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An Image Fusion Method Based On Framelet Transform

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Article Info	ABSTRACT
	Image fusion is the process of combining relevant information from two or more images into a single image. The resulting image contains more information as compared to individual images. In this system, we are proposing a new image fusion method by using a technique called framelet transform. This method consists of two phases; First is the frame separation where the pre-processing and Selection of frames for both the images occurs and the second phase is the Frame fusion that is done by inverse framelet transform method is done from which a fused output images will be formed that will be containing both the information of the input images (CT & MRI images).

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1. INTRODUCTION

In the field of image fusion mechanism in medical image processing field, many a type of image fusion techniques are used in the past years. Among them few methods are analyzed and stated here.

2. BACKGROUND

An image fusion strategy based on decomposition of a multiscale guided filter is discussed in [1]. In this method the guided filter produces a filtering output from the contents guidance image and it can be derived from a local linear model.

Shearlet transform and sparse representation based image fusion technique is discussed in [2]. The Shearlet transform decomposes the image source into a low and high frequency subband coefficients. The sparse representation is used for training the coefficients and for fusing the images with higher energies. The fusion of MRI and PET images is discussed in [3]. The purpose of the method is to fuse the functional information of PET images to the structural information of the MRI images. The process is done by using the Non Subsampled Contourlet Transform (NSCT) along with the fusion rules.

The image fusion method discussed in [4] is done by fusing the wavelet transforms along with the Adaptive and Burt fusion algorithm over a multi-resolution image. The fusion is done based on adaptive thresholding of wavelet transform to adaptively fuse the source image with the match degree case. Image fusion algorithm based on non subsampled shearlet transform and compressive sensing is discussed in [5]. The NSST is used for decomposition of images into band pass and low pass subbands. And the compressive sensing is used for fusing the low pass subband with the improved weighted fusion rule. An outcome of periodized small side games with and without mental imagery on playing ability among intercollegiate level soccer players is also describes that [6]. Image Super Resolution Using Wavelet Transformation Based Genetic Algorithm explained in [7]. Framelet transforms are used in application like classification of the glaucoma in digital fundus images as in [8]. The fusion of unimodal multi-feature and one-dimensional

hidden markov models for low-resolution face recognition as in [9]. Also it is used in many applications like credal fusion of classifications for noisy and uncertain data and texture fusion for batik motif retrieval system as on [10], [11].

3.   THE PROBLEM

There are some problems that are occurred in the previous methods like noise occurrence and pixel losses or overlapping of the pixels while fusing the images. So in order to overcome those problems we are implementing a new image fusion system as explained below.

4.   PROPOSED SOLUTION

In this system, an image fusion method is proposed solution is stated by using a technique called framelet transform. The system is of two phases namely; frame separation and frame fusion is occurred where the first phase is of pre-processing and selection of frame process occurs and the frame fusion is done by the inverse framelet transform. The first phase is done for both the input images and the second phase is done for the coefficients of the both the images. The complete framework of the proposed system is as shown in figure 1.
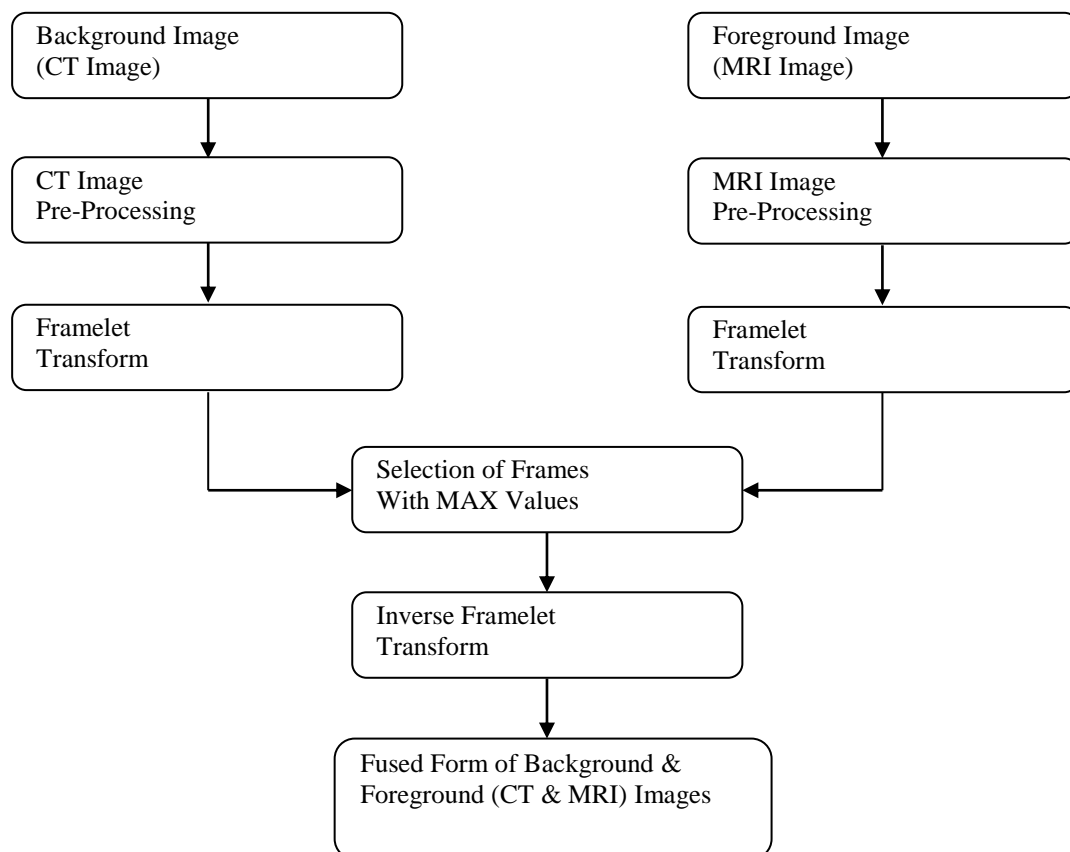

