ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

# Spine Image Fusion and Detection of Defect Region by Using MMA and SGNN.

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**ABSTRACT**

In medical science and diagnosis a major important task is image fusion. This fusion technique is motivated to capture the relevant information from the source input image. In fusion the edges and outlines of the objects are the important than the other objects and details in an image so. That the edges and outlines of the objects to be persevered to make a medical image to be an effective. In medical science each computer or medical diagnosis having the different types of features. In computer tomography having the features of bony details. Magnetic resonance image [MRI] having the features of soft tissues and bony details. Here, we have projected an effective combination technique to fuse MRI and CT scan image. By effective fusion, we can get accurate results and information. In this paper we have proposed multimodal object algorithm and selfish gene algorithm. To remove the fusion errors or noise, we used non subsampled directional filter banks.

**Keywords:** Image fusion, medical image diagnosis, multimodal object analysis.

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ISSN: 0975-8585

## INTRODUCTION

The medical image fusion plays a major and important role to recognize the disease and also it is used to remove the physical correlation between the two images, which will be a major problem for physical. In fusion two images are combined into one image, which combines the features of both images. They are attractive quality image, Computed tomography (CT), A PET scan as well as single position secretion computer tomography (SPSCT). All above images can be give results in medical diagnosis but fusion technique can give better results than the above medical images. [1] Our proposed fusion technique not only provides the accurate diagnosis, it also reduce the cost of storage required for it. While it reducing the size of the two images into single.

The various combined techniques are deployed within spatial domain plus frequent area techniques. Frequency domain techniques results are better than the spatial technique. The image fusion technique is discussed into three levels. They are classified below.

1. Pixel level combination.
2. Feature level combination.
3. Decision level combination

Pixel level combination techniques play in every pixel, which performs efficient and original quality of image. In this level, resource images are splitted into various parts and they are used for fusion. This level considers the decisions from the various level sensors. In spatial level fusion concept, it provides high spatial resolution. But it has an image blurring problem. Wavelet transform been widely due for multi-resolution decomposition it is very good enough to detect discontinues at edge points but not it is not have any other disadvantages.

Curve let transform can represent smooth and edge parts of image with clarity, and it can provide more information than wavelet transform. It adds the parameters below, they scale, orientation and transform. But it misses the texture and contrast information. Contour let-balanced combination process provides good performance than the conventional wavelet-based combination mechanism spatial and spectral analyses. Contourlet transform has major disadvantages; source images are not limited to a small area.

In computer tomography (CT) images it has brightness of bony details, but it don't have soft tissue details. MRI image having the features of both bony details and soft tissue. But both two details having the same portion.

## PROPOSED METHOD

The below fig.1 indicates the Flow chart of the designed method and it is described as follows. The CT images and MRI images given to the forest region filter this performs an major filtering process of background. It is an effective filter method, which separates the image into two levels. That is background image and foreground image. In CT image it removes the background fully and it gives the bony. In case of MRI image also it performs the same task.

The multimodal object algorithm splits up the image or label the image into different frequencies. In both CT and MRI image it creates three type of frequencies, they are low, med and high frequencies. In case of CT image high frequency details are only used, which represents the bony details. In MRI image low, med and high frequencies from MRI image.

After combination, the combined image is retrieved and it is feed into the directional filters. Here we have used non-sub-sampled directional filter, which removes an errors occurred while performing the multi frequency fusion. Neural network system is used to detect defected area in the fused images, by training correct structure of spine image.

