and Yang,Bin. ―Multifocus image fusion using region segmentation and spatial frequency.‖ Image and vision computing, 26.7 (2008):971-979.

[9] Wallance,G.k. ―The JPEG still picture compression standard.‖ ,IEEE Transaction, 38.1 (1992):xvii-xxxiv.

[10] Nirmal, D.E. ,Vignesh, R.K. and Vaidehi,V. ―Multimodal image fusion in visual sensor networks.‖ IEEE International Conference on Electronics ,Computing and communication Technology, (2013):1-6.

[11] Piella,G. and Heijmans,H. ―A new quality metric for image fusion.‖ International conference on image processing, 3 (2003):III-173-6

ISSN: 2321-8169
427 – 434

[12] Haghighat,A.B.M. ,Aghagolzadeh,Ali. and seyedarabi,Hadi. ―A non-refeernce image fusion based on mutual information of image features.‖ International conference on computer and electrical engineering, 37.5 (2011):744-756. 52

[13] Kumar,B.K.S. ,Swamy,M.N.S. and Ahmad,M.O. ―Multiresolution DCT decomposition for multifocus image fusion.‖ Annual IEEE candidate conference on Electrical and computer Engineering, (2013):1-4.

[14] Malhotra,G.and chopra,vinay. ―A review on various image fusion technique.‖ International journal of computer engineering and application ,6.3 (2014).

[15] Yang,L. ,Guo,B.L. and Ni,W. ‖ Multimodality medical image fusion based on multiscale geometric analysis of contourlet transform .‖ Neurocomputing ,72.1-3 (2008):203-211.

[16] Amolins,krista. , Zhang,Yun. and Dare,peter. ―Wavelet based image fusion techniques — An introduction, review and comparison.‖ ISPRS Journal of Photogrammetry and remote, 62.4 (2007):249-263.

[17] Zheng,Yufeng. , Essock,A.Edward and Hansen,c. ― An Advanced Image Fusion Algorithm Based on Wavelet Transform – Incorporation with PCA and Morphological Processing .

[18] Guanqun,Tao. , Dapeng, Li. and Guanghua, Lu. ―Fusion based on different fusion rules of wavelet.

[19] Garzelli.‖ Wavelet based fusion of optical and SAR image data over urban area.

[20] Sadjiadi,Firooz. ―Comparative Image fusion Analysis.

[21] Blum,R.and Liu,Z,Multi-sensor Image Fusion and its applications London,CRC press,2005.