



Detection of Abnormalities Using Multimodal Image Fusion and Text Encryption

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ABSTRACT - In today's world the expansion of medical field is tremendous. Early diagnosis and appropriate treatment planning of different diseases requires the precise information which can be obtained through the image fusion of various modalities of medical images. Images fusion is the process of combining the relevant information from a set of images into a single image, where the resultant fused image will be more informative and complete than any of the input images[1]. Here we are combining images of CT scan and MRI scan of the brain, DWT (Discrete wavelet transform) based image fusion is implemented. Then segmentation process is employed to extract the abnormal areas or affected regions from the fused images and Convolutional Neural Network is used to detect the normal and abnormal brain image. And also an AES encryption technique is employed to convert the report of the fused image to cipher text.

KEYWORDS – MRI (Magnetic resonance imaging), CT (computerized tomography), DWT (Discrete wavelet transform), CNN (Convolution Neural Network).

I. INTRODUCTION

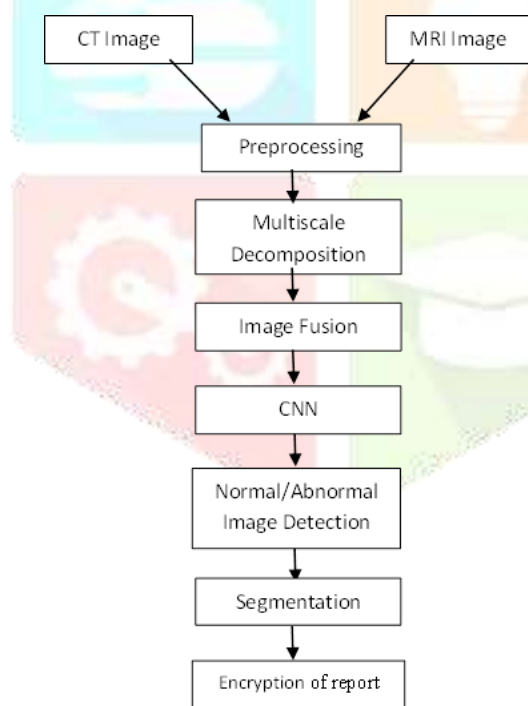
In today's world the expansion of medical field is tremendous. Diagnosis and Appropriate treatment planning of different diseases requires the precise and accurate information which can be obtained through fusion of various modalities of medical images. One such advanced technique is called the image fusion. Images fusion is the process of combining two or images into a single image without losing the relevant information from a set

of images, where the resultant fused image will be more complete and informative than any of the input images[1]. In this era of biomedical imaging, the widely used two modalities are Magnetic Resonance Imaging (MRI) and the Computed Tomography (CT) scan which do not reveal identically every detail of brain structure. While CT scan is very suitable for imaging bone structure and hard tissues, the MRI images are much superior in depicting the soft tissues within the brain that play vital roles in detecting diseases affecting the skull base. These images are thus complementary in numerous ways and no single image is totally sufficient in terms of their respective information content. The advantages these images may be fully exploited or utilized by integrating the complementary features seen in different images through the method of image fusion. Important applications of images fusion include medical imaging, microscopic imaging, remote sensing, computer vision, and robotics[2]. To get improved image resolution image fusion can be used. There are lots of different image fusion techniques are used today like DWT, PCA, SWT etc. From which wavelet transform based image fusion has advantage over other spatial domain methods in terms of spatial and spectral resolution and DWT is suitable for medical images. In this paper, discrete wavelet transform based image fusion is implemented[3]. The segmentation process is used to extract the abnormal areas or affected regions from the fused image. There are different types of classification techniques. Here Convolutional Neural Network is used to detect the normal and abnormal brain

image. And AES algorithm is used for encryption and decryption of the text result.

II. PROPOSED SYSTEM

In proposed system image acquisition is first done. The term image acquisition is the process of capturing the images and stores them into our personal computer. Here two images of different modalities are taken as the input namely, CT image and MRI image. These images are firstly re-sampled to 256×256 pixel by changing the number of pixels and they are converted to gray scale image. Now these images are considered for undergoing fusion process and Discrete wavelet transform based image fusion is implemented. There are different types of classification techniques. Here Convolutional Neural Network is used to detect the normal and abnormal brain image. Then segmentation process is used to identify tumor regions from the fused image. And AES algorithm is used for encryption and decryption of the text.