ISSN: 0975-8585

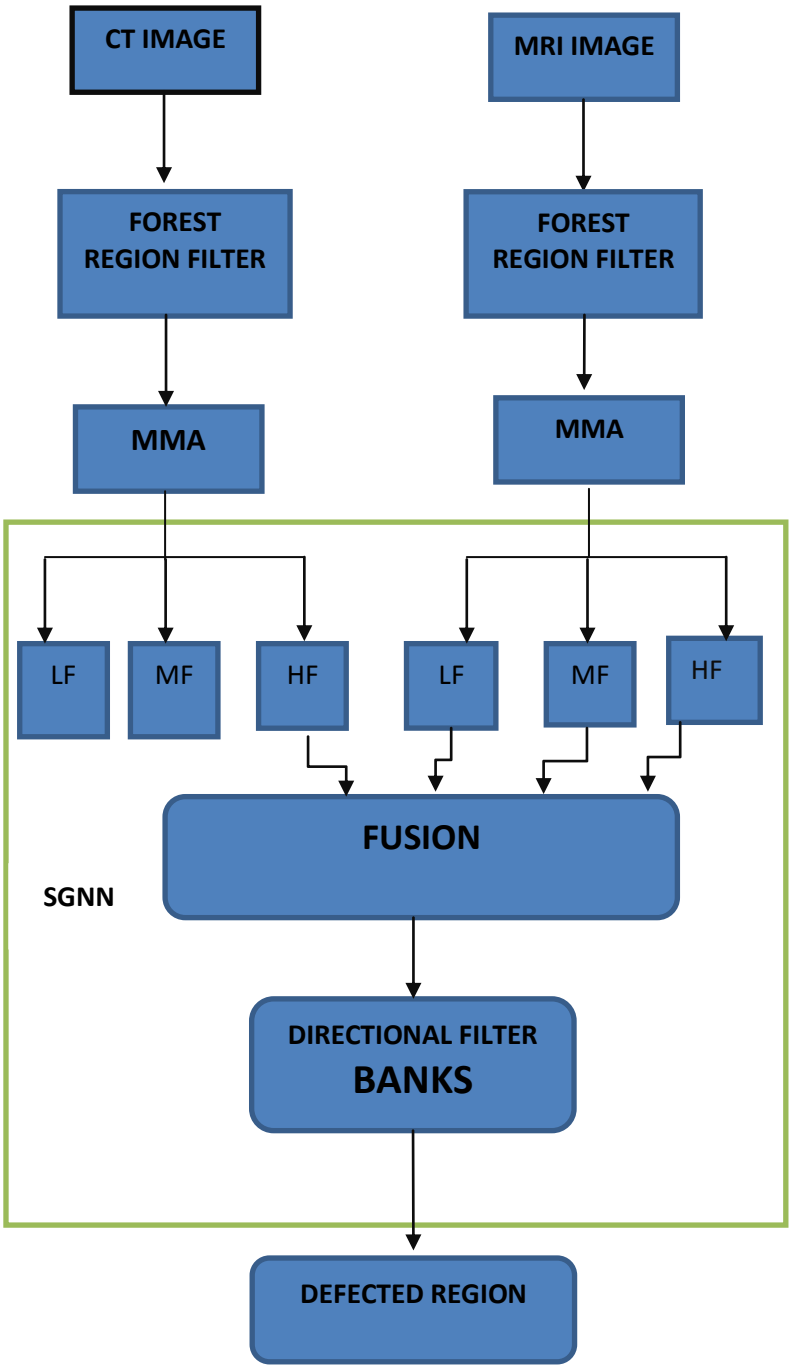


**Figure 1: Block diagram of proposed method**

**FOREST REGION FILTER**

The forest region filter is an efficient new discriminative approach for predicting continuous variables given a signal and its context it is useful for general restoration task that can be tackled through convolution filtering where it is used to filter the background to be applied to each data points. The background is filtered by using following equations.

$$P[F(t)] = P[I(t)] - P[B]$$

It represents every pixel value of each pixel is represented by $P[I(t)]$. The output image can be improved by thresholding.

ISSN: 0975-8585

$$| P[F(t)] - P[F(t+1)] | > threshold$$

**MULTIMODAL OBJECT ALGORITHM:**

Multimodal object defines that the multi types of modes or connectivity of an particular thing. For an example if the image having the different multi model objects, which are connected components by individuality. So every components are labeled by their features. In CT image the bony details are highlighted in high frequency level components and they are labeled. In magnetic resonance image (MRI) consists of multi objects like soft tissue and bony details. They are grouped or labeled as per their connectivity and intensity level. This algorithm is mainly used to fuse the object in CT and MRI image in correct level.

Equations required to separate low, med and high frequencies are listed below.

$$LF(\lambda_{low}) = \lambda_{min}\left[ e^{\left[\frac{B_{j-1}^{+}+B_{j}^{-}}{2}\right]} \right] if\ j < t1$$

$$MF(\lambda_{med}) = \lambda_{med}\left[ e^{\left[\frac{B_{j-1}^{+}+B_{j+1}^{-}}{2}\right]} \right] if\ t1 < j < t2$$

$$HF(\lambda_{high}) = \lambda_{high}\left[ e^{\left[\frac{B_{j}^{+}+B_{j+1}^{-}}{2}\right]} \right] if\ j > t2$$

**SELFISH GENE NEURAL NETWORK**

The selfish gene algorithm performs the task or event with the effective output, but it perform the operations selfishly. It combines all the features of an image. I and also it takes an advantage of every algorithm which it like to use.

In our application, it takes an advantage of frequency analysis of an image like low frequency and high frequency. Like wavelet transform. It splits into multiple frequencies. Like wavelet transform, it differentiates the multimodal algorithm outputs. Based on the threshold it splits into multiple frequency like low frequency, med frequency and high frequency and from those frequencies, it select the best details required to fuse. It adds an another advantage of neural network system which can perform efficient operation on medical science and diagnosis. In this system, we are training to detect the defect region in the fused spine image.

