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# Image Fusion Based Brain Tumor Detection

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***Abstract:*** ***It is very important to detect brain tumor at right time in brain tumor diagnosis. We are using image fusion for CT and MRI images. Image fusion is use to get more information for brain tumor diagnosis. Resultant fused image of CT and MRI images will improve accuracy of tumor detection. MRI and CT scan images are very useful in tumor disease diagnosis. Brain image is easily degraded by noises. For noise minimizing and enhancing the image quality we use discrete wavelet transform method. It provides enhances image quality. Here we are using image fusion method and morphological image processing for increasing image intensity. Image segmentation used to detect tumor portion accurately and indicate about growing area of tumor.***

***Keywords: Magnetic Resonance Image (MRI), CT Scan, DWT, Segmentation & Morphological.***

## I. INTRODUCTION

For Brain tumor detection it is important to highlight important feature of CT and MR images. It is possible only through image fusion. Image fusion is one of the most commonly used methods in medical diagnosis. It fuses the CT & MRI brain images to provide important information inside fused image. Medical imaging image fusion, usually involves combining information of multi modalities such as magnetic resonance image (MRI), computed tomography (CT), positron emission tomography (PET), and single photon emission computed tomography (SPECT). [1] CT images which are used to ascertain the difference in tissue density and MRI provide an excellent contrast between various tissues of the body. CT images signify the difference in tissue density depending upon the tissues ability to reflect the X-rays, while MRI images provide contrast between dierent soft tissues. these features make CT and MRI more suitable for the detection of tumor .[12] Wavelet transforms is a new area of technology. utilizes wavelet analysis based image fusion to enhance the efficiency of brain tumor detection. Wavelets allows images and patterns to be decomposed into elementary forms at different positions and scales and subsequently reconstructed with high precision.[2] We use denoising method to improve the image quality. Image denoising is use to remove noise from image without affecting the quality of the image. Extraction of noise is very important for image enhancement. We will remove noise without affecting the edges. Image noise should be reduced to get better edge detection. Brain images may contain noise. Therefore we have to use accurate process to remove noise from brain images. Morphological image processing is use for increasing image intensity. Image segmentation used to highlight tumor portion and indicate about growing area of tumor.

## II. METHODOLOGY

MRI & CT Images affected by different noise. Here preprocessing unit remove noise and convert MRI and CT image into RGB.We use DWT for image enhancement. CT and MRI enhance image fused together to get new fused image.

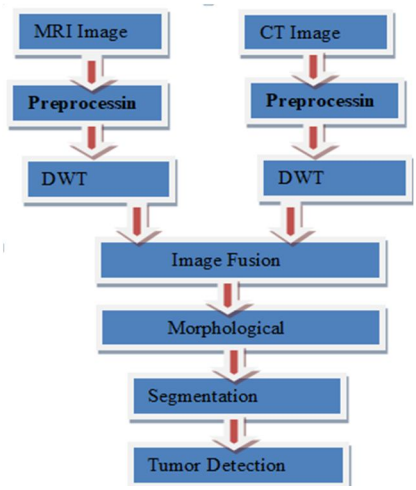



Fig.1 Brain tumor detection process.

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Brain Tumor detection method explained in Fig.1. Fig. 1 shows the block diagram brain tumor detection. It consists of a preprocessing unit , wavelet decomposition blockand fused image is obtained after fusion process.

Preprocessing is a process to remove the noises from the input images. It is also used to convert the heterogeneous image into homogeneous image. MRI and CT images are prone to be affected by noise in digital imaging which can occur during image transmission and digitization. Image fusion using wavelet scheme decomposes the source images MRI and CT into approximation and detailed coefficients at required level using DWT. RGB to Gray image shown in fig 1

