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Mri-Pet Image Fusion Based On SPD

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ABSTRACT: It is observed from this research work that by fusing PET and PET based on image selection criteria retains more structural information compared to the existing method. It is depicted as finding the ideal enlistment parameters to pick up the ideal combination for fusion. Developed algorithm proposes a clinical way of approach of image selection process of input image for image fusion, initially PET image is taken as color image and domain is changed to YUV which is segregated in to YUV layers from this Y layer is separated from the YUV images through examining with SSIM or VIF considering high valued image, later on the R layer is fused with gray scale MRI image using different Transforms and compared the output in which SPD (steerable pyramid decomposition) gives best result.

KEYWORDS: Image Fusion; PET Image; MRI Image; YUV Components ;Steerable pyramid decomposition; SSIM; VIF; PSNR; ENTROPY;

INTRODUCTION:

The term fusion implies by and large a way to deal with extraction of data procured in a few areas. The objective of IMAGE-FUSION (IF) is to incorporate reciprocal multi sensor, multi-modality as well as multi visual data into one new image containing important data, the nature of which can't be accomplished with one such system. The term quality, its significance and estimation rely upon the specific application [1].Image fusion is essential in a wide range of imaging fields, for example, satellite imaging, remote sensing and Medical imaging. Researches have been developing algorithms based on HSI, HVS,PCA, Wavelets and steerable pyramid decomposition methods [1]. Still there is lot of scope for improvement.

In the treatment process, quick and comprehensive information on patient's condition is a vital necessity. Medical images have provided an accurate and reliable tool in brain diagnosis [3]. Fusion of medical images should be taken carefully as the whole diagnosis process depends on it. Medical images should be of high resolution with maximum possible details. The medical images ought to speak to immeasurably vital attributes of the organ to be imaged so the incorporated picture should show most extreme conceivable subtleties. In this way our point is to embrace the best technique for picture fusion with the goal that the analysis ought to be precise and flawless [2].The need for colored images with spatial and spectral information at the same time has made the researchers to probe for solutions. This proposed method introduced various Image fusion is a strong way to combine the advantages of two or even more images in one image. Different methods have been proposed to fuse images in recent years [3].The method we deal with is selection of the component from the color image by considering the highest SSIM and VIF values and by comparing the values with respect to color image (PET) concluding the single Component image(R component image) with most of the image information within it hence considering that image for the fusion which results more informative and quality fused image compared to existing direct fused image.

SEGREGATION OF YUV AND SELECTION OF SINGLE COMPONENT IMAGE FROM COLOR IMAGE USING SSIM AND VIF:

In this step we examined the color image that is PET image through SSIM and VIF. The highest SSIM and VIF valued image is considered as the more informative input image for the fusion.

PROPOSED METHOD FLOW CHART

In this paper, the proposed method is to fuse PET (color image) and MRI (gray scale image) based on the objective details of the given images. This paper explores a clinical way selecting and processing the most informative component (Y,U, and V) of the host images with respect to SSIM and VIF. Based on these values, the test images taken showed R component perceives more information (based on SSIM and VIF Values) than G and B component and also YUV together So, R component is fused with Gary scale MRI. The all image size considered in this paper is [512 512].

After selection process of the input images is complete, now by using the different fusion algorithms images are fused. The fused image is having more structural information compared to the existing methods.

