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# Image Fusion Based on Transformation and Optimization Techniques

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***Abstract:*** ***Digital image processing is very promising research area for the researchers; image fusion is one of them. Image fusion is the process of improvements in the results for scene by combining information captured by multiple sources or modality sensors. The objective of image fusion is to extract the required important data from the multiple different image to generate a combine image that contain a improvement image than individual image. In this paper we presents the image fusion techniques with the wavelet transform and particle swarm optimization and our simulation shows that the our proposed method gives better results than the existing techniques.***

***Keywords:*** ***Image fusion, PSNR, Optimization, Gray image.***

## I. INRODUCTION

With the recent developments in the field of multimedia computing information or digital image processing, image fusion process used for various visual applications, image fusion provide the possibility for combining the images an enhanced the representation of combining image where captured from various sources or modality sensors. In fusion process combine information the multiple image for the same scene, these image may be captured by different time, different devices, different spatial or other image characteristics, and objective of image fusion is to retain the most required characteristics of the image. The image fusion process generally classified into three different levels such as the pixel level, which works either in the time domain or in the spatial domain, the another classification is features or middle level, which works with the image features such as the image color, size, texture, shape etc. the last classification is decision or high level, which works with object detection and classification and finally integrate to them.

Wavelet Transform is faster and developed in multi-resolution pattern. It has various characteristics of time-frequency level. Wavelet transform holds time as well as frequency features in any image and provides best picture. Wavelet transform is such kind of tools that divides the data into various frequency parts.

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These frequencies can be high and low and further this process is called as a decomposition process where frequency images low and high frequency images exists.

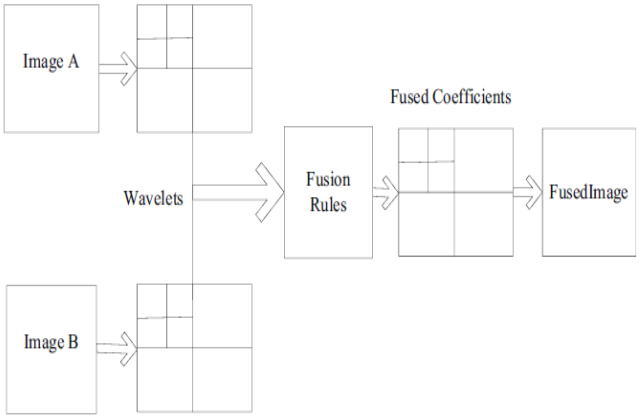


**Fig 1: Wavelet based image fusion.**

The above figure shows the image fusion process with the help of wavelet transformation techniques, where the image A and image B is process by wavelet transformation and fused with the some fusion rules and coefficient value of image fusion, and finally we obtain required fused image.

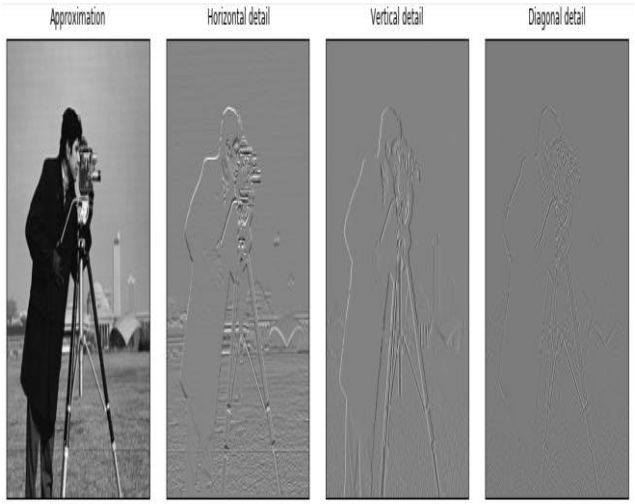


**Fig 2: DWT Decomposition Level.**

## II. PROPOSED METHODOLOGY

In this section we mention that our proposed methodology for the image fusion process, Here we present a hybrid approach for the image fusion which is a combination of the wavelet transformation and the optimization methods i.e. particle swarm optimization techniques.

