



IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 7 Issue: V Month of publication: May 2019 DOI: https://doi.org/10.22214/ijraset.2019.5074

www.ijraset.com

Call: 🛇 08813907089 🕴 E-mail ID: ijraset@gmail.com



Review of Different Image Fusion Techniques

Sonali B. Anantkar¹, S. R. Khot²

¹Student of Department of Electronics and Telecommunication, DYPCET, Kolhapur, India ²Associate prof. D. Y. Patil College of engineering & technology, Kolhapur, India

Abstract: This paper proposes study of different image fusion techniques. Image fusion is combining relevant information from two or more images into a single image. The resulting image is more informative than the original image. It is not possible to get an image with all relevant information in one try, hence we have to take no. of trials then these images can be fused to get all relevant information. This paper provides survey about several techniques which provide better approach for future research. Keywords: Image fusion, Discrete Wavelet Transform (DWT), Principal component analysis (PCA), Discrete Cosine Transform (DCT)

I. INTRODUCTION

Image fusion can perform on two or more images are combined into a single image retaining the important features from each original image [7]. Various types of images are available like multisource, multi view, multi temporal images taken at different time period [1], such images are changes its information due to environmental conditions. These are also multimodal images; like CT, MRI, PET images.

II. RELATED WORK

In this paper comparative study of several methods is introduced.

Shweta Goel et al. [1] propose a multimodal images CT and MRI are fused using dual tree Discrete Wavelet Transform. Image decomposes into wavelet co-efficient using DWT. These co-efficient are then fused using PCA for approximation coefficients and by maximum selection rule for detailed information to enhance contrast. This provides better result than other methods. Stimulation results shows that the DTDWT based multimodal medical image fusion technique using Weiner filter gives better performance and improved image quality as compared to existing technique.

Mirajkar Pradnya et al. [2] proposed an image fusion algorithm based on wavelet transform to prove the geometric resolution of two images in which two images to be processed are firstly decomposed into sub images and then the information is performed using these images under certain criteria and finally these sub images are reconstructed into result image with plentiful information. In this three method are compared and best method is found for image fusion. They got good results for stationary Wavelet based image fusion method at level 2 compared to all other method.

S. S. bedi et al. [3] provides survey about some of the various existing techniques applied for image fusion and comparative study of all the techniques conclude the better approach for future research. Combination of DWT and spatial domain fusion method like PCA improves the performance as compared to individual DWT and PCA algorithm.

Nishthula P et al. [4] proposes a simple and easy method of image fusion for bone cancer detection. This study integrated the merit both preserving spatial information of ISH Transform, reduce the spectral distortion by using retina inspired model(RIM) and minimizing redundancy by PCA transformation and obtained satisfying fused result.

In Kiran Parmar et al.[5] the fusion performance is evaluated on the basis of the root mean square error(RMSE) and peak signal noise ratio(PSNR). It gives better least MSE and highest PSNR.

In M. A. Mohamed [6] compare several techniques and conclude how did get result by using those techniques.

Anjali Malviya et al. [7] presents fusion of multifocus images based on maximum selection scheme, weighted average scheme and window based verification scheme. It gives high signal to noise ratio and less root mean square error.

Zijun wang et al. [8] proposes comparative analysis of several methods. It shows the consistency between theoretical analysis and Experimental result.

K. C. Rajini et al. [9] presents the overview of the image fusion techniques and the results from number of wavelet based image fusion schemes are compared. Wavelets provide high quality spectral content with less spectral distortion. The result show that symlet wavelet performed better in terms of performance measures.

Nivedita Jha et al. [10] perform proportional study of image fusion methods. It shows the DWT with PCA gives better result than the other techniques mentioned in the paper. And concludes that DWT with ICA (Independent Component Analysis) may be the future trend of research.



International Journal for Research in Applied Science & Engineering Technology (IJRASET)

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.177 Volume 7 Issue V, May 2019- Available at www.ijraset.com