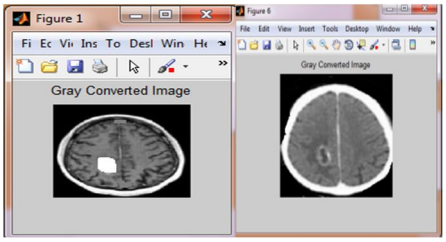



Fig.1 RGB to Gray MRI and CT

*A. DWT Based 2 Level Decomposition Shown Below*

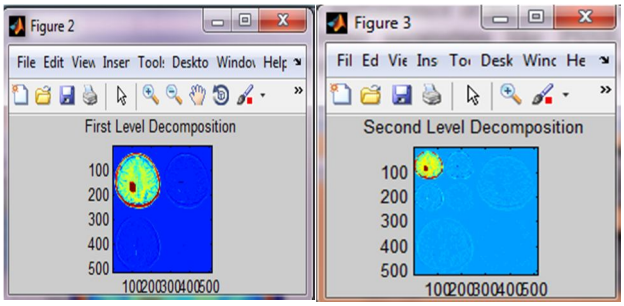



Fig.2 MRI image 2 level decomposition

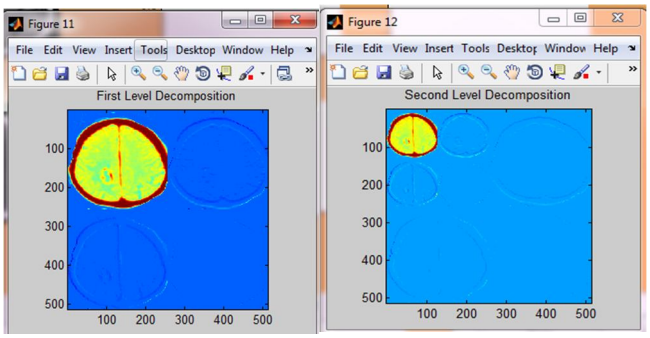



Fig.3 CT image 2 level decomposition

*B. DWT image Output image for MRI and CT*

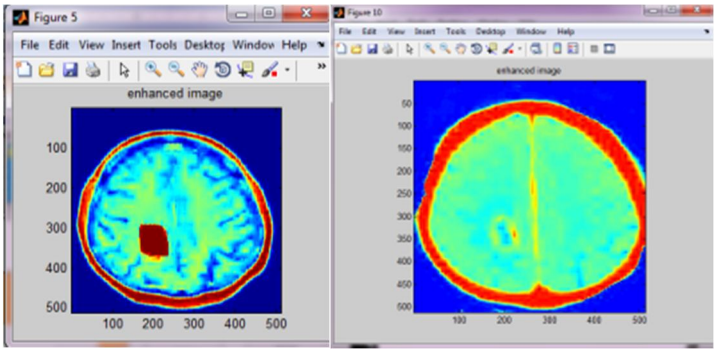



Fig.4 Enhanced image after DWT block

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## III. EXPERIMENTAL RESULTS

DWT maintain the edges and enhance important value of an image. Enhanced image fused together by fusion method. We are using morphological image processing &image segmentation method for area calculation of tumor. MRI and CT image are shown in Fig.2 and Fig.3 respectively.

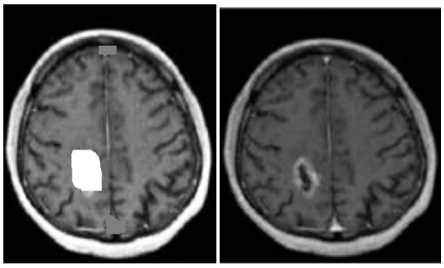


Fig. 2 MRI Image Fig. 3 CT Image

Final Fused image is used for tumor detection. Fused image shown in Fig.4. Result is shown below in Fig.5.

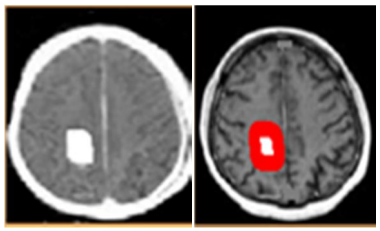


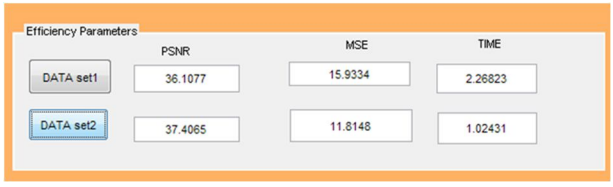
Fig. 4 Fused Image Fig. 5 Detected Tumor

The performance of the fused image is evaluated using different parameters like PSNR, MSE. GUI based analysis of CT and MRI image as shown in Fig. 6.



Fig. 6 GUI for brain tumor detection.

