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STUDY AND ANALYSIS OF DIFFERENT IMAGE FUSION TECHNIQUES

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ABSTRACT

Image Fusion is a process of combining the relevant information from a set of images, into a single image, wherein the resultant fused image will be more informative and complete than any of the input images. This paper presents an evaluation of several image fusion methods. The major objective of image fusion is to combine information from various images of the single scene in order to deliver only the valuable information. In Image fusion process we get the sharper image resolution and classification of image is also improved. In this paper we analysis different image fusion techniques.

KEYWORDS: *Image fusion, DCT, DWT, PCA, HIS, HPF.*

I. INTRODUCTION

Image fusion is an essential topic in vision processing. Image fusion is a procedure of mixing the relevant information from several pictures in to a single image wherever actually the resulting merged image may well be much more beneficial and complete than some of the insight pictures. Image fusion means the mixing of two into a single picture that's the utmost data material without producing details which is nonexistent in given picture. With rapid development in technology, it's now probable to obtain data from multi-source pictures to generate a good quality merged picture with spatial and spectral information. A few scenarios in perspective processing involve high spatial and high spectral handle in one single vision. All the present equipment isn't effective at providing such files convincingly. [3]The vision synthesis techniques enable the blend of various information sources. The merged vision could have complementary spatial and spectral quality features. There are several essential needs for the image fusion method: - 1.)The merged photograph should hold all applicable data from the perception images. 2.) The image fusion should not present items which could result in an incorrect diagnosis.

II. IMAGE FUSION PROCESS

Image fusion is usually done in three different levels of image representation, they are:

2.1 pixel level image fusion

Pixel level fusion is the combination of the raw data from multiple source images into a single image. In pixel level fusion the fused pixel is derived from a set of pixels in the various inputs .The main advantage of pixel level fusion is that the original measured quantities are directly involved in the fusion process.

2.2 Feature level image fusion

Feature level fusion deals with the fusion of features such as edges or texture while decision level fusion corresponds to combining decisions from several experts. In other word, Feature level fusion requires the extraction of different features from the source data before features are merged together.

2.3 Decision Level Image Fusion

Decision-level fusion involves fusion of sensor information that is preliminary determinate by the sensors. Examples of decision level Fusion methods include weighted decision methods, classical inference, Bayesian inference, and Dempster–Shafer method. In decision level fusion the results from multiple algorithms are combined together to yield a final fused decision. [2]