Figure 1. Block diagram of Framelet Based Image Fusion

4.1. Frame Separation

In the proposed system the first phase is the frame separation process. In this, first both the input images are pre-processed by denoising and the color conversion method. Then the image frames are separated as low, high and band pass frequency coefficients by using the framelet transform to that of the original images. With the help of the framelet transform any one of the frequency co-efficient can be separated and used for fusion process that occurs in the next phase.

4.2. Frame Fusion

The second phase is the frame separation where the frequency co-efficient of any of subbands can be selected and used for fusion. In this method we are selecting the subband of higher frequencies for the fusion process. This fusion of the subbands can be done by inverse framelet transform algorithm. This algorithm will reverse the process of the framelet transform by fusing the two different subabnd of a image into a single subband coefficient image. The output will be obtained as the fused form of single image that contains both the information of the CT and MRI images.

5.   RESULT AND DISCUSSION

In this section the results and interference of the proposed system is discussed. Here the fusion system makes use of two input images namely MRI and CT images. Here the MRI image is considered as the foreground image and the CT image is considered as the background image. Both input images are processed separately and are fused together by using the fusion algorithm. The output image of the propose system is as shown figure 2.
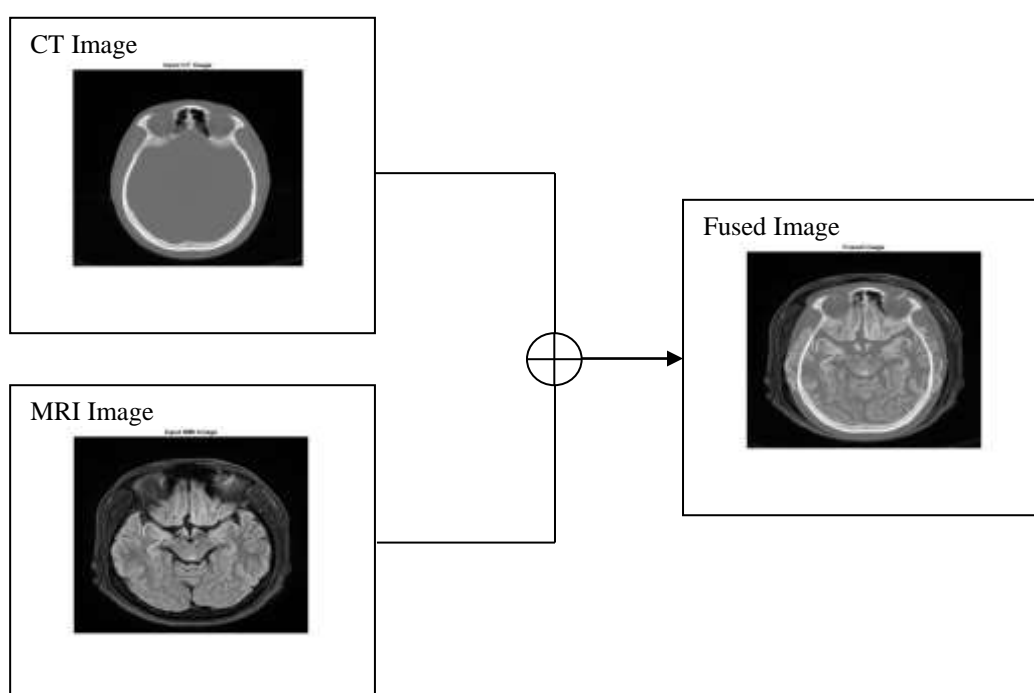

Figure 2. Resultant Outpt Images

The output images of the proposed image system is shown above and it is understood that how the input images (CT and MRI) are fused together to form a single fused image. Also the fused will be having both the input image information without any data loss. The performance evaluation of the output fused image can be done by calculating the Peak Signal to Noise Ratio (PSNR) and Structural Similarity Index (SSIM) values for the corresponding image.

6.   CONCLUSION

The paper depicts a new image fusion system by using the technique called the framelet transform. Unlike the other methods this algorithm can be used for fusion process by selecting any of the frequency coefficient subbands like low, high and median subbands without any data loss of both the input images. Experiments and related objective measurements show that the proposed method can obtain a better fusion performance when compared to other state-of-the-art methods.

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