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BRAIN TUMOUR REGION DETECTION USING IMAGE PROCESSING

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Abstract - *Brain is the controlling unit of human body. It regulates the functions such as memory, vision, hearing, knowledge, personality, problem solving etc. The main reason for brain tumors is the uncontrolled development of brain cells. The main goal of medical image processing is to spot accurate and meaningful information using images with the minimum error possible. The proposed method describes the strategy to detect and extract brain tumor from patient's MRI scan images .First it takes required details of person and then MRI brain image is used for tumor detection process. It includes pre-processing, segmentation, morphological operation, watershed segmentation and calculation of the tumor area and determination of the tumor location. This process helps in identifying the size, shape and position of the tumor. It helps medical staff as well as patient to understand the seriousness of tumor with the help of area detection*

Key Words: Brain tumour, Magnetic Resonance Imaging, Pre-processing, Segmentation, Threshold Image, Morphological Image

1. INTRODUCTION

Brain regulates all the functions of human body including memory, vision, hearing, knowledge, personality, problem solving etc. But the genuine functioning of the brain is severely disturbed by a tumor inside the brain. Severe headache, nausea, dizziness are most common symptoms of brain tumors, but these symptoms differ among various individuals depending on the location of the tumor within the central system nervosum . Classifies brain tumours by cell origin and the way the cells behave, from the smallest amount aggressive (benign) to the foremost aggressive (malignant). There are three common types of tumor:

a) **Benign Tumour:**-A benign (non-cancerous) brain tumour is a mass of cells that grows slowly in the brain. It usually stays in one place and does not spread. The symptoms of a benign brain tumour depend on how big it is and where it is in the brain. Some slow-growing tumours might not cause any symptoms initially. Common symptoms include severe, persistent headaches, seizures (fits), persistent nausea, vomiting and drowsiness.

b) **Pre-Malignant Tumour:** - A precancerous condition or premalignant condition, sometimes called a potentially precancerous condition or potentially premalignant condition, may be a state of disordered morphology of cells that's associated with an increased risk of cancer. If left untreated, these conditions may lead to cancer.

c) **Malignant Tumou r**: - Malignant tumours are cancerous tumors, they tend to become progressively worse, and can potentially result in death. Unlike benign tumors, malignant ones grow fast, they're ambitious, they hunt down new territory, and that they spread (metastasize). The abnormal cells that form a malignant neoplasm multiply at a faster rate.

Magnetic resonance imaging (MRI) provides detailed information about brain tumor anatomy, cellular structure and vascular supply, making it an important tool for the effective diagnosis, treatment and monitoring of the disease. Magnetic resonance imaging (MRI) may be a non-invasive medical test that helps physicians diagnose and treat medical conditions. MRI uses a robust magnetic flux, frequency pulses and a computer to provide detailed pictures of organs, soft tissues, bone and virtually all other internal body structures. The images can then be examined on a PC monitor, transmitted electronically, printed or copied to a CD. MRI does not use ionizing radiation (x-ray). Detailed MR images allow physicians to gauge various parts of the body and determine the presence of certain diseases.

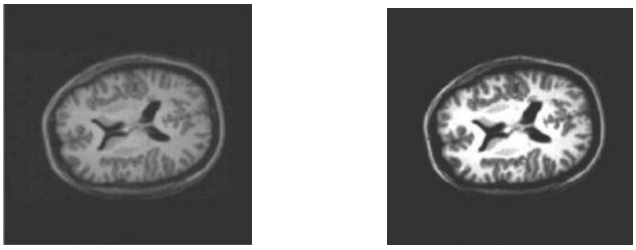
Brain tumor detection is a difficult task and the situation becomes more difficult when using manual processes. Manual processes need the expertise of experienced oncologists and the shortage of these oncologists create complex situations that disrupt patients with brain tumors from getting successful treatments. These manual methods consume a lot of time and the final results may not be reliable. To overcome this issue, automated approaches to detect brain tumors at early stages have been implemented by various groups of researchers all around the world. When detected in an early stage, brain tumors can be

successfully treated [3]. This intensifies the need of developing methods to automatically detect brain tumors in a shorter period. It is also needed to raise the awareness among communities about these tumor detection approaches in order to tempt them for early treatments

2. Methodology

2.1 Image Preprocessing

Image preprocessing aims to improve the image data by suppressing the undesired distortions and enhances some of the image features that will be helpful in further processing. The goal of Pre-processing is to get rid of the noise and to supply Contrast Enhancement to improve the image quality.



