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IMAGE FUSION OF FOUR COLORED DIGITAL IMAGES USING E-LAPLACIAN PYRAMID APPROACH

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ABSTRACT

Image Fusion is the system of consolidating a few pictures from multi-modular sources with separate corresponding data to frame another picture, which conveys all the regular and integral highlights of individual pictures. With the ongoing quick advancements in the area of imaging innovations, multisensory frameworks have turned into a reality in wide fields, for example, remote detecting, restorative imaging, machine vision and the military applications. Picture combination gives a successful method for lessening this expanding volume of data by removing all the helpful data from the source pictures. Picture combination gives an incredible methodology to engage examination and examination of Multi-sensor data having equal information about the concerned territory. In proposed system, Laplacian pyramid Implement pixel level selection approach so that the fused image can be constructed pixel by pixel level considering the features of both the images at a time. In the proposed algorithm the input images are decomposed into four parts and then these parts and then wavelet transformation is performed by predictive coding technique.

KEYWORDS: Image Fusion, Laplacian Pyramid, E - Laplacian Pyramid, DWT, Image processing.

1. INTRODUCTION

Image fusion is the procedure of blending a few images from multi-modular sources with particular correlative data to shape another image, which conveys all the normal and additionally integral components of individual images. With the late quick advancements in the space of imaging advances, multisensory frameworks have turned into a reality in wide fields, for example, remote detecting, medicinal imaging, machine vision and the military applications. Image combination gives a powerful method for decreasing this expanding volume of data by extricating all the helpful data from the source images. Image combination gives a powerful technique to empower correlation and investigation of Multi-sensor information having corresponding data about the concerned district. Image combination makes new images that are more appropriate for the motivations behind human/machine discernment, and for further image preparing errands, for example, division, object discovery or target acknowledgment in applications, for example, remote detecting and therapeutic imaging.

Images from various sensors typically have distinctive geometric representations, which must be changed to a typical representation for combination. This representation ought to hold the best determination of either sensor. The arrangement of multi-sensor images is likewise a standout amongst the most critical preprocessing ventures in image combination. Multi-sensor enlistment is additionally influenced by the distinctions in the sensor images. In any case, image combination does not as a matter of course suggest multi-sensor sources.

The most crucial debate concerning image fusion is to choose how to blend the sensor images. As of late, various image combination strategies have been anticipated [7]. One of the primitive combination plans is pixel-by-pixel grey level normal of the source images. This oversimplified strategy frequently has extreme symptoms, for example, dropping the complexity. Some more refined methodologies started to create with the starting of pyramid change in mid-80s. Enhanced results were acquired with image combination, performed in the change space. The pyramid change understands this reason in the changed domain. The essential thought is to play out a multi resolution deterioration on every source image, then incorporate every one of these disintegrations to build up a composite portrayal and lastly reproduce the combined image by playing out a backwards multi-resolution change. Various pyramidal disintegration strategies have been produced for image combination, for example,

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Laplacian Pyramid, Ratio-of-low-pass Pyramid, Morphological Pyramid, and Gradient Pyramid. Most recently, with the advancement of wavelet based multi resolution investigation ideas, the multi-scale wavelet deterioration has started to replace pyramid decay for image combination.

2. LITERATURE SURVEY

[1]Hamid Reza Shahdoosti et al. (2016) An ideal fusion method protects the Spectral data in melded picture and adds spatial data to it with no spatial twisting. The PCA is a notable pansharpening approach broadly utilized for its productivity and high spatial determination. Be that as it may, it can bend the unearthly qualities of the multispectral pictures. In this paper, we display another combination strategy in light of the same idea. In traditional standard PCA strategy, PCA change is connected to the otherworldly groups of multispectral pictures, however we connected PCA change to the pixel obstructs. Visual and factual dissects demonstrate that the proposed calculation plainly enhances the combining quality regarding: RASE, ERGAS, SAM, connection coefficient and UIQI; contrasted with combination techniques including, IHS, Brovey, PCA , HPF, HPM.