In the below diagram for the proposed work we select two image one as an input image and another one as a reference image then we apply the wavelet transformation for both the input image using some fusion rules and coefficient factors and process further for the optimization techniques with the image fusion types such as the feature level image fusion.
Here our obtain results are compared in between existing and proposed techniques, and our proposed method gives better performance parameters value for the desired results and enhance the performance of image fusion process.

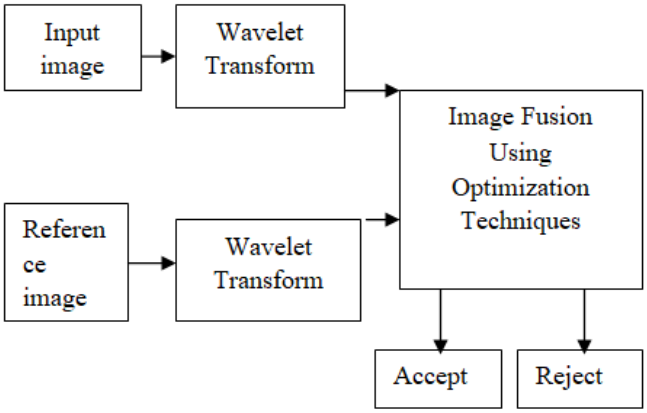


**Fig 3: Proposed method block diagram.**

## III. PROPOSED ALGORITHM

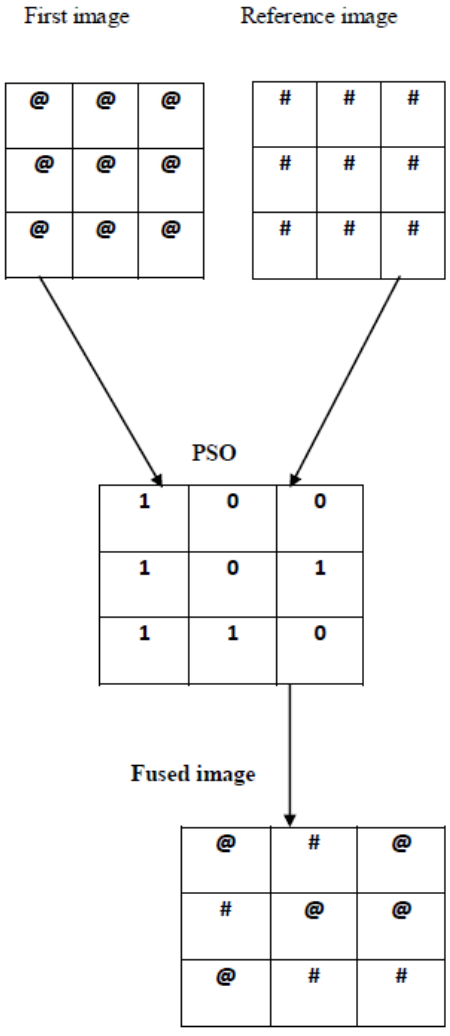


**Fig 4: Illustration of proposed algorithm.**

The above diagram present the basic procedure we have to follow in image fusion process, initially we take an input image and combine with the another input image i.e. references image, after the combination of both input image we apply the procedure for the particle swarm optimization to combine the image into another image i.e. result image or fused image.