Original image Enhanced image

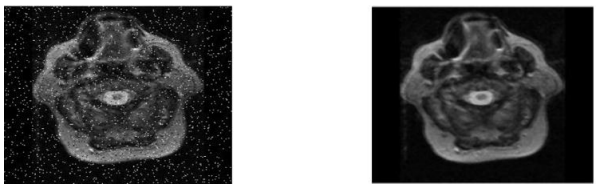
Figure 1. Image Enhancement

i. Grayscale Imaging

Grayscale may be a range of reminder gray without apparent Color. The darkest possible shade is black, which is that the entire absence of transmitted or reflected light. The lightest possible shade is white, the entire transmission or reflection of sunshine in the least visible wavelengths. So due to the above reasons first we convert our MRI image to be pre-processed in grayscale image.

ii. Median Filter

This the foremost common technique which used for noise elimination. It is a 'non-linear' filtering technique. This is wont to eliminate 'Salt and Pepper noise' form the greyscale image. Median filter is predicated on the average value of pixels. The advantages of median filter are efficient in reducing Salt and Pepper noise and Speckle noise. Also, the edges and boundaries are preserved. The main disadvantages are complexity and time consumption as compared to mean filter.



Salt and pepper noise Median Filter

Figure 2. Applying Median filter

2.2 Segmentation output

Segmentation may be a difficult step in medical imaging because the pictures are too complex. In segmenting process, the image is split into several partitions consistent with their color, intensity etc. [4, 10]. This helps to watch and analyze the small print of the pictures and supply accurate results [2]. There are several segmentation methods

A. Threshold Image

Threshold segmentation is one of the simplest segmentation methods. The method is based on threshold value which will convert the grayscale image is one of the simplest segmentation methods. The method is based on threshold value which will convert the grayscale image into binary format. In the threshold segmentation, there are several methods where we use local methods which adapt the edge value on each pixel to the local image characteristics for segmentation. Some methods used under this segmentation include maximum entropy method and k-means clustering method for segmentation

B. Morphological Operation

After thresholding the morphological operation is applied on the converted binary image. The purpose of morphological operation is to separate the tumor part of image. This operation is the collection of nonlinear operation related to the shape or morphology of features in an image. Morphological operation on a binary image creates a new binary image in which the pixel has non-zero value only if the test is successful at that location in the input image. Only the tumor portion of image is visible. This portion has the very best intensity than other regions of the image.

3. DISCUSSION

Irregularities in the brain that prevent ideal functioning of the brain are identified as brain tumors. A person at any age can be diagnosed by brain tumor and the danger is that the impact of tumor on different individual may differ. Although the tumor is in primary stage or secondary stage, it is hard to detect tumors manually because it consumes lot of time and the results are less reliable and less accurate. This fact intensifies the need of developing automated algorithms and approaches to detect brain tumors in a shorter period of time with a high reliability.

Below is a table with comparisons of different types of brain tumor detection approaches executed by various researchers

Ref	Advantages	Drawbacks	Future Expansion
[1]	Morphological operations remove noise and make the images clearer and more accurate. Histograms can be drawn according to the results to display frequencies. It helps to compare results on different occasions and to make decisions. Intensities are used in Thresholding to indicate information.	Images are not in the exact size; hence the images have to be re-sized which may result in inaccuracy. Calculation of the area of tumour depends on the accuracy of pixel information obtained from Gray scale imaging	Develop the algorithm to identify the type of the tumour and use color images in the process.
[2]	Automated brain tumour detection algorithm is developed. Indicates the tumour affected area as a portion.	Conversion of RGB to Grey may create inaccurate results.	Use density-based clustering to detect the tumour effectively
[3]	The system can be developed to calculate the area of the tumour and its size using enhanced algorithms.	Pre-processing is essential for noise removal.	Develop algorithm to detect area and thickness of the tumour. Use feature extraction to get accurate results.
[10]	According to data, technologies can be selected. Faster results	Discovering the best hyper plane is difficult at the stage SVM	Evaluate tumour size, type and location using a 3D image.

4. CONCLUSION

This project, various techniques that are being used to detect the brain Tumour from MRI images of brain are evaluated. The proposed technique has the capability to produce effective results even in case of high density of the noise. The proposed project will detect the presence of brain Tumour with increased accuracy

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