[2]AbdelazizKallel (2015) Among others, the wavelet-based pansharpening approach tries to improve the determination of the multispectral (MS) mage by infusion of spatial subtle elements removed from the highresolution panchromatic (PAN) picture. The issue is displayed as takes after, the sources of info are a coarse-resolutionMS picture and a highresolution subtle element picture gave from the PAN picture; in this way one would believe that the wavelet recreation permits consolidating approximations and points of interest to build the high-determination MS picture. In any case, the wavelet change (WT) accept that subtle elements and approximations are ascertained utilizing the same wavelet deterioration. Presently, in the pansharpening case, the MS low-determination picture is thought to be associated and obscured because of the imaging framework regulation exchange capacity (MTF) that is approximated as a particular low-pass channel. In the interim, there are no requirements about points of interest that can be removed from PAN utilizing discrete WT (DWT). Guess and points of interest are not any longer orthogonal as required in the remake of the MS high-determination picture in view of DWT. For that, we propose in this paper another combination blueprint [coupled multiresolution deterioration model (CMD)] permitting the remaking of a high-determination MS given its estimation and points of interest got by MTF-custom fitted downsampling and wavelet disintegration, individually. For acceptance, CMD is connected to Pléiades, GeoEye-1, and SPOT 6 pictures. Contrasted with different methodologies [i.e.,Gram–Schmidt (GS) adaptive, GSmode 2 (GS2), "À trous' WT (AWT), summed up Laplacian pyramid (GLP), DWT, and PCI Geomatics programming algorithm], our strategy performs by and large better.

[3]Harpreet Kaur et al. (2015) introduced an Image Fusion on Digital Images utilizing Laplacian Pyramid with DWT. Picture Fusion is a system of uniting of two pictures or more than two pictures or blending of the relating furthermore the fundamental segments of set of near twisted, insufficient or noised pictures, to make a resultant picture. In this paper utilizing upgraded laplacian pyramid method, mapped the neighborhood binarized pixels of pictures inside the area which is pixel by pixel combination. E-Laplacian procedure takes a shot at dim scale pictures, shaded or RGB pictures and restorative pictures. The last stride performed is a converse DWT with the new band coefficients to build the combined picture. The Laplacian gives the improved consequences of intertwined pictures with more precision in PSNR, Entropy, SD, SSI, MI, and Average Gradient.

[4]NishaGawari, et.al.(2014),Image fusion is the way toward consolidating pertinent data from two or more pictures into a solitary picture. The subsequent picture will be more instructive than any of the information pictures. The object of picture combination is to hold the most alluring attributes of every picture. This paper talks about the Formulation, Process Flow Diagrams and calculations of PCA (main Component Analysis), DCT (Discrete Cosine Transform) and DWT (Discrete Wavelet Transform) based picture combination procedures. The outcomes are additionally outfitted in picture and table organization for near investigation of above strategies. This paper introduces the three diverse picture combination methods and there relative investigation, as the customary combination procedures PCA and DCT has a few disadvantages .The near study presumes that DWT is the best approach for picture combination. In this paper DWT based two calculations are proposed, these are most extreme pixel substitution and pixel averaging approach.

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Research Gap

The motivation for image fusion research is mainly due to the contemporary developments in the fields of multi-spectral, high resolution, robust and cost effective image sensor design technology. Since last few decades, with the introduction of these multi-sensory imaging techniques, image fusion has been an emerging field of research in remote sensing, medical imaging, night vision, military and civilian avionics, autonomous vehicle navigation, remote sensing, concealed weapons detection, various security and surveillance systems applications. There has been a lot of improvement in dedicated real time imaging systems with the high spatial, spectral resolution as well as faster sensor technology. Explicit inspiration for the research work has come from the necessity to develop some competent image fusion techniques along with the enhancement of existing fusion technologies. A lot of improvements are required to attain high accuracy on colored images which is to be achieved in this proposed work.

