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Review Of Brain Tumor Detection Using MRI Images

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Abstract: ***Brain tumor is introduced as life-threatening diseases and hence its need to detect this diseasesfast and accurate. This can be worked out by the execution of automated tumor detection techniques on medical images. MRI is the most advisable one since it does not use ionizing radiation and it also provides greater contrast between different soft tissues of the human body. Brain tumors can be detected manually by experts from the MRI images. Pre-processing is necessary to enhance the input MRI image. Many automated techniques which use image segmentation. There are two images segmentation methods. First is cellular automata edge detection, and the second is Modified texture based region growing. Cellular automata provide clear and exact edge detection, combination of both enhances the tumor detection done by the individual methods such as cellular automata edge detection and modified texture based region growing and. Region growing is the segmentation based on similarity criterion and edge detection is the segmentation based on discontinuity. Modified texture based region growing performs region growing by taking both the intensity and texture constrain into account. Considering the advantages of both the techniques, we can determine the exact size and location of tumor.***

Keywords : MRI of Brain Scans, Segmentation, Brain Tumor

I. INTRODUCTION

Image Processing is a method to translate an image into digital form and perform some operation on it, in order to get an improve images or to extract some useful information from it. Digital format images used in the today‟s world. Medical Imaging is the techniques, methods, process & art of creating visual representation of the interior of the body for the medical observations such as clinical analysis and medical intervention. Examination of the internal structure of the various parts of the human body which helps doctors to visible the inner portion of the body are performed by CT scan in MRI. CT scanner, MRI took over conventional X-ray imaging, ultrasound by permitting the doctors to see the body‟s third dimension. As per the International Agency for Research on Cancer (IARC) more people diagnosed for brain tumors. Greater than 126000 people are diagnosed per year around the world, with more than 97000 mortality rate. The main concept is that local textures in the images can cause the typical regularities of the biological structures. Thus, the textural features have been using a co-occurrence matrix approach. Among three possible types of image areas in which the level of recognition is done and they are as tumor, background, non-tumor. We are interested in tumor image segmentation. [1]

A. Brain

Normally, human brain includes three major parts controls unlike activity. [2]

Cerebrum: The cerebrum controls the different activities such as learning, thinking, emotions, speech, problem solving, reading and writing. Cerebrum divided into right and left cerebral hemispheres.

Cerebellum: The cerebellum controls various movements, standing, balance and complex actions.

Brain Stem: The spinal cord jointed with the brain by the brain stem. Brain stem also perform the control action, it controls blood pressure, body temperature and controls some vital functions.

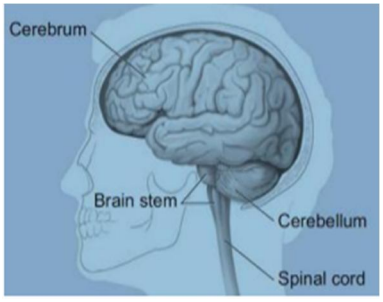

Fig.1: structure of brain

B. Magnetic Resonance Imaging (MRI)

A magnetic resonance imaging (MRI) scanner uses great magnets to polarize and stimulate hydrogen nuclei (single proton) in human being tissues, which produces a signal that can be detected and it is predetermined spatially, ensuing in images of the body. Due to MRI technique, brain activity related to the blood can change due to the MRI techniques. MRI has also well-known valuable in the surgical cure of brain by allowing regions with critical brain functions to be located. The surgeon can keep away from damaging this region while removing as greatly diseases or dysfunctional tissue as achievable[3].

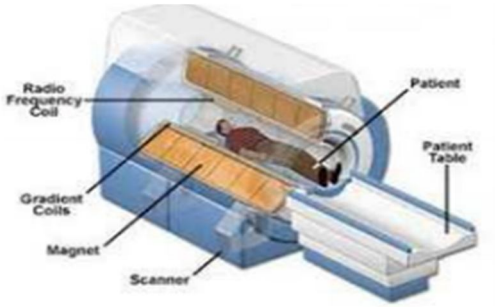

Fig.2: MRI scanner

1) Challenges: Main function of central nervous system is performed by frontal part of the brain. Brain tumor is an intracranial solid neoplasm. Tumors are formed by uncontrolled cell division and an abnormality in the brain. In this work, we have used a brain image (2D) axial view from MRI scan because MRI scan is not as much of harmful than CT brain scan. Different diagnostic methods for a patient is subjected to find out the symptoms mentioned by him. A patient is subjected to various diagnostic methods to determine the cause of the symptoms mentioned by him. [4]