PSNR and MSE have been evaluated and tabulated in Table I.




## IV. CONCLUSION

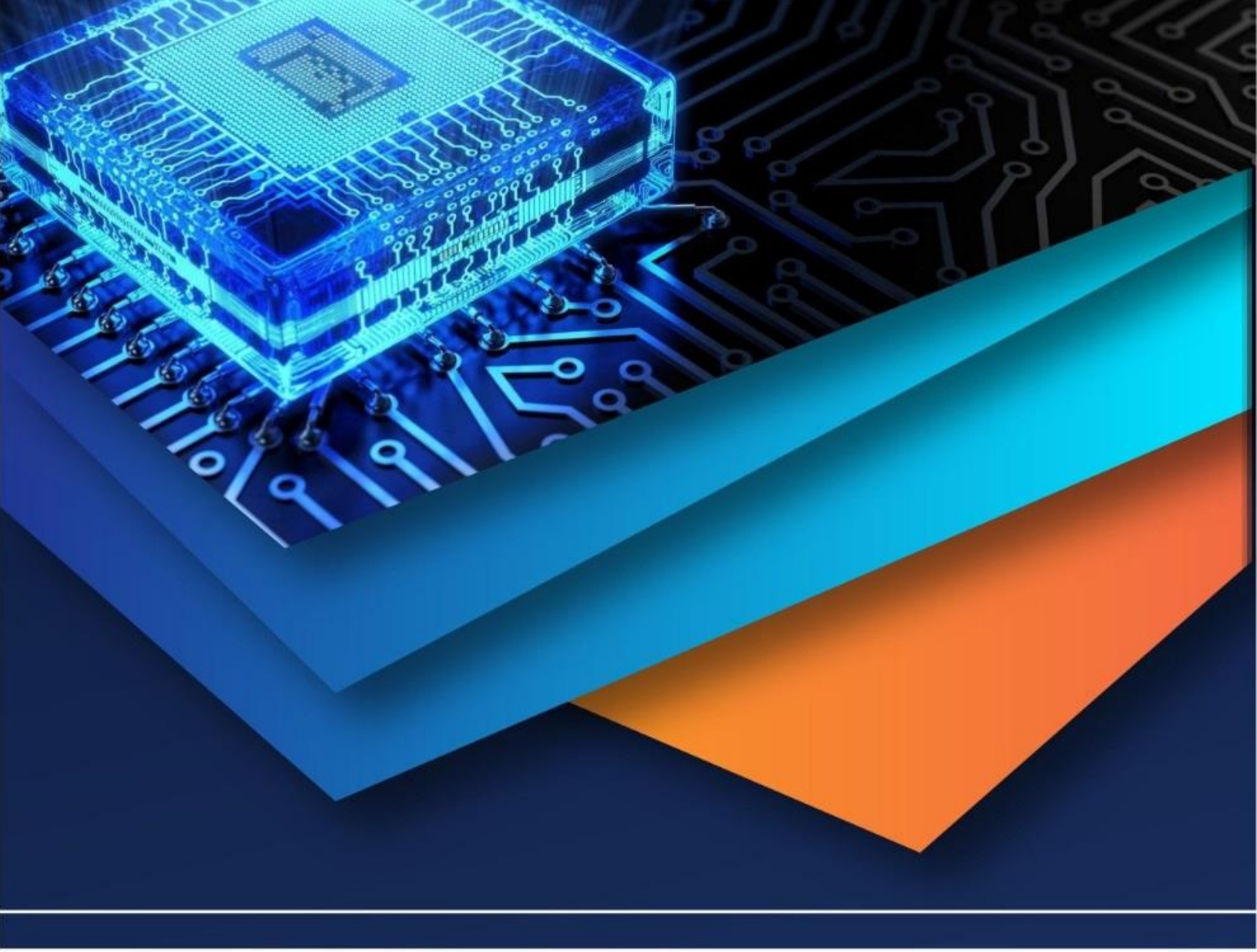
Brain tumor detection using discrete wavelet transform and fusion able to detect brain tumor accurately and it also determined the position of the tumor in fused image. We get detection result of 96% and sensitivity up to 93%. Here we use different normal or abnormal brain tumor images. We get result accurately. It is very helpful in diagnosis of brain tumor.

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