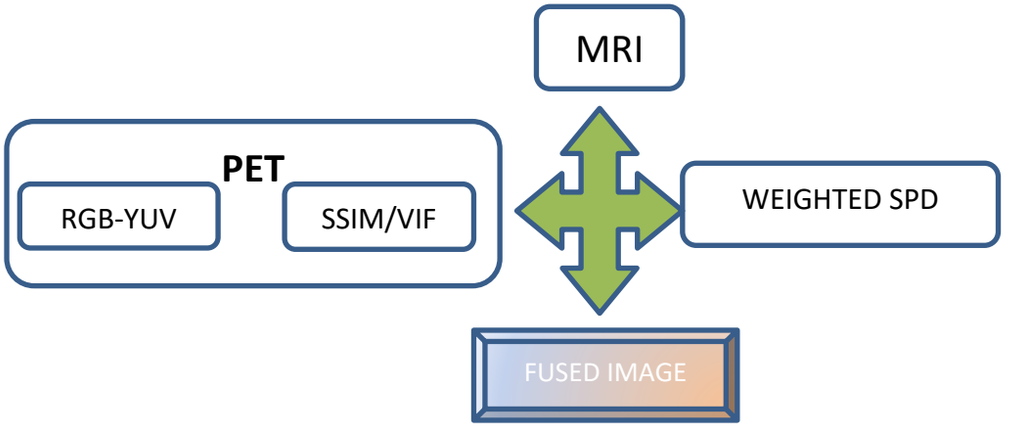


Fig 1: Proposed Framework

Algorithm

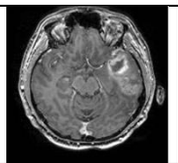
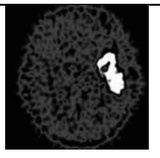
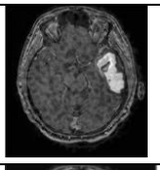
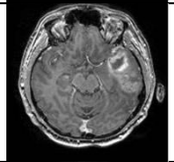
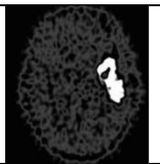
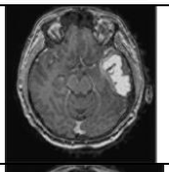
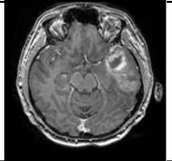
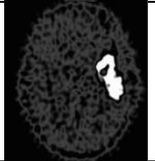
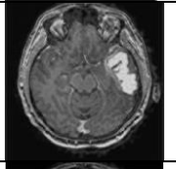
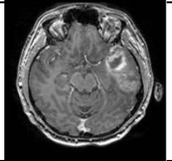
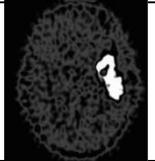
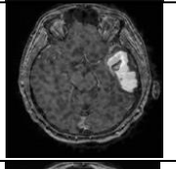
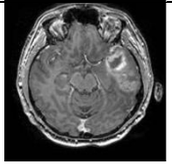
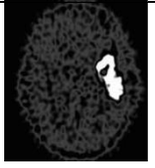
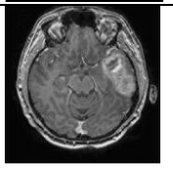
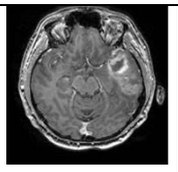
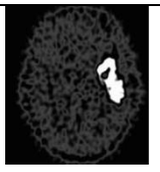
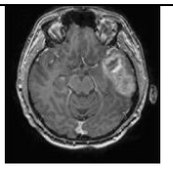
Step 1: changing the color domain to yuv
Step 2: selection of high dependency component ‘Y’ based on SSIM and VIF
Step 3: Testing the method using different transforms(DCT,DWT etc.,)
Step 4: Estimation of weighted value based on observer decision
Step 5: Applying the weighted sum for better fusion.
Step 6: Evaluation of the Algorithm

RESULTS AND DISCUSSION

Figure.3 shows MRI, PET and the resultant fused image. Visually the output fused image is satisfying and seems to contain useful information of both input images, but subjective evaluation is not enough and some objective assessments to prove the efficiency of the proposed method is needed standard deviation STD,

Entropy, PSNR, Mean, Covariance, RMSE, and Correlation Coefficient are defined and the proposed method is compared with the existing method for these metrics. The matrices values obtained by fused images with input images are noted and studied which appreciates the performance of proposed method is far better mathematically[6]. Table I shows the results of this comparison.

TABLE 1: VISUAL COMPARISON OF DIFFERENT FUSION ALGORITHMS AND THEIR FUSED IMAGES

	Grayscale MRI	R Component Gray scale PET	Fused image
Curvelet			
Wavelet			
Discrete Meyer Wavelet			
Bi Orthogonal			
DCT			
Steerable pyramid decomposition			

Performance metrics used to Compare output and input images

a) Standard deviation b) Peak Signal to Noise Ratio c) Entropy (EN) d) Mean (M) e) Root Mean Square Error (RMSE) f) Correlation Co-Efficient (Cc) g) Co-Variance

Table 1, 1.2: EXPERIMENTAL RESULTS AND COMPARISONS OF EXISTING FUSION AND PROPOSED FUSION METHOD

	PSNR		STD.DIV		ENTROPY		MEAN	
Fusion Methods	**Existing**	**Proposed**	**Existing**	**Proposed**	**Existing**	**Proposed**	**Existing**	**Proposed**
Curvelet	56.5018	62.1643	133.7321	140.9669	6.1920	6.1725	189.5846	205.8400
Wavelets	58.9672	69.0040	99.0779	100.9903	6.7642	6.7711	150.2033	155.0529
Discrete Meyer wavelet	58.9672	69.0040	99.0779	100.9903	6.7137	6,7711	150.2033	155.0529
Bi orthogonal	56.5020	62.1643	133.7173	140.9669	6.1840	6.1725	189.5920	205.8400
DCT	64.5089	64.8546	0.1659	0.1772	6.1705	6.1599	0.1851	0.2010
WSPD	56.8697	65.1870	99.0779	100.9903	6.7137	6,7711	150.2033	155.0529