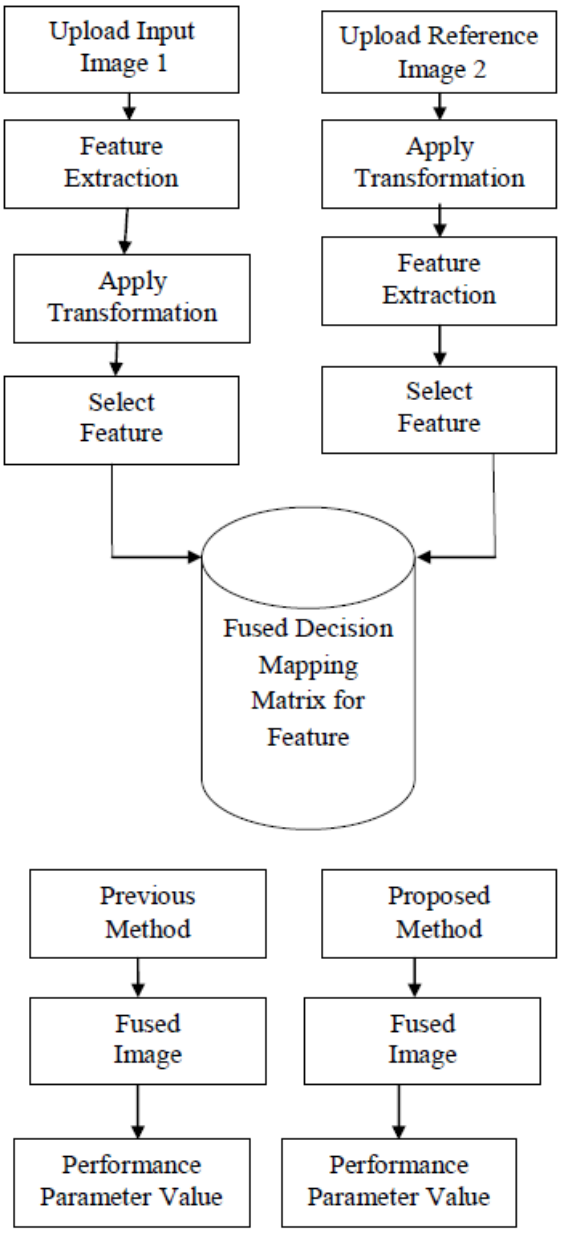


**Fig 5: Proposed image fusion method flow graph.**

## IV. RESULT ANALYSIS

In this section we discuss the about simulation results and comparative performance evaluation for the existing and proposed approach. In this section we discussed about the region based image fusion techniques, which are comparatively evaluate the performance for the both approach previous approach and the proposed approach, all the performance parameters are measured by the both approach and here we found that the our proposed approach gives better results than the previous approach.

There are different number of parameters such as the peak signal noise ratio, information entropy and standard deviation etc. Here we used the different number of input image and with the original image and the reference image and then finally fused into result image, the fused images are the result image which s basically combination of an image one and image two in an efficient manner.

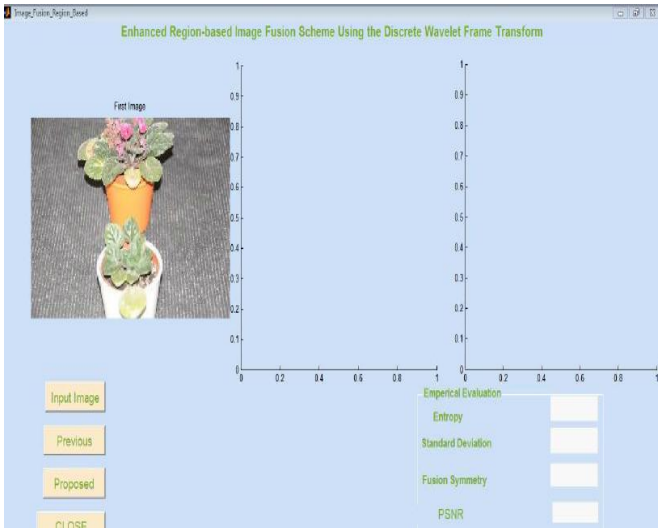


**Fig 6: This image shows that the experimental simulation window.**

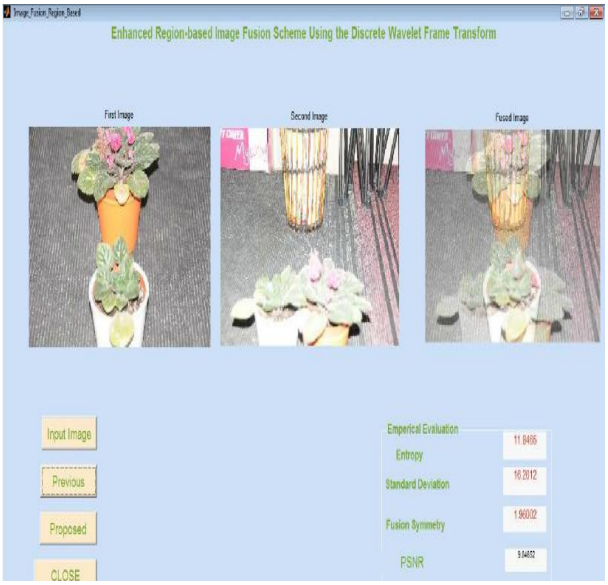


**Fig 7: The above figure shows the experimental result for the previous and proposed techniques.**

| IMAGE NAME | Name of method | Information Entropy | Standard Deviation | Fusion Symmetry | PSNR |
|---|---|---|---|---|---|
| A1 | Previous | 11.84 | 16.26 | 1.96 | 9.84 |
| A2 | Proposed | 25.51 | 26.70 | 0.9 | 25.01 |