Sr	Fusion	Detail	Domain	Advantages	Disadvantages
No	Method				
1	Simple average	In this, region of image s which are in focus assume as of higher pixel intensity. It takes value of P (i, j) of each image and adds it. Average of sum can is taken by dividing it by 2 [3].	Spatial	Simplest method	It does not give a guarantee to have clear objects from the set of images.
2	Maximum selection	Algorithm chooses in-focus region of input image then select maximum intensity value for pixel by comparing it to other pixel intensities and that max value can be assigned to corresponding pixel	Spatial	It gives highly focused image	It affects on contrast of image and may cause blur the image.
3	PCA	It transforms no. of correlated variables into uncorrelated variables called principal component [1]. 1. Column vector from approximation coefficients is evaluated . 2. Using these vectors covariance matrix is calculated and diagonal values are stored. 3.From covariance matrix eigan values and eigan vectors are calculated 4. Then select column vector corresponding to max eigan value. Values of this column are then multiplied with old approximation coefficients to obtain new fused coefficients [1].	Spatial	It removes redundancy and has high directionality. It enhances features and extracts more information.	Spatial domain may produce spectral degradation.
4.	DWT	Images are decomposed into wavelet coefficients by using filters i.e. approximation and detailed coefficients.	Transform	It provides better SNR	It has less spatial resolution and has poor directional selectivity.
5	HIS transform	 It transforms RGB channels into HIS component. Match the histogram of panchromatic image with intensity component. Replace intensity component with stretched panchromatic image. Take inverse transform IHS to RGB channels [8]. 	Spatial	It offers separate channel outline for HIS.	Only three bands are involved.
6	DWT + PCA	DWT applied on source image to decompose it into different wavelet coefficient and PCA applied on low frequency coefficients [10].	Transform + spatial	It gives better result compared to PCA and DWT separately. It has high spatial resolution with high quality spectral content.	Method is complex.
7	SWT transform	Similar to DWT but process of down sampling is suppressed only. It is based on idea of no decimation. It applies DWT and suppressed down sampling in forward and up sampling in inverse transforms [2].	Transform	It is translation invariant. Edge information is enhanced It can be applied to any Arbitery image	Time for decomposition is high. Computational complexity is high and large storage space is required. Not suitable for real

III. IMAGE FUSION TECHNIQUES



International Journal for Research in Applied Science & Engineering Technology (IJRASET) ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.177 Volume 7 Issue V, May 2019- Available at www.ijraset.com

					time applications.
8	Pyramid based	Pyramid levels obtained from down sampling	Transform	Computationally more	Number of
	fusion	of source images are fused at pixel levels		efficient.	decomposition levels
		depending on fusion rule. Fused image is		Provide good visual	affects image fusion
		obtained by reconstructing the fused image		quality of an image for	result.
		pyramid [6].		multi focus image.	
		It represents fused image by dividing it into		It reduces the	Fused image is of not
		blocks then calculate the DCT representations		complexity and	good quality if block
9		and taking average of all DCT represent for		decomposes the image	size is less than 8x8
	DCT	corresponding blocks. Then finally take IDCT	Transform	into series of	or equivalent to the
		to reconstruct the fused image [6] [10].		waveform.	image size itself.
				Used for real time	
				applications.	
		It normalizes the three multispectral bands	Transform	It produces RGB	Result in color
10	Brovey	used for and to multiply the result by any		image with higher	distortion
	Transform	other desired data to add the intensity and		contrast.	
		brightness component to the image [8].		Simple and	
				computationally	
				efficient and faster.	
	Independent	A method for finding underlying factors or		Computational	Image should be non-
11	Component	components from multivariate (multi-	Spatial	complexity is good	Gaussian.
	Analysis [10]	dimensional) statistical data.		and it shows	
				significant	
				enhancement.	
		1. Average filter is utilized to get the two-scale		Simple method,	It may have halos
12	Guided	representations.	spatial	Computationally	near some edges.
	Filtering [11]	2. The base and detail layers are fused through		efficient and suitable	
		using a guided filtering based weighted		for real time	
		average method.		applications.	

IV. CONCLUSION

There are Different Image Fusion techniques are available now a days. Above some of them are mentioned along with advantages and disadvantages. This study will helpful to the who are new learner of I mage fusion. This study states that DWT with PCA technique has great advantage over other method.

REFERANCES

- [1] Shweta Goel, Sumit Budhiraja, Anahat Dhindsa, Nancy Mehata "CT and MRI fusion using Weiner filter in Dual tree framework" IEEE conference 2017.
- [2] Mirajkar Pradnya P., Ruikar Sachin D." Wavelet based Image fusion techniques" IEEE 2013.
- [3] S.S. Bedi Rati Khandelwal "Compehensive and comparative study of image fusion techniques" IJSCE 2013
- [4] Nishthula P, Yudha R. B. "A Novel Method to detect to bone cancer using image fusion and edge detection" IJECS 2013
- [5] Kiran Parmar, Rahul Kher, Falgun N Thakkar "Analysis of CT and MRI image fusion using wavelet Transform" IEEE 2012
- [6] M. A. Mohmed, B. M. El-den "Implementation of image fusion techniques for multi focus images using FPGA" NRSC 2011
- [7] Anjali Malviya, S. G. Bhirud "Multi Focus image Fusion of Digital images" IEEE 2009.
- [8] Zijun Wang, Djmel Ziou, Costas Armennakais, Deren Li, Qingquan Li "A Comparative analysis of image fusion methods" IEEE 2005.
- [9] K. C. Rajini, S. Roopa "Review on Rescent Improved image fusion techniques" IEEE 2017.
- [10] Nivedita Jha, Aumreesh Saxena, Amit Shrivastava, Manish Manoria "A Review on Varios Image Fusion Algorithm" RISE 2017.
- [11] Shutao Li, Xudong Kang and Jianwen Hu "Image Fusion with Guided Filtering" IEEE 2013.











45.98



IMPACT FACTOR: 7.129







INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089 🕓 (24*7 Support on Whatsapp)