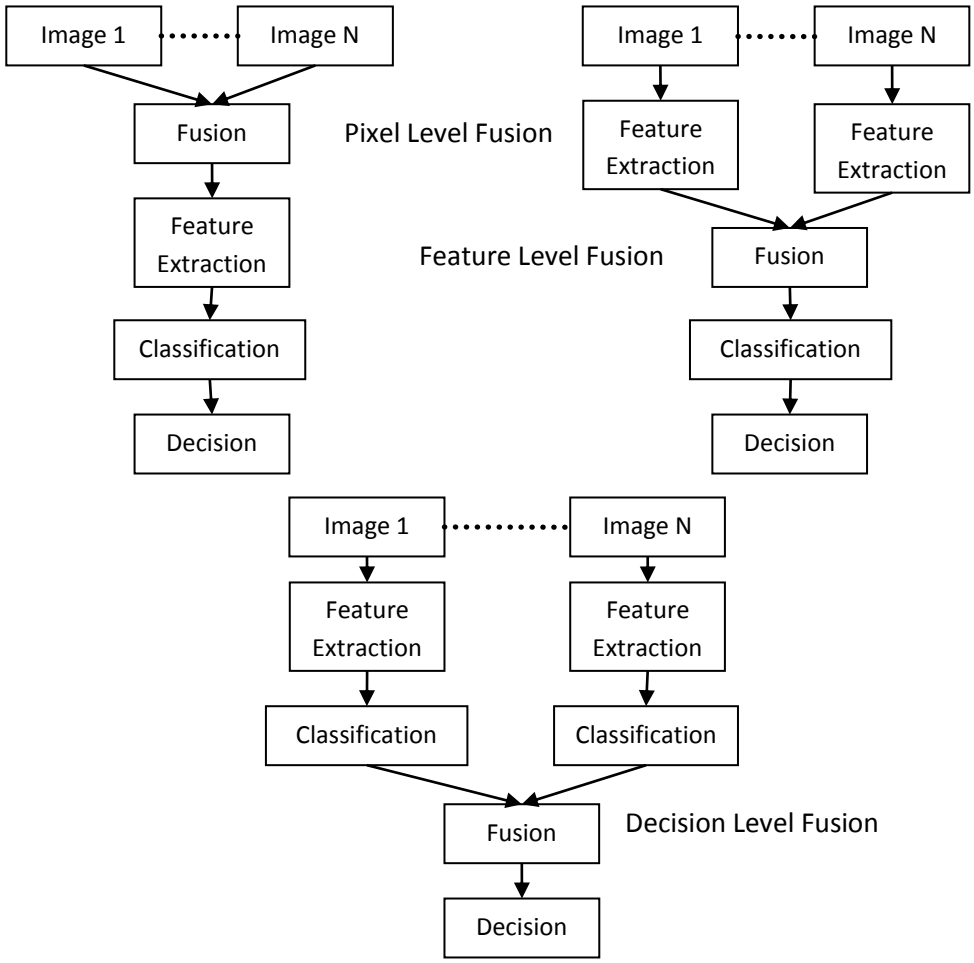

Figure 1: - Block Diagram of fusion process

III. IMAGE FUSION TECHNIQUES

In the Image Fusion method the required data from the given supply photographs is merged together to make a composite image whose quality is more advanced than the given feedback images. Picture combination methods could be categorized in to two groups' i.e.

- Spatial domain fusion method
- Transform domain fusion

In spatial domain practices, the pixel price of a picture is immediately dealt with. The pixel values are altered to obtain preferred result. Fusion is required in every area where images are required to be examined. For example, medical image analysis, microscopic imaging, analysis of photographs from satellite, remote sensing request, pc vision and battlefield monitoring. An analysis of remote sensing photographs is being performed utilizing the adjustable quality analysis tool. The distinct wavelet convert is among the important method used for fusion. Strategies like these show increased benefits

in spatial and spectral quality of the merged image when compared with different spatial types of fusion. [5]

1. Principal Component Analyses (PCA)

PCA is just a mathematical instrument for change of correlated factors in to uncorrelated factors. For picture classification and picture pressure PCA is used comprehensively. There's involvement of mathematical formula for change of factors which can be called key components. It computes a tight and optimum explanation of the info set. The very first key aspect corresponds to the maximum amount of difference probable in the info and every subsequent aspect corresponds to the rest of the variance. First key aspect is taken across the direction of optimum variance. The 2nd key aspect is limited to lay in the subspace at a 90 level angle of the first. Within this Subspace, this aspect items the direction of optimum variance. The next key aspect is taken in the optimum difference direction in the subspace at a 90 level angle to the former two. [6]

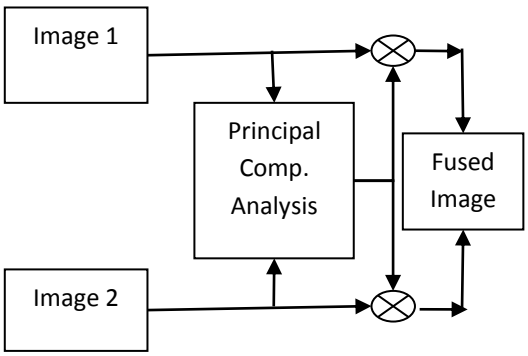

Figure 2:- Image Fusion Process using PCA [3]

