A Review on Image Fusion Techniques and Proposal of New Hybrid Technique

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Abstract — Image fusion is described as the method of mixing 2 or more images to make a more informatics resultant image than any of the image used as input image. Image fusion is done to get a more enhanced and informative and more quality image from 2 or more pictures that are taken from completely different views, completely different sensing element,completely different modal and different temporal. the application areas of image fusion include both military and domestic functions and even medical functions. many techniques are designed till date for efficient fusion like Principal component Analysis, discrete wavelet based fusion etc. .

Keywords- Image Fusion, DWT, LP, PCA,DWT

1. INTRODUCTION

Image processing is a wide area of analysis for students. It offers alternative of numbers of fields and area in which analysis work can be carried out. Image fusion is one such field within the area of image processing during which varied researches are being carried out to get better results. Image fusion is the technique of obtaining a a lot of informative and top quality image from 2 or more pictures. the images that are fused are more probably to be taken of same perspective and same sensors however these may well be of various detectors, completely different modal, varied focal and varied temporal. in the method of image fusion, the information of all the images to be fused is taken into account and so fusion is finished such that the resultant image will be more informative and qualitative. the requirement of image fusion is to get resultant image of high spatial and high spectral information. The algorithms that are developed for image fusion are input dependent. the method of image fusion finds its use in various management and exploration operations for domestic and non-civil goals. Applications of image fusion include areas like satellite imaging; rob vision, object revelation and recognisance. Image fusion can even use in medical diagnosis and treatments. this is often done by merging or overlaying completely different pictures of patient to get more correct data. The technique of image fusion is employed for determining the case by combining the knowledge from varied sensors. varied algorithms are designed for image fusion that has Laplacian Pyramid, principal component analysis, discrete wavelet Fusion etc. The techniques developed for image fusion should have high accuracy, high reliableness & dimensionality.

Image fusion is referred to as the process of obtaining a superior image from the input images by extracting certain features of the input images. Basic objective of fusion is obtaining more informative and better quality image than the input images.

Figure 1.image 1

Figure 2 .image2

Figure 3 . fused image

Image fusion techniques are classified into following two categories:

A.Spatial Domain Fusion

B.Frequency Domain Fusion

1.1 Spatial Domain fusion: In these techniques, fusion is done by directly changing the image pixels. The values of the pixels of both the images are done such that a better and enhanced image is obtained as a result. Types of spatial domain fusion techniques are :

  1.1.1 PCA
  1.1.2 Averaging method
  1.1.3 IHS method
  1.1.4 High pass filtering

1.2 Frequency domain fusion : In this type of image fusion, decomposition of multiscalar coefficients of the images selected as input is done at first and then certain rules are implied. The coefficients of the fused image are chosen on the basis of the employed rules. Types of frequency domain fusion techniques are:

  1.2.1 Discrete wavelet transform
  1.2.2 FSD pyramid
  1.2.3 Laplacian Pyramid
  1.2.4 Ratio-of-low-pass pyramid
  1.2.5 Gradient Pyramid

2. RELATED WORK

- **Kusum Rani, " Study of different Image Fusion Algorithm",** - Image fusion is a technique that integrate complimentary details from multiple input pictures such the new image provide a lot of information and a lot of appropriate for the aim of human seeing. This paper presents a review on a no. of the image fusion techniques like simple average, simple minimum, simple maximum, PCA, DWT etc.

- **IshaMehra[2014] Image fusion using wavelet transform and its application to asymmetric cryptosystem and hiding -** Image fusion could be a widespread technique which provides higher quality amalgamate image for interpreting the image information. in this paper, color image fusion using wavelet transform is applied for securing information through asymmetric cryptography scheme and image hiding. The elements of a color image corresponding to completely different wavelengths (red, green, and blue) are amalgamate along using discrete wavelet transform for getting a better quality retrieved color image. The fused color components are encrypted using amplitude- and phase-truncation approach in fresnel transform domain. Also, the individual color elements are transformed into completely different cover pictures in order to result disguising data of input image to an attacker. uneven keys, physicist propagation parameters, weighing factor, and 3 cover

pictures provide enlarged key area and hence increased security. framework results support the idea of the proposed fused color image encryption scheme.

- **Dr. S.S Bedi, " Image fusion techniques and quality assessment parameter for clinical diagnosis: A Review** –   Image fusion is a tool that serves to mix multi sensors images by using advanced image process techniques. particularly it serves best in diagnosis i.e. computed tomography , magnetic resonance image , scan provides differing types of knowledge, by fusing them we will get correct info for higher clinical diagnosing. transform domain image fusion strategies like wavelet transform, curve let transform have its specific benefits whereas going for multi-sensors image fusion. Analysis is completed to work out the image fusion algorithmic rule that is additional appropriate for clinical diagnosing. Analysis is additionally done on image quality assessment parameters of image fusion. This paper presents a review on image fusion techniques and image quality assessment parameters like Structural similarity index measure, normalized absolute error,   laplacian mean square error, mean square error, Peak signal to noise ratio, entropy, structural content, Normalized cross correlation . Comparison and effective use of all the techniques in image quality assessment is additionally determined.

