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# Security Based Brain Tumor Classification using Image Fusion

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***Abstract:Today, the use of medical images is often complicated for diagnosis process and planning of treatment. The major challenge in image processing and fusion includes data mismatching, data storage issues and security constraints. Although several techniques are being used for image processing, they lack in security parameters. Our objective is to provide an efficient method for image fusion techniques along with the security paradigms. In order to provide security, encryption standards are used. The results of improved framework give better performance and quality over existing methods in terms of security, database information, and fusion factor.***

***Keywords- Tumor, Fusion, Security, Neural network.***

## I. INTRODUCTION

The brain tumor can be defined as a massive or abnormal cell growth in the region of brain. This can occur to any person irrespective of their ages. A brain tumor can be classified into two types; they are Malignant which is cancerous or Benign which is non-cancerous. The tumor which initially affects the brain are coined as the primary tumors whereas the later the tumors present in the various other part of the body that may spread to the brain are called as the secondary tumors or metastatic tumors. A research states that in the United States in the year 2018 approximately around 78,990 newer victims are suffering from primary tumors. These include around 23,830 primary malignant tumors and 56,151 non-malignant tumors. According to the recent statistical report, India is the country which is dealing with more number of diagnoses as malignant tumor. It is the most cancerous one if it is not rectified and treated in primary stage or premature grade the outcome may lead to the death of a person. The reports of human brain in predicting the tumor might be in error or mislead due to the noise and distortions in the scanned images. This gives us motivation to construct the algorithm to predict the tumor. This paper deals with the method of detecting the tumor region with security parameters and classifying them into either normal, malignant or benign cancer.

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The Magnetic Resonance Imaging is an efficient technique that gives a higher standard image of the anthropoid. The human brain consists of three tissues, namely the white matter, grey matter and thirdly cerebrospinal fluid. The aim of tumor detection is to classify the tumor cells and to provide security parameters while doing so. This is done by detecting the abnormal regions comparing with the normal healthy tissues.

Various other methods are available in the field of medical imaging which includes image enhancement, segmentation, mainly morphological operation, histogram and so on. There are many segmentation and classification techniques are applied in the field of medical imaging to identify the tumor region. There are many methods applied on the images to perform the task such as pre processing the image to remove noisy data, image segmentation is done in order to segment the region, image classification to classify the type of tumor. There exist different data mining algorithms such as SVM, k-means, k-medoids, FCM, a neural network to mine the data. Individual images provide less efficiency of data when compared to fused images. Hence forth image fusion helps in merging two images into a single image using various techniques. Fusing images provides more clarity than single image. They can be used for various purposes. Image fusion is widely used in tumor detection process. There are different types of images available. They include multi- source images, multi-view images, multi- temporal images, multimodal images. Recent advancement in the field of artificial intelligence has paved the way for deep learning approach. The following session in this paper describes the methods used and results of the existing research of the same domain, detection, security parameters used and classification of brain tumor.

## II. TYPES OF IMAGES

Various types of images are available. They include multisource images, multi-view images, multi- temporal images, multimodal images. Multisource images are images that are taken from different sources. Multi-view images are images taken at different angles or several views. Multi-temporal images are images captured at various time period, such images under goes many physical changes which include change of information due to pressure, temperature etc. Multimodal images are images of different modalities like CT or PET or MRI images. Recent advancement of image fusion has been done in various fields which includes medical, remote sensing, face detection etc. This research work relies on Multimodal medical fusion of images for Computed Tomography and Magnetic Resonance Imaging scan images.

### A. Need for Brain Anatomy

The severity of brain tumor is based on the parameters like the location of formation of the tumor, how it is formed like shape and size and the damage in the nearby nervous systems. Based on this information the person can be treated with efficient diagnosis methods.

### B. Brain Tumor

A brain tumor is a huge collection of abnormal cells in the brain. The skull, which encloses the brain, is very rigid. Any growth inside it can cause problems. Brain tumors can be cancerous which is malignant or noncancerous which is benign. When these tumors grow, they cause increase in pressure inside the skull. This condition can cause brain damage, and it can lead to death. Hence detection and treatment of brain tumor is an essential factor.

## III. METHODS

### A. Image Fusion

The CT images are used to view the hard bones and MRI images are used for viewing the soft tissues present inside the brain. By combining these two images an enhanced idea about the overall part of the brain can be obtained.

### B. Wavelet Transform

Wavelets are used in image processing in order to detect and filter unwanted noise such as white Gaussian noise. This kind of noise can cause high contrast and disturbs neighboring pixel intensity values. Using the obtained wavelets, the transformation is performed on the two dimensional image as well as three dimensional image. In this paper, image fusion is done using quaternion wavelet transform method. The quaternion wavelet transform is proposed by Corrochano, is the new multiscale analysis tool used for capturing the geometrical portions of an image. The QWT coefficients of an image have three phases and one magnitude. The first two QWT phases denotes the shift of each image features in the horizontal coordinate system and the vertical coordinate system. The third phase describes the edge orientation mixtures as well as texture information. Hence, the QWT is coined as shift-invariant. The QWT also owns many efficient and interesting theoretical properties, one among them is the quaternion phase representation properties and symmetrical properties. Further the quaternion wavelet transform can be computed using two dimensional (2D) tree filter bank which uses the linear computational complexity. It is one of the best method for fusing images and to provide an efficient output.