2. Discrete Cosine Transform (DCT)

It's seen that all the picture fusion methods are extremely complex and consumes long which are tough to be used on real-time applications. The fusion strategies which are used in DCT domain are extremely effective when the feedback photographs are numbered and merged photographs are restored in JPEG standard .For using the JPEG development, an image (in color or gray scales) is divided in two blocks of 8x8 pixels firstly. The compression is obtained in two measures; the initial through quantization and the next through the entropy development process. For reducing the problems undergone in the fusion of real time programs and enhancing the quality of merged picture, DCT fusion strategy is applied. Difference of 8×8 blocks computed from DCT coefficients is used as a comparison qualification for the experience evaluate. [6]

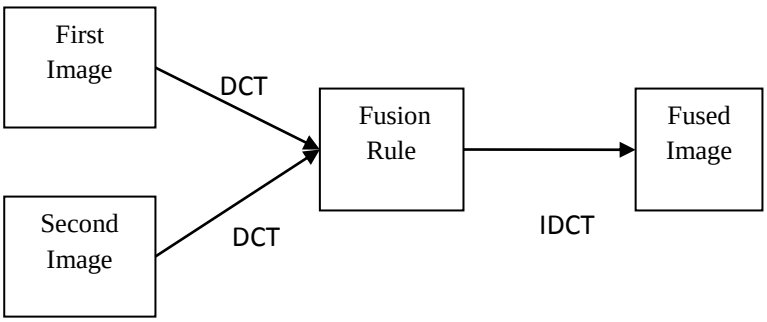

Figure 3:-Image Fusion process Using DCT [3]

3. Discrete Wavelet Transform (DWT)

In discrete wavelet change (DWT) decomposition, the filters are particularly developed to ensure that successive layers of the chart just contain details which are not presently accessible at the preceding

levels. The DWT decomposition works on the cascade of special low pass and high-pass filters and a sub-sampling operation. The components from 2D-DWT are four photographs having measurement add up to half how big is the original picture. [6]

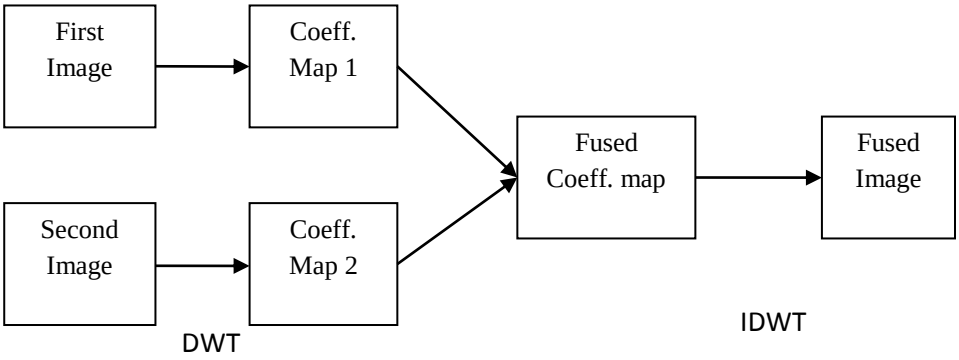

Figure 4:-Image Fusion process Using DWT [3]

4. IHS Fusion Technique

In IHS mix technique the IHS (Intensity, Shade and Saturation) place are turned from the Red, Natural and Orange (RGB) place of the Multispectral image. The intensity element I is replaced by the PAN. Then a opposite convert is placed on get RGB image as an output. The generalized IHS mix technique applied where in actuality the fourth element added with the method of IHHS transforms. The fourth element has more Power (I) value. The low intensity (I0) is replaced by high definition (I new) of Gray level image and changed back again to original RGB place with H (Hue) and S (Saturation) parts which are original. The IHS convert divides spatial & spectral data from a regular RGB image. [1]