1. Image Acquisition and Preprocessing:

Image acquisition is the first stage of the proposed method. The term image acquisition refers to the process of capture the images and store them into our personal computer. Two different images with different modalities are taken as the input image. Here for image 1 providing CT image and image 2 providing MRI image. These images are firstly re-sampling, that means changing the number of pixels in the image by 256×256 pixel. A new version of the

images with different size in pixel is formed using there-sampling method. Then there-sampled image will be converted into the gray scale image. These images are considered for undergoing fusion process.

2. Image Fusion

In this stage, discrete wavelet transform is further applied on these processed images. Wavelet transforms are multi-resolution image decomposition tool which provide the different frequency sub bands like low frequency and high frequency at multi-scale. 2-D Discrete wavelet transform converts the image from spatial domain to frequency domain. The approximation and detailed information will be provided by the decomposition stage. When applying the DWT the source image is divided by vertical horizontal lines, and the image can be decomposed into four sub-bands those are LL1, LH1, HL1 and HH1. The low frequency sub band LL1 sensitive to the human eyes. The high frequency sub bands LH1, HL1 and HH1 contain more detailed information.

3. Convolutional Neural Network:

The Convolutional neural systems are regularized renditions of multilayer perceptron (MLP). It is utilized for include extraction and training the images. A ConvNet can effectively convert the Spatial and Temporal conditions in an image through the utilization of significant filters. The design perform a better fitting to the image dataset because of the decrease in the number of parameters involved and reusability of weight. In other words, the network can be trained to understand the sophistication of the image better.

4. Segmentation:

In this stage the fused image will be given for the segmentation process. The main objective of this approach is to extract the abnormal areas or affected regions from the fused image. Here we use thresholding for segmentation, that is on the basis of the different intensities of pixels in the foreground and background regions of an image.

5. Encryption

The encryption is done on results for more security. AES algorithm is used for encryption and decryption of the text data.

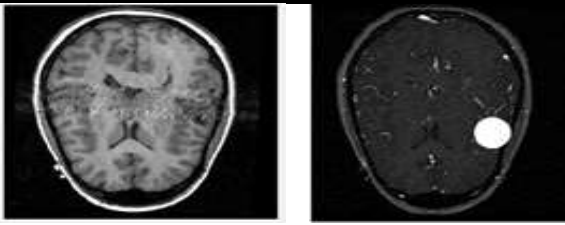


Fig 2.1 MRI and CT scan image

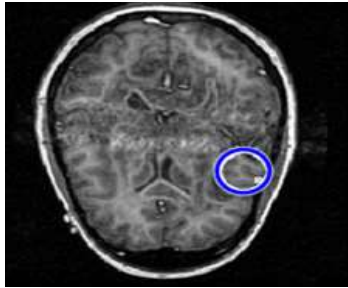


Fig 2.2 Result

II. SCOPE

- Our designed system will provide more accurate and more informative images which will be of great benefit to the doctors for diagnosis and treatment of diseases. It only requires less time for processing and more accurate result in no time.
- Now designed system will only provide fusion of MRI scan and CT scan images but it can be extended to other medical images like PET, SPECT, Endoscopic images since the growth of medical field is tremendous.
- It also provides a security to the data by the implementation of AES algorithm.
- With further research and innovation, this project can be implemented in different areas.
- Along with these advantages efficient memory management makes this system relevant and special.

IV .CONCLUSION

This paper is aimed to design automatic algorithm to detect the abnormalities of brain from fused CT and MRI images by DWT based image fusion and Conventional Neural Networks. This algorithm has been successfully designed.

The data collected from Whole Brain Atlas website and its prepared by pre-processing and post-processing operation to make it suitable to detect. For fusion process Discrete wavelet transform method used. The resultant image will be more informative and contain clear information than that of the input image. The performance of the fused images are evaluated

using the various quality measurements. A wavelet based image fusion is proposed to provide the high quality fused image with spacial and spectral information. For improving the contrast and quality of the image phase congruency and directive contrast fusion rules are used. Fused image is given to the segmentation stage to extract the abnormal areas or affected regions from the fused image. One of the simple and well suited method for segmentation is thresholding on the basis of the different intensities or colours in the foreground and background regions of an image. In the proposed framework thresholding is performed by calculating standard deviation of the image. For classify the images to normal or abnormal CNN is used. Then the network was trained and its performance was evaluated. Finally, the proposed algorithm, which based on the Discrete wavelet transform and Convolutional Neural Network has been successfully tested and achieved the best results with accuracy 95%.

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