### C. Security

The security standards are applied in order to provide reliability during image fusion. The encryption and decryption standards are used in initial phase. After image fusion both the keys are being checked and further processing are done. The algorithm used for security parameters is RSA algorithm. RSA (Rivest–Shamir–Adleman) is one of the best public key cryptosystem used for encryption and decryption. This feature is done in order to provide an additional security during tumor detection and to avoid fraudulent cases.

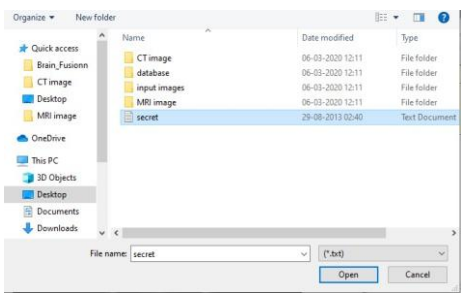


**Fig 1. Encryption File**

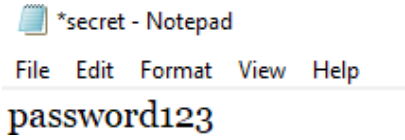


**Fig 2. Secret Key**

### D. Pre-Processing

Pre-processing the data is an essential step to improve the data efficiency. Pre-processing technique is used to remove unwanted noise in the data. It includes various techniques like cleaning that is removing noise transformation and reduction. The uncleaned data can cause errors in output hence pre- processing need to be done to avoid errors. The median filter is used to denoise and to extract the noise from noisy images One such example is CT and MRI image This is a non- linear filtering method which effectively reduces unwanted distortions or noise while preserving the original boundary edges. This filter operates on one and one process. A single entry is loaded by moving one image after another image, also by replacing the median position of the window entry. If the entries are of odd number, it is simple to calculate the median. The median filter is used to predict the efficient result when image smoothing is done.

### E. Segmentation

Image segmentation involves partitioning a digital image into multiple segments. These segments are also called as set of pixels or image objects. The goal of segmentation is to simplify the image and to change the representation of that image. These changes gives the output image which is more meaningful and easy to analyze. They are also used to locate objects and boundaries such as lines, curves etc in images. Segmentation is applied here in order to view clear picture of brain areas so as to detect the tumors if it is present inside portion of the brain.

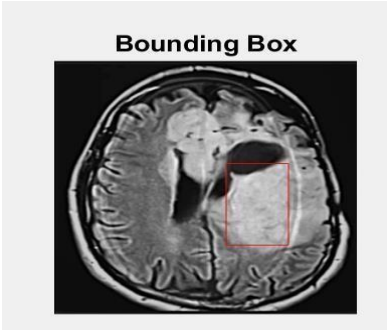


**Fig 3. Segmentation**

### F. Classification

Classification system mainly consists of database. This database contains predefined patterns. These patterns are used to compare the result obtained with the database and to classify them. This classification is done using machine learning approach. It involves supervised learning in which the dataset are trained and the output is obtained. Once the classification is done we can classify whether the tumor present is benign or malignant.

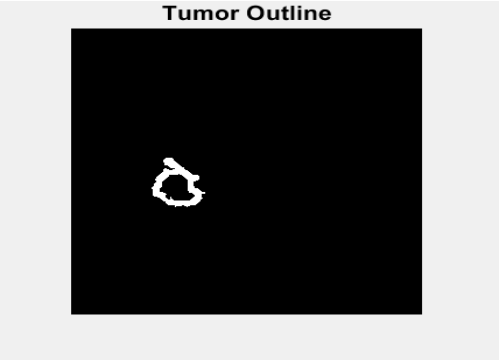


**Fig 4. Tumor outline**

## IV. PROPOSED SYSTEM

The proposed system discusses mainly about security parameters used in image fusion process. At first the two input images namely CT images and MRI images are taken. After fusing the images the encryption and decryption technique is applied. If same key is applied the image will be retrieved. This step is implemented in order to provide additional security to the system. After retrieving the images pre- processing techniques is applied. Then the Brain tumor segmentation is done using machine learning approach to make the system detect the tumor cells automatically using image processing techniques. Finally the neural network classifies the tumor whether it is in normal or in an abnormal condition comparing with the database.