3. PROPOSED METHODOLOGY

Here we develop a proposed method in the image fusion. For image fusion here we are using the E-Laplacian Pyramid. The fuzzy will provide the good result in the image fusion. Initially we generate the Laplacian rule in membership function. Images are in matrix form where each pixel value is in the range from 0-255. Use Gray C *o* I or map. Make the Comparison between the rows and columns of both of the input images. In the event that the two pictures are not of the same size, select the segment, which are of same size.

Decide number and type of membership functions for both the input images by tuning the membership functions. Input images in antecedent are resolved to a degree of membership ranging 0 to *255.*

Flow chart of the proposed system is as below:

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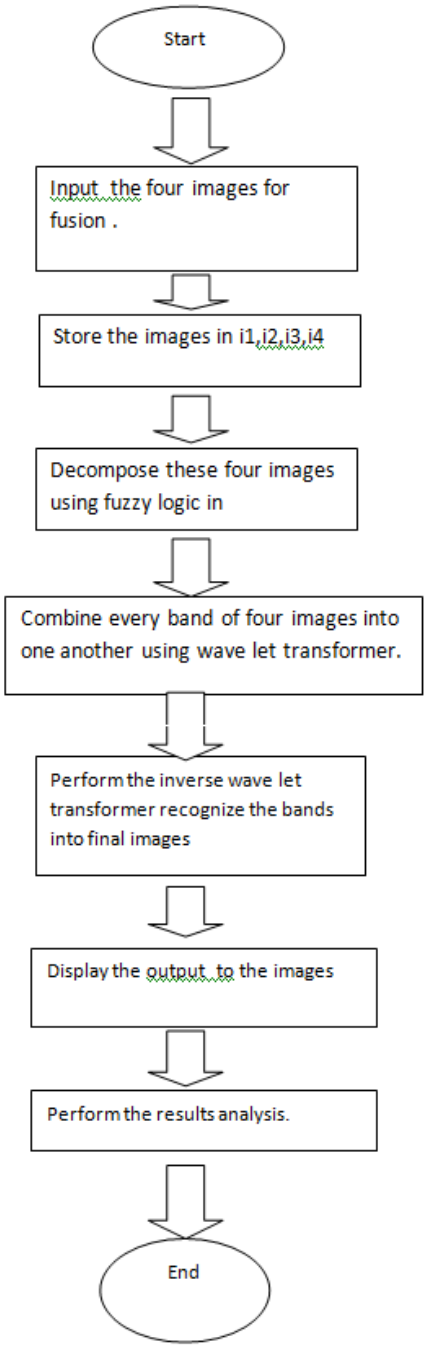

Algorithm for image fusion

Step 1: Input the four images for fusion.
Step 2: Store the images in i1,i2,i3,i4 .
Step 3: Decompose the four images using fuzzy logic in LL,LH,HH,HL bands.

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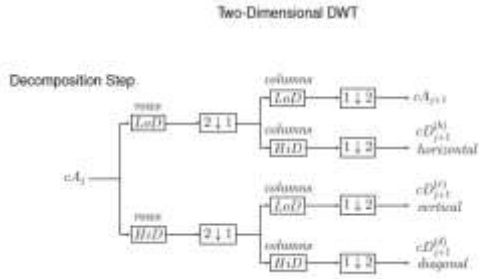

Step 4: Combine every band of four images into one another using wavelet transformer.

$$X_w(a,b) = \frac{1}{|a|^{1/2}} \int_{-\infty}^{\infty} x(t)\overline{\psi}\left(\frac{t-b}{a}\right) dt$$

Step 5: Performer the inverse wavelet transformer to recognize the bands into fixed images.
Step 6: Display the output to images.
Step 7: Perform the result analysis.
Step 8: In the proposed algorithm, firstly system takes the input of four images named i1,i2,i3,i4. Then these four images are decamped into their bands named LL,LH,HH,HL.Every band of the respective image is combined to every another band using wavelet transformation. After this inverse wavelet transformation is performed to produce the final image.