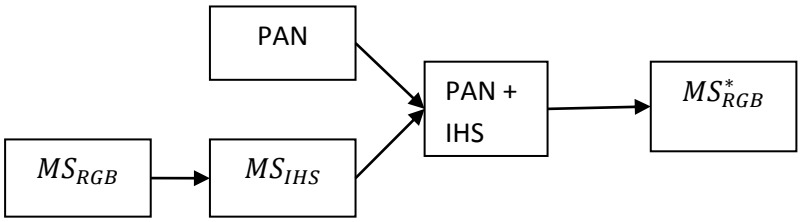

Figure5:- IHS fusion principle

5. High Pass Filtering

High pass filtration mix strategy is a technique that produces the large frequency the different parts of high definition panchromatic image superimposed on low-resolution multispectral image, to acquire the enhanced spatial resolution multispectral image. This approach preserves a high proportion of spectral characteristics since the spatial data is related to large frequency data of the HRMIs.

Table 1:- Different techniques of image fusion.

Sr.no.	Technique	Method	Feature	Limitation
1.	DCT	Numerical method	Sharp image, Improved contrast, Energy efficient multifocal image fusion scheme.	It uses some sequential algorithms & the time spent on it is higher.
2.	PCA	Statistical method	PCA is a tool which transforms number of correlated variable into number of uncorrelated variables; this property can be used in image fusion.	Complexities are less but not completely dealt with.
3.	DWT	Numerical method	Minimizing the spectral distortion, Superior quality of image is available.	In this method final fused image have a less spatial resolution.
4.	IHS	Color related method	Outperforms existing image fusion algorithm. Helpful in static image fusion applications.	Time consuming & cannot be adopted in real time applications.
5.	HPF	Statistical method	Preserves both spectral & spatial information.	Needs to capture regularities of contours

IV. CONCLUSION

The main purpose of perspective synthesis would be to joining information from numerous pictures of exactly the same see to be able to offer of good use information. The major aim of picture synthesis in multi-focus cameras to amalgamate the information from numerous pictures of the alike scene in order to deliver only the multi focused image. The DCT based techniques of picture synthesis are proved to be right and time-saving in real-time methods for however pictures or videos. So in near future we will propose a brand new strategy that will integrate the picture synthesis techniques to boost the synthesis quality further. No implementation has been done in that work so in near future to validate the planned work MATLAB tool will also be used for experimental purpose.

REFERENCES

[1] Choi, Myungjin. "A new intensity-hue-saturation fusion approach to image fusion with a tradeoff parameter." Geoscience and Remote Sensing, IEEE Transactions on 44, no. 6 (2006): 1672-1682.
[2] Deb, Suman, Saptarshi Chakraborty, and Taniya Bhattacharjee. "Application of Image Fusion for Enhancing the Quality of an Image." (2012).
[3] Desale, RajendaPandit, and Sarita V. Verma 2013 "Study and analysis of PCA, DCT & DWT based image fusion techniques." In Signal Processing Image Processing & Pattern Recognition (ICSIPR), 2013 International Conference on, pp. 66-69. IEEE.
[4] Galande, Ashwini, and RatnaPatil 2013 "The art of medical image fusion: A survey." In Advances in Computing, Communications and Informatics (ICACCI), 2013 International Conference on, pp. 400-405. IEEE.
[5] Jasmeetkaur, Er, and Rajdavinder Singh Boparai 2013 "An Evaluation on Different Image Fusion Techniques."vol.4.
[6] Jing, Hongyuan, and Tanya Vladimirova (2014) "Novel PCA based pixel-level multi-focus image fusion algorithm." In Adaptive Hardware and Systems (AHS), NASA/ESA Conference on, pp. 135-142, IEEE.
[7] Pei, Yijian, HuayuZhou, Jiang Yu, and GuanghuiCai 2010 "The improved wavelet transform based image fusion algorithm and the quality assessment." In Image and Signal Processing (CISP), 2010 3rd International Congress on, vol. 1, pp. 219-223. IEEE.
[8] G. Arun Karthick, K. Kavitha, V. Sivakumar, D. Surender. "A Hybrid Method For Covert Communication Using Steganography And Image Fusion", International Journal of Advances in Engineering & Technology (IJAET), Volume 7 Issue 2, pp. 410-415, May 2014.