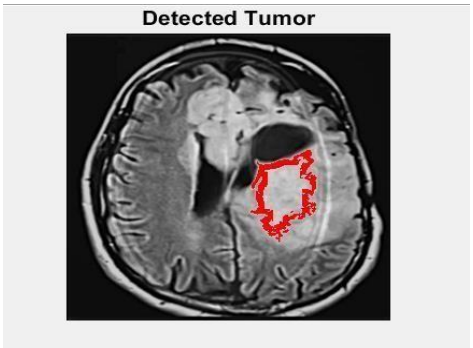


**Fig 5. Detected Tumor**

## V. RESULT

The present work involves fusion of Computed Tomography (CT) and Magnetic Resonance Imaging (MRI) images helps in providing an enhanced understanding about the anatomical functioning and physiological functioning of the brain and to detect tumor cells. The security measures are taken to provide reliability to the system. The process of image fusion involves usage of quaternion wavelet transform. After the fusion of images, the encryption and decryption techniques are applied. Here the security standards are implemented using RSA algorithm. This algorithm works well for both encryption as well as decryption Then brain tumor segmentation is done using machine learning approach to make the system detect the tumor cells automatically using image processing techniques. Finally neural network efficiently classifies the tumor comparing with the database.

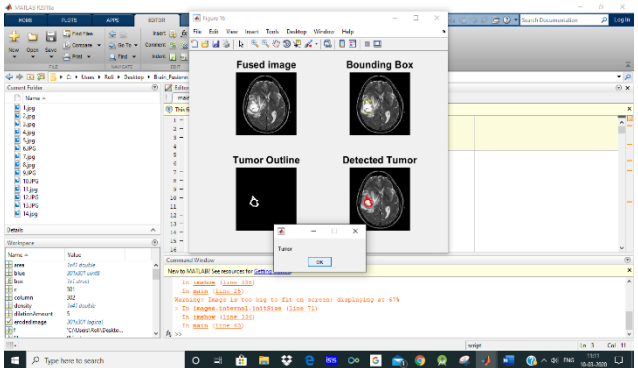


**Fig 6. Tumor message**

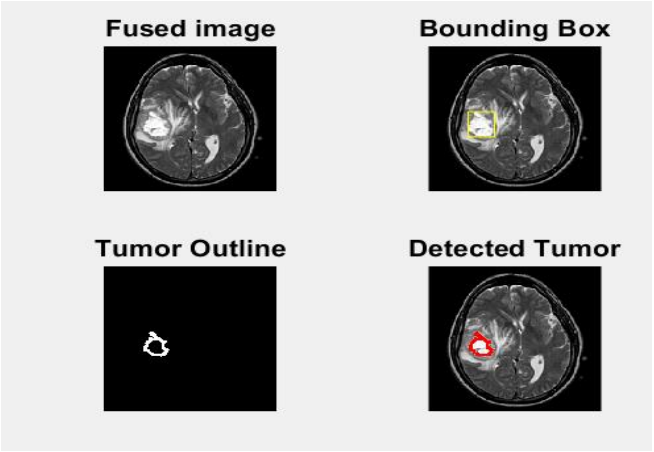


**Fig 7. Final Output**

## VI. CONCLUSION

In this work, we propose an enhanced method of image fusion for supervised learning in medical and security parameters are implemented. The fusion schemes are based on quaternion wavelet transform. The QWT provides an abundant magnitude signals and phase information, which provides translation invariance as well as limited redundancy. We showed difference from the traditional fusion methods using an additional feature of adding security parameters. Also we did the qualitative depth analysis of the tumor cells using machine learning approach. In the future work, further investigation can be done in enhancing the security standards. These features provides reliability and robustness.

## REFERENCES

1. "A Glioma Segmentation Method Using CoTraining and Superpixel-Based Spatial and Clinical Constraints" by Flanging Sheen, Cunning Hong, Teaming Zhan, Junkie Chen, Xihu Wang, Guowei Yang, Zhenyu Lu,in ,IEEE transaction, vol 6, pp. 57113-57122.

2. A. Soma Sekhar, Dr.M.N.Giri Prasad, "A Novel Approach of Image Fusion on MR and CT Images Using Wavelet Transforms" IEEE 2011

3. Sruthy S, Dr. Latha Parameswaran Ajeesh P Sasi, "Image Fusion Technique using DT-CWT" IEEE 978-1-4673-5090- 7/13/2013.
4. Y. Liu, J. Jin, Q. Wang, and Y. Shen,''Phases measure of image sharpness based on quaternion wavelet,'' Pattern Recogn. Lett., vol. 34, no. 9, pp. 1063– 1070, 2013.
5. S. Li, X. Kang, and J. Hu, ''Image fusion with guided filtering,'' IEEE Trans. Image Process., vol. 22, no. 7, pp. 2864– 2875, Jul. 2013.
6. G. Carneiro, J. Nascimento, and A. P. Bradley, "Unregistered Multiview Mammogram Analysis with Pre-trained Deep Learning Models," in Medical Image Computing and Computer-Assisted Intervention – MICCAI 2015, Cham, 2015, pp. 652-660.

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