RESULTS AND DISCUSSIONS

Proposed system is evaluated on the various input images and the results evaluated for the proposed system are better than that of existing system. System is evaluated on various parameters like MSE, PSNR, Mean, SD, Entropy, $Q_{A/B}$, MI.

Result snapshot of the proposed system:

Table 1.1 Results Obtained by the Proposed System on Colored Images

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The above table 1.1 shows the results obtained by the proposed system on the colored images. In the above table various inputs along with their type and results are given. As shown in the above table, we evaluate the results on JPEG colored images.

Table 1.2: Performance Evaluation of Proposed System on Different Parameters on Colored Images

The above table 1.2 shows the overall performance of the proposed system on colored images. The values obtained by the proposed system on different parameters are evaluated to be very good.

Image no.	Entropy	SD	Avg. Gradient	MSE	PSNR	MI	$Q_{A/B}$
1.	9.5355	0.0311	0.1344	0.0380	124.79	2.5059	7.6284
2.	9.8599	0.0372	0.1606	0.0483	122.67	2.7204	7.8853
3.	10.0209	0.0400	0.1729	0.0104	136.09	2.2306	8.0167
Avg	9.80	0.0361	0.1559	0.1771	127.85	2.4856	7.8434

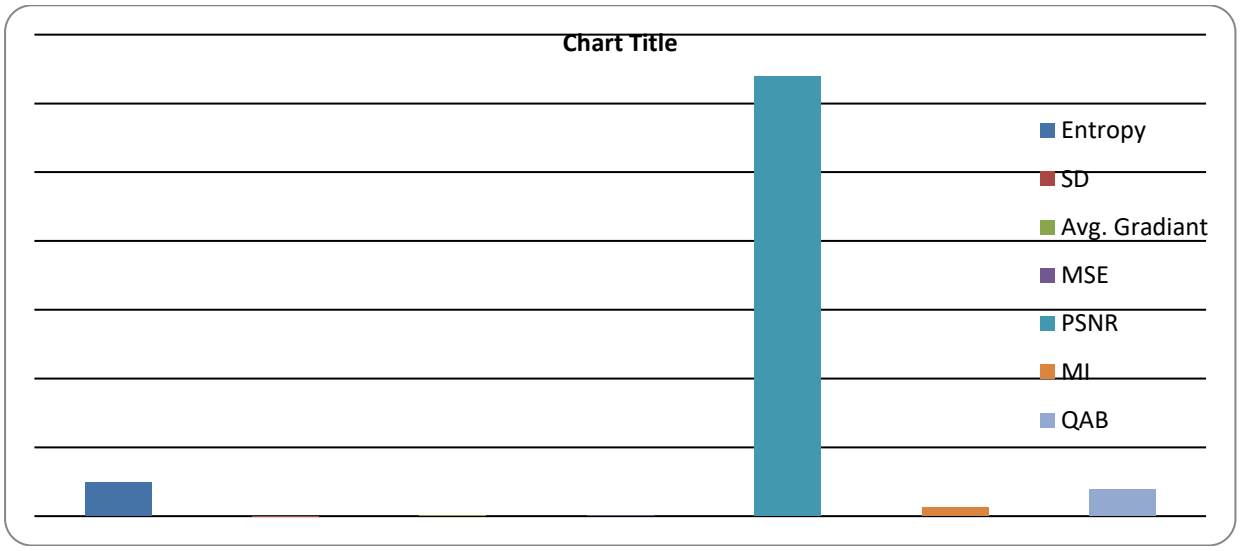

Fig 1.1: Quality Measures of Colored Images on the basis of Various Parameters

Table 1.3: Comparison Table of Existing System and Proposed System on Different Parameters on Colored Images

Parameters	Existing	Proposed
Entropy	6.95	9.80
SD	0.0079	0.0361
Avg. Gradient	0.0924	0.1559
MSE	0.2123	0.1771
PSNR	94.35	127.85
MI	1.1523	2.4856
$Q_{A/B}$	6.2153	7.8434

Above Table 1.3 shows comparison of Existing System and Proposed System various parameters on gray scale images.