Table 1

	RMSE		CC		CO-Variance	
Fusion Methods	**Existing**	**Proposed**	**Existing**	**Proposed**	**Existing**	**Proposed**
Curvelet	0.3830	0.1995	0.9487	0.9488	6.7655	2.5187
Wavelets	0.2883	0.0908	0.9693	0.6192	6.7642	2.5187
Discrete Meyer wavelet	0.2883	0.0908	0.9693	0.6192	6.7642	2.5187
Bi orthogonal	0.3829	0.1995	0.9406	0.7390	6.7642	2.5187
DCT	0.1523	0.1464	0.4188	0.3967	0.0676	0.0676
WSPD	0.883	0.1908	0.9693	0.9192	6.7642	2.5187

Table 1.2

CONCLUSION

the proposed strategy is to combine PET (color picture) and MRI (gray picture) in light of the target subtleties of the given pictures. This paper investigates a way choosing and handling the most enlightening part (Y,U, and V) of the host pictures concerning SSIM and VIF. In view of these qualities, the test pictures taken demonstrated Y segment sees more data (in light of SSIM and VIF Values) than U and V segment and furthermore YUV together So, Y part is intertwined with Gary scale MRI. The all picture measure considered in this paper is [512 512].

After determination procedure of the info pictures is finished, presently by utilizing the distinctive combination calculations pictures are melded. The melded picture is having increasingly basic data contrasted with the current techniques..

REFERENCES :

[1]Implementation of hybrid image fusion technique for feature enhancement in medical diagnosis Jyoti Agarwal and Sarabjeet Singh Bedi2
[2] A.A. Goshtasby, S. Nikolov, "Image fusion: advances in the state of the art", Information Fusion 8 (2) (2007) 114– 118
[3] A.Mumtaz, A.Majid, and AMumtaz. (2010, March), "Genetic Algorithms and Its Application toImageFusion,"[Online].Available:http://0www.ieeexplore.ieee.org.sheba.ncat.edu/stamp/stamp.jsp?tp=&arnumber=4777465&tag=1, 2008
[4] C. Xydeas, and V. Petrovic, "Objective Pixel-level Image Fusion Performance Measure," Sensor Fusion: Architectures, Algorithms and Applications IV, SPIE, vol. 4051, pp. 89-98, 2000
[5] N. E. Huang, etaI, "The empirical mode decomposition and the Hilbert spectrum for nonlinear and non-stationary time series analysis," Proc. R. Soc. Lond. A. 454,pp. 903-995, 1998
[6]Ashwini.G etal,"Objective analytics based image fusion algorithm for diagnosing brain tumor images of MRI and PET." International Journal of Electronics, Electrical and Computational System, Vol 6,Nov 2017
[7] W. Dong, X. Li, X. Lin, Zh. Li, "Abidimensional empirical mode decomposition method for fusion of multispectral and panchromatic remote sensing images," Remote Sens., no. 6, pp. 8446-8467, September 2014
[8] S.Daneshvar, H.Ghassemian, "MRI and PET image fusion by combining IHS and retina-inspired models," Information Fusion; pp. 1 14-123 ,May 2010
[9] V.P.S. Naidu and J.R. Raol, "Pixel-level Image Fusion using wavelets and Principal Component Analysis," Defence Science Journal, VoI. 58,No. 3, May 2008, pp. 338-352 02008,DESIDOC.
[10] Nirosha Joshitha J, R. Medona Selin,"lmage Fusion using PCA in Multifeature Based Palmprint Recognition,"lnternational Journal of Soft Computing and Engineering (IJSCE) ISSN: 2231-2307, Volume-2, Issue-2, May 20 I 2.
[11]Fusion of MR and CT Images Using The Curvelet Transform F. E. Ali , I. M. El-Dokany, A. A. Saad, and F. E. Abd El-Samie Department of Electronics and Electrical Communications., Faculty of Electronic Engineering, Menoufia University, 32952, Menouf , EGYPT. E-mail: fathi_sayed@yahoo.com
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