- **Sejal Baraiya, Vol. 1, Issue 7, Dec 2014, " an introduction of image fusion techniques",** - This paper presents two approaches for fusion, spatial fusion and transform fusion like Principal component Analysis that is a spatial domain technique and DWT, DCT that are transform domain technique. during this paper comparison of PCA, DWT and DCT and DWT in done. Parameters like spatial frequency, SD, PDNR etc. are wont to get high resolution and sensible quality united image.

- **Harmandeep Kaur vol.5, issue 5,may 2015, "Analytical Comparision of Various Image Fusion Techniques"-**In this paper various techniques like IHS,PCA,DWT,Gradient pyramids, Laplacian pyramid,SF,DCT are evaluated with their inputs and outputs.This paper counsel that Laplace with shift invariant DWT offer economical results on coalesced image.

- **Ms. Mukta, Volume 3, Issue 4, "Comparative Study of different Image fusion techniques"** – The comparative study of image fusion techniques are performed during this paper. Image Fusion techniques are helpful to form one enhanced image that is more appropriate for human visual object detection and target recognition. This paper concludes that spatial domain techniques give a high spatial resolution however result in image blurring downside. The wavelet transform is good for image fusion which give a top quality spectral content.

- **Rajendra Pandit Desale, 2013, "Study and analysis of PCA, DCT and DWT based image fusion techniques"** International conference on signal processing and pattern recognition - Diagrams and algorithms of PCA (principal component Analysis), DCT (Discrete cosine Transform) and DWT (Discrete wavelet Transform) primarily based image fusion techniques. The comparative analysis of above techniques is performed and given within the variety of table. The PCA & DCT are standard fusion techniques with several drawbacks, whereas DWT primarily based techniques are a lot of positive as they provides higher results for image fusion

3. PROBLEM FORMULATTION

Image fusion is the method that mixes information from multiple images of identical scene. These images may be captured from totally different sensors, acquired at totally different times, or having totally different spacial and spectral characteristics. There are various type of strategies for image fusion, earlier the image was fused directly by combing the pixels of the image however that lead to blurring of the fused image. In direct pixel combining methodology, the source image and the neighbor images are combined with the corresponding pixels of each the images. The defined weights of the images are integrated into an image. The pixels of the new image are generated on the idea of the common weight of pixels of that image. HSI is another methodology used for image fusion however the limitation of this methodology is that the involvement of only 3 bands. Then came the DWT methodology that's additionally referred to as discrete wavelet transform. The DWT gave improved results than the conventional strategies like it had good spectral preservation however it additionally had certain drawbacks that restricted its use in image fusion. The spacial improvement once applying DiscreteWavelet Transform was poor and it had high shift invariance that reduced the potency of the system. In many situations image process needs high spacial and high spectral resolution in a single image. wavelet fusion technique additionally induces small distortion. however of these methodology weren't efficient.

An economical technique has to be implemented for image fusion that's more economical than the standard techniques and a high spacial and high spectral resolution image should be obtained after fusion

4. OBJECTIVE

1 To review various algorithms for fusion

2. To implement a replacement approach of fusion i.e. hybrid approach

3.To implement techniques of wavelet fusion & Laplacian pyramid for image fusion

4.Improved quality image once fusion is obtained
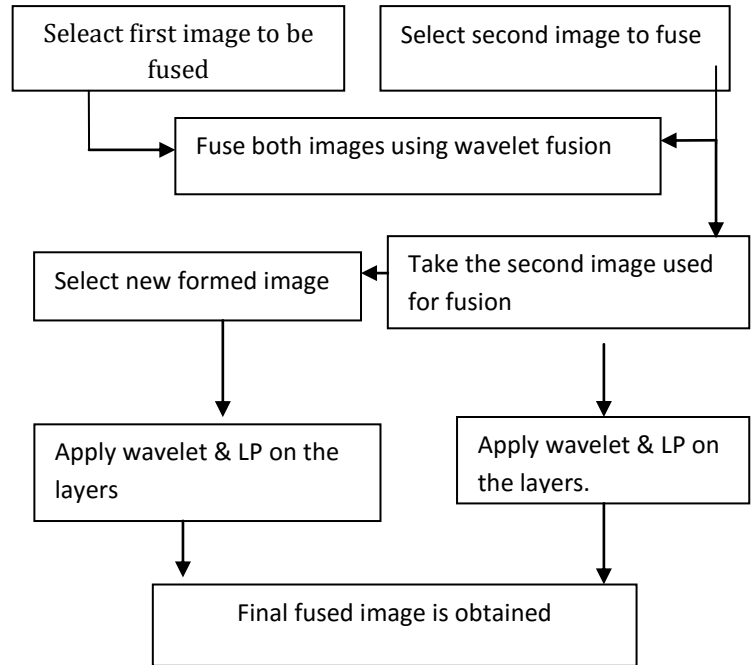
5. METHODOLOGY

Fig-1: Process of applying proposed technique for obtaining a final fused image.

6. CONCLUSION:

This paper proposed hybrid approach which solves the matter of edge preservation and fused the images additional specifically. Since, the second approach used with wavelet fusion technique is Laplacian Pyramid, this technique analyses every specific of the image and thus helps in retaining the standard of fused image. The Laplacian Pyramid technique checks every pixel of the images and thus simply observes any change within the data of the image. The planned technique has proved to be higher than the standard techniques in terms of edge preservation and is best within the terms of quality.

7. REFERENCES

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BIOGRAPHIES

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