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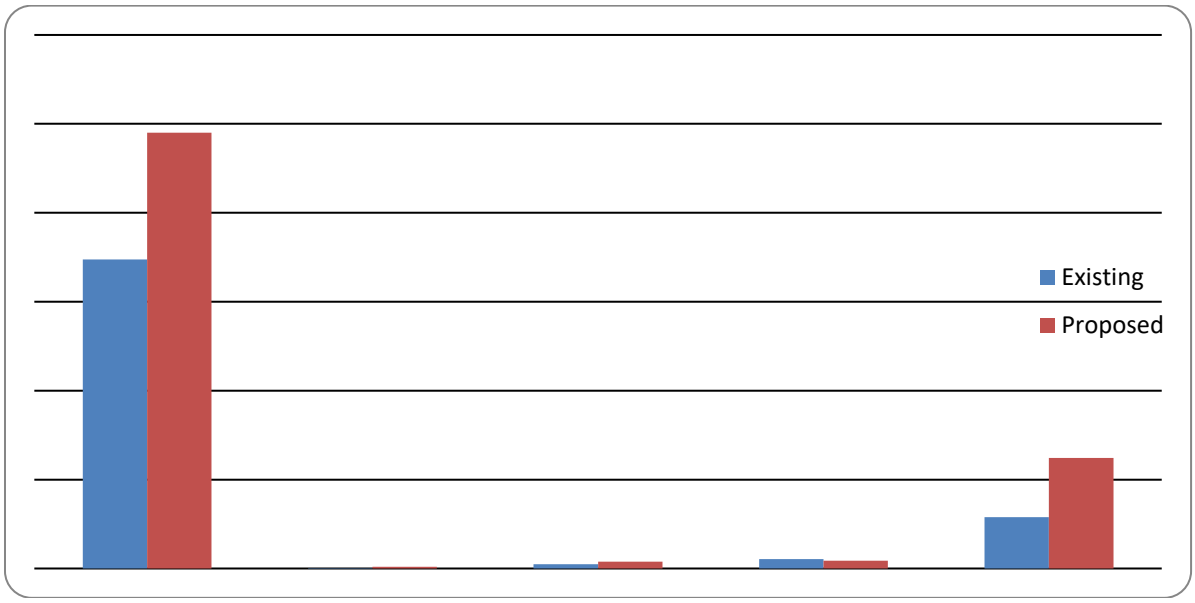

Fig 1.5: Comparison graph of Existing and Proposed System on Colored Images on the basis of PSNR, MI and SD

Above Fig.1.5 shows the Comparison of Existing and Proposed System on the basis of various parameters which are PSNR, MI and SD on Colored images. The Proposed system gives better results compared to the existing system.

4. CONCLUSION AND FUTURE SCOPE

Conclusion

The proposed system is developed to fuse the colored images. Proposed system is use the E- Laplacian pyramid technique to fuse colored images. Proposed system is evaluated on standard data set as well as real world images collected from various sources. Experimental results shows that the results of the proposed system are better than that of existing system in terms of Mean, Standard Deviation(SD), Entropy, $Q_{A/B}$, Mutual Information(MI),Peak Signal to noise ratio(PSNR), Mean Square error(MSE).

Future Scope

In future, proposed system can be extended to fuse four images simultaneously using E-Laplacian pyramid technique. Also values of parameters can be improved in future. Proposed system can also be tested on real medical images which can be collected from various sources.

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