**Table 1: The above table shows that the comparative study for the image A1 and image A2 for the different number of performance parameters and we found that the proposed methods gives better results than the existing techniques.**

| IMAGE NAME | Name of method | Information Entropy | Standard Deviation | Fusion Symmetry | PSNR |
|---|---|---|---|---|---|
| A11 | Previous | 17.07 | 19.98 | 0.85 | 15.07 |
| A12 | Proposed | 28.78 | 23.80 | 0.92 | 28.26 |

**Table 2: The above table shows that the comparative study for the image A11 and image A12 for the different number of performance parameters and we found that the proposed methods gives better results than the existing techniques.**

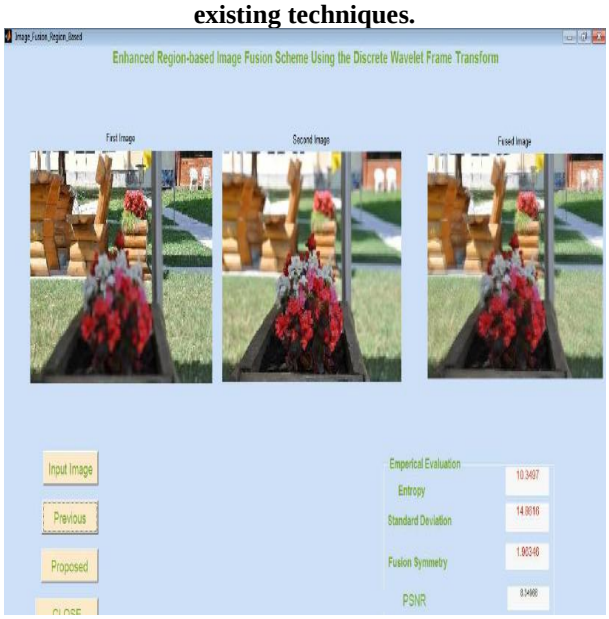


**Fig 8: The above figure shows the fused image as an output with performance parameters value.**

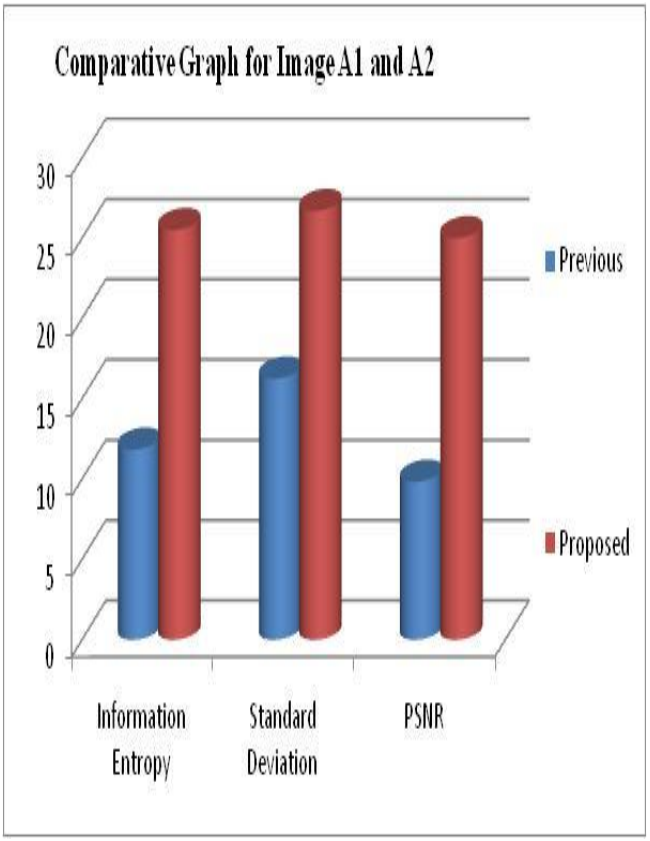


**Fig 9: The above figure shows that the performance evaluations graph for the Input image A1 and A2.**

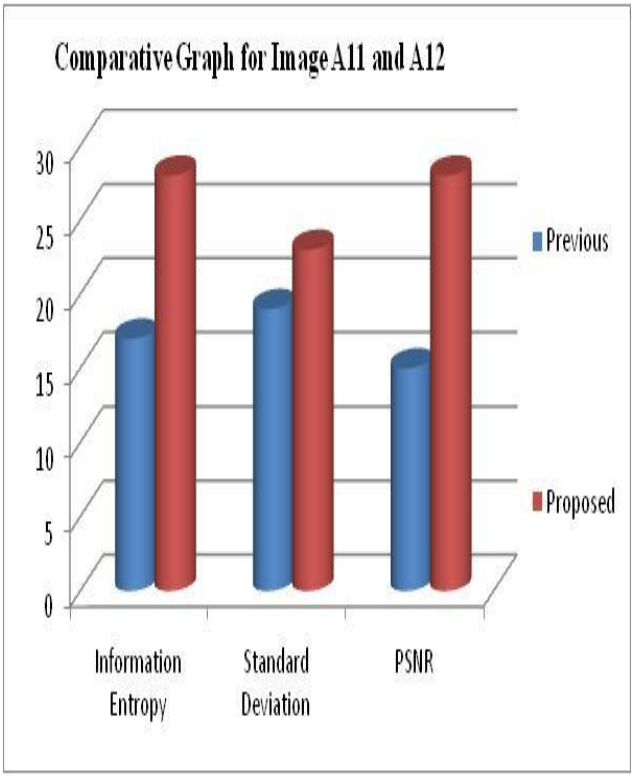