**NON SUB SAMPLED DIRECTIONAL FILTER BANKS**

Picture combination structure is designed for therapeutic picture, that was predicated in sub sampled countourlet network and directive distinction .For fusion, different rules area unit utilized by that additional data may be conserved with in the amalgamate picture by means of better value. Low rate band area unit amalgamate allowing for part congruency while instruction distinction, initialized because the combination frequency is higher in band The property of NSCT is providing multi directional , multi scale , shift invariant image decomposition its being enforced by suggest that of the fusion technique or algorithm. The visual and applied math comparison demonstrate that the planned for formula will enhance the small pint of the amalgamated image, might improve the visual impact with abundant less info distract that its competitors.. To make the filter to give better results, we iterate NSDFB's to the nest level and we up sample all filter with queue in matrix given below

$$Q = \begin{pmatrix} 1 & 1 \\ 1 & -1 \end{pmatrix}$$

ISSN: 0975-8585

**IMAGE FUSION TECHNIQUES**

Image fusion method has been divided into two types.

1. Spatial area combination method.
2. Transform area combination method.

**PIXEL LEVEL ALGORITHM**

Pixel level approach operates on many parameters. They are discussed below.

(i)Simple maximum method operates by choosing greatest strength of equivalent pixel of both pictures.

$$F(i,j) = \sum_{i=0}^{m} \sum_{j=0}^{n} \max A(i,j) B(i,j)$$

(ii) Easy method operates via choosing least strength of equivalent pixel of both pictures.

$$F(i,j) = \sum_{i=0}^{m} \sum_{j=0}^{n} \min A(i,j) B(i,j)$$

(iii) Easy average process it take average of corresponding selected intensity in pixels form both input images.

$$F(i,j) = \frac{A(i,j) + B(i,j)}{2}$$

(iv) Weight average method has an weight which are assigned to all resources. The combined output picture pixel is obtained via computing weight sum of all corresponding pixels in input images. It increases indicator to sound percent of combined picture, but it improves the reliability. The fused output image is obtained average intensity of both image.

$$F(i,j) = \sum_{i=0}^{m} W\, A(i,j) + (1-w) + (1-w)\, B(i,j)$$

(v) Principal component analysis method. It converts the observation of all probably connected variable into a value of unconnected variable was standard mechanism. Principle components are very less than original values. It determines the weights for each source. It results high quality in spatial domain.[4] But it also result in spatial degradation.

(vi) Discrete wavelet transform method, it calculated the image x by passing it through a series of filter banks it has a steps of filtering low pass filter is used to get impulse response and also it is decomposed by using higher through a filter. Disintegration method be frequent to enlarge the occurrence motion plus the estimated coefficient decayed with higher and lower through a filter plus it is down sampled. The fusion rules are used to fuse image. Inverse discrete wavelet transform is functional for decomposition level to generate combined picture it minimize spectral distortion. It provides better signal to noise ratio than others. But it has less spatial resolution it performs better filtering of color distortion than spatial domain fusion.

(vii) curvelet transform is used to preserve the shape of the curve in an fused image it preserve the edge better than others. It also gives the same color as in the original multispectral images [6].

(viii) Contourlet transform, the wavelet transform has limitations in direction to improve the above techniques. The curvelet and contourlet transform is used contourlet transform it is a multidirectional and

multi resolution image expression method. It has a good direction sensitivity and catches accurately edge information.

(ix) multimodal object analysis the intensity or the threshold are fixed based on the each and every object details in the image the CT and MRI image details are classified into levels. So the bony details in the CT image is separated or pressured by using MMA algorithm and MRI details are improved in intensity level and both are fused by our proposed fusion technique.

## SIMULATION OUTCOMES AND RESULTS

The medical image fusion for the spine CT image and MRI image has been performed by using multi modal object algorithm and selfish gene neural network. Our proposed algorithm has been implemented in mat lab r2013a. The following figures shows the put in computed tomography picture, Magnetic resonance image, combined image and diagnosed image.

