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Performance Comparison of Cross Coefficient Fusion with Dual Tree Complex Wavelet Transform

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Abstract:

Medical image processing is the most challenging and emerging field now days. Image fusion is the process of integrating information from two or more images.The fused image should be more informative than the input images. In the field of medicine, diagnosis, treatment planning and implementation is the most crucial stage in a patient's life. Care must be taken to acquire the image, and analyzing the image. Most of the radiological images having its own characteristics depend upon the nature of the sensors utilized for sensing the images. In order to visualize the images clearly the physician should fuse the images manually and diagnose the disease carefully. For accurate and quick diagnosis automatic medical image fusion is necessary. Each modal of radiological images have own its strengths and weakness. The CT (Computer Tomography) images are used to visualize bone structures effectively and MRI (Magnetic Resonance Imaging) Images are used to visualize soft tissues. By fusing these two modalities the Examiner may get more information. In this paper image fusion based on cross coefficient (regular and inverse) and Dual tree complex wavelets are compared and results analyzed for clinical evaluation. Maximum selection rule is applied to fuse the images. From the simulated results it is found that the regular fusion and DTCWT enhanced output compared to inverse fusion.

Keywords: Image fusion, radiological images, wavelet, complex wavelet transform.

I. INTRODUCTION

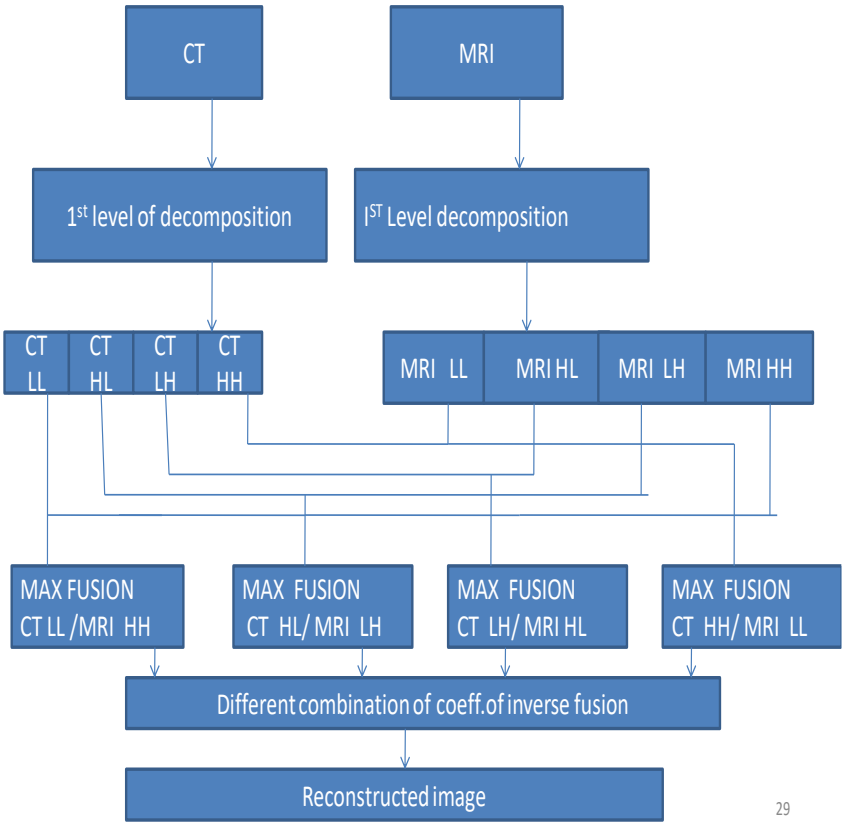
The digital era has witnessed an exponential growth in medical imaging technology. New modalities and analytical techniques improve the potential for noninvasive study of anatomy and physiology. In medical imaging due to different physical properties of imaging, various modalities provide different features of human body. There are several types of diagnostic tools available to capture an image of patient's body. Different types of medical Images like x rays

which are used to detect broken bones. The CT to detect bone structures and MRI to visualize soft tissues. Every new modality strives to be better than the previous ones. Each modality has its own strengths and weakness. To preserve all the
Complementary information provided by different modalities in a single image, image fusion is performed, which is useful for human visual and machine perception. The process of combining relevant information from two or more images into a single image is known as Image Fusion. The combined CT and MRI imaging can provide anatomical and physiological characteristics of the

human body. So, enhancing the images, using best fusion technique lead to yield a good clinical result.

Masking and maximum fusion rule is applied for hybrid architecture; According to (Mirajkar pradnya P.Sachin, D.Ruilkar)Fusion result depends on type of images to be fused [1]. Gaussian filter, wavelet and, curvelet transforms are used to remove the noise then modified haar wavelet transform is applied for fusion [2]. Rui shen,Anup basu detected that cross scale coefficient is applied for 3D image fusion , Inter pixel redundancy is reduced. Vishal R Gupta, Vishal kumar Agarwal, Prof S L Tade identified that approximated coefficients are fused by averaging method and Detailed coefficients are fused by replacing maximum pixel value. Pixel based fusion is implemented by DWT, DTCWT(5); Contrast based image fusion preserves contrast and edge information. Noise introduced with detailed coefficients (8). Susmitha vekkot and Pancham Shukla identified that Choice of optimum fusion rule is based on type of images fused(10).

In this paper initially the CT and MRI images were decomposed by wavelet transform. Then by using regular cross coefficient fusion, the coefficients of CT and MRI images were fused by different combinations (LL, HL, LH, and HH). Finally the fused images were reconstructed by taking inverse transform of the fused images. In the second method inverse cross coefficient fusion by different combinations and reconstruction is done by taking inverse transform of the fused images. In third method using Dual tree complex wavelet transform fusion is applied for CT and MRI images.



Fig(1) block diagram of coefficient grouping and combination

	RMSE	PSNR
CT-FUSED OUTPUT	55.044	13.3505
MRI-FUSED OUTPUT	39.4054	16.2557

TABLE.1 RMSE and PSNR for DTCWT

Results and Discussion

The experimental results show that the different combination of reconstructed CT and MRI coefficients gives various clinical informations. In regular fusion reconstructed coefficient of MRI, reconstructed coefficient of HH CT and other MRI coefficients,

Reconstructed coefficient HL CT and other MRI coefficients gives enhanced output. In Inverse fusion reconstructed coefficient of LL MRI and other CT coefficients, reconstructed coefficient of HL CT and other MRI coefficients gives the enhanced results

Conclusion

The experimental results shows that the cross coefficient fusion gives enhanced output in inside the structure and the DTCWT gives the enhanced edges and corners.From the results further work may carry out by hybrid fusion of DWT and DTCWT.

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