**Fig 10: The above figure shows that the performance evaluations graph for the Input image A11 and A12.**

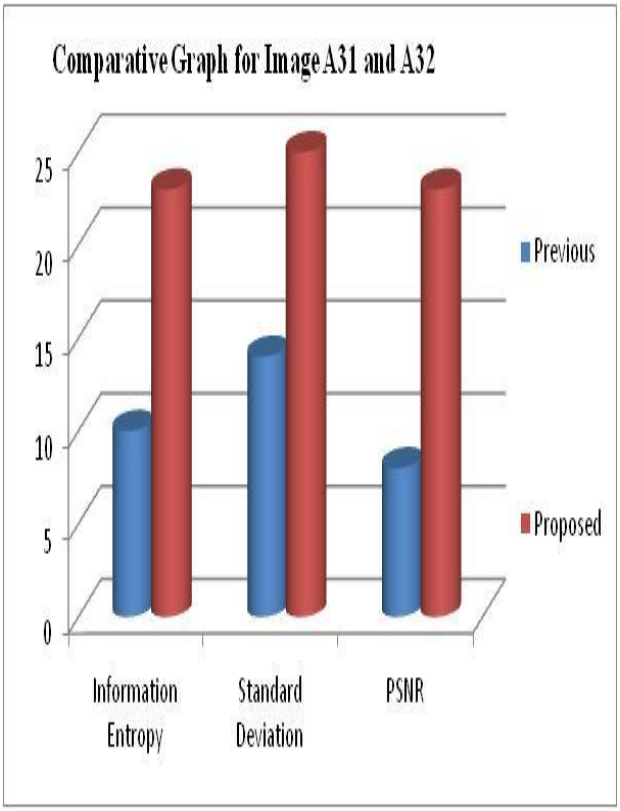


**Fig 11: The above figure shows that the performance evaluations graph for the Input image A31 and A32.**

## IV CONCLUSION

In this dissertation we discussed about the region based image fusion techniques, which are comparatively evaluate the performance for the both approach previous approach and the proposed approach, all the performance parameters are measured by the both approach and here we found that the our proposed approach gives better results than the previous approach. For the quality measurement of our proposed methods and the previous method we compare on the some performance parameters such as the fusion symmetry, Information entropy, Standard deviation and Peak signal noise ratio. Our proposed methods increased the value of Information entropy, Standard deviation and Peak signal noise ratio, and also decrease the value of fusion symmetry.

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## AUTHORS PROFILE

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