**Figure 2: Input Magnetic resonance image**

**Figure 3: Input Computed Tomography**

ISSN: 0975-8585

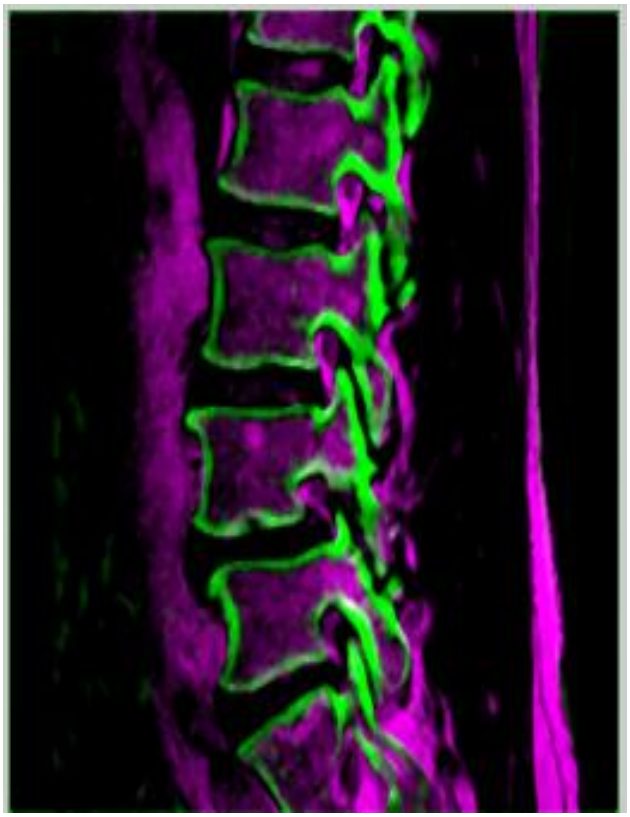

**Figure 4: Combined Spine image**

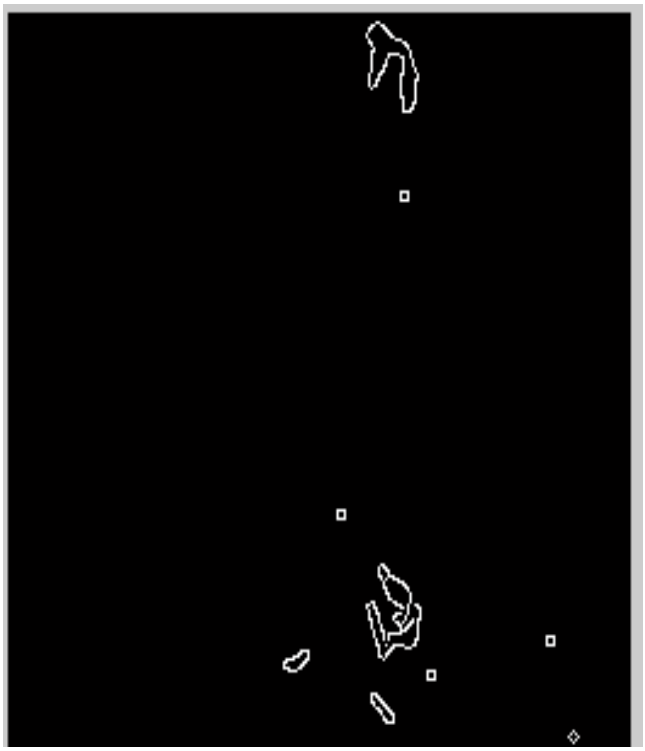

**Figure 5: Diagnosis image**

**Validation:**

The basics of structure match directory as a way for picture value appraisal so as to HVS is very tailored on behalf of extract structured data from the picture .The SSIM directory procedures the structure comparison furthermore because the luminance and distinction connection between pictures wedge by wedge .To validation the fusion level, the masked tissue in MRI and masked bony details in CT images are compared to the fused image. So the structural similarity index is calculated.

$$SSIM\ (x,y) = \frac{(2u_x u_y + c_1)(2\sigma_{xy} + c_2)}{(u_x^2 + u_y^2 + c_1)(\sigma_x^2 + \sigma_y^2 + c_2)}$$

Where $u_x, u_y$, $\sigma_x^2$, $\sigma_y^2$, $\sigma_{xy}$ are the representation of various components in pictures.

The Mean Squared Error its works within the constituent domain is cherish the mean square quantization error (MSQE) within the DCT domain as result of DCT could be a normalized orthogonal transformation. Its attainable to live PSNR from the quantization error within the DCT domain

$$\mathrm{MSE} = \frac{1}{mn}\sum_{i=0}^{m}\sum_{j=0}^{n}[\,I(i,j) - K(i,j)\,]^2$$

Mean squared error and high indicator to sound percent are calculated.

PSNR represents amount secret writing error, that is the distinction between the supply and decoded video signals..

$$\mathrm{PSNR} = 20\log_{10}(\mathrm{MAX_I}) - 10\log_{10}(\mathrm{MMSE})$$

Where I is the original image and K is noise.

## CONCLUSION

An effective medical image fusion and medical diagnosis method has been proposed and implemented for the spine CT and MRI images. From those above images, the important and most of the details are preserved and they are designed and estimated by using the Mat lab r2013a. It has very less fusion errors, which is removed by an non sub sampled directional filter banks.

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