II. CURRENT STATE OF THE ART (LITERATURE SURVEY)

Charutha S. et al, presented that Integrating cellular automata edge detection and modified texture based region growing which combines modified texture based region growing and cellular automata edge detection[5]. Texture based region growing detected small sized tumor and cellular automata edge detection detected large sized tumor also modified in paper [5]. Integration of these both techniques provides more efficient brain tumor detection. S. u. aswathy et al [6] representative survey of various classification techniques for MRI brain image, A comparative study is made various methods which can detect the tumor efficiently. M. Rakesh et al represented that image segmentation and detection by using Fuzzy c-means (FCM) algorithm [7]. For image segmentation and detection of the tumor objects that are found in the MR brain image, FUZZY C-MEANS algorithm is used. Fuzzy C-means algorithm is used for clustering irregular MR brain images from four tumor classes, namely metastate, glioma, meningioma, and astrocytom [7].MukeshKumar et al represented that region growing segmentation method for segmentation of brain tumor in MRI; in which it is possible to determine abnormality is present in the image or not [8]. Anam Mustaqeem et al [9] represented that Segmentation is main technique used. Out of different segmentation techniques, threshold segmentation, watershed segmentation and morphological operators used. The proposed segmentation method was experimented with MRI scanned images of human brains, thus locating a tumor in the images [9]. Anam Mustaqeem et al [10] shown that different techniques of segmentation which is mainly based on watershed segmentation, threshold segmentation and morphological operators. They show their proposed segmentation which was experimented to show the human location of tumor in the MRI scanned images of human brains. R. FanyJesintha Darathi [11] represented as out of different segmentation technique, seed based segmentation used and with this segmented image for detecting the tumor section and after that highlighting the region with help of level set method pre-processing. Warsito P. Taruno et al[12] proposed that ECVT is able to detect brain tumors through an examine the brain function abnormalities, as the tumors block the show of neuro-signals and cause abnormalities in the brain activity image. The ECVT sensor design has been optimized for the recognition of the brain tumors in dissimilar compassion regions of the brain. Pabitra Roy et al represented in [13] as standard deviation is computed from the filtered image using this standard deviation an intensity map is performed The proposed algorithm is used to detect the location or position the abnormal regions, the centroid of the abnormal regions, and border of the abnormal regions and the perimeter of the detected abnormal regions. Siva Sankari. S [14] represented as optimal features of brain tumor extracted by utilizing GLCM, the Gabor feature extraction algorithm is used to help of k-means Clustering Segmentation. In this segmentation technique [1] [14], k-means clustering method which gives more perfect consequence with the help of the balance of a segmented brain tumor image. Using the K-means algorithm, it has a lead of less computing time. As

compared to the two clustering methods such as partitioned clustering and hierarchical clustering, we get hierarchical clustering is less than a partitioned cluster. Prof. M. N. Thakare et al in [15] find out the size of the tumor, Firstly quality of scanned image is enhanced and then morphological operators is applied to identify the tumor in the scanned image. Later than that edge detection operator is applied for boundary extraction and to find the size of the tumor. For brain tumor boundary extraction various edge detection operators are used which are as prewitt edge detection, Robert edge detection operator, canny edge detection operator. Dr.Monisha Chakraborty et al[16] different processes,out of which, firstly pre-process the two-dimensional magnetic resonance images of brain and later detect the tumor using edge detection technique and colour based segmentation algorithm. Edge-based segmentation implemented using operators e.g. Sobel, Canny, Prewitt and Laplacian of Gaussian operators. The color-based segmentation method has been proficient using K-means clustering algorithm. From the pre-processed image with color-based segmentation carefully selects the image as a clustering feature and brain tumor is detected by means of color-based segmentation with K-means clustering. Garima Tiwari et al[17] represented that there are two parts first to remove the noise with enhance the medical images by way of compression and second part is the use of morphological operators to find region of interest, exclusive of the smaller and larger areas for obtained region by Harris corner discovery and cellular automata conception. Corner detection is used to know the shape as well as certain features of the image and Pseudo-code of the cellular automata algorithm is used for edge detection. Ganesh Madhikar et al[18] represented in paper Comparative analyses is discussed planned for the normal and the modified region growing using both the Radial Basis Function (RBF) neural network and Feed Forward Neural Network (FFNN). The performance of propose technique is evaluated by considering the region growing algorithm and the modified region growing algorithm in terms of the quality rate. Manoj Diwakar et al[19] represented as there are various classical methods for edge detection but the algorithm used in this paper is edge detection using 2D Cellular Automata concept was worn because the detection of edges depends on district pixels. The Cellular Automata rule number 252 provides well-built edge detection. The algorithm was useful on numerous images and the results obtained are efficient. Deepak Ranjan Nayak et al [20] represented new method for edge detection.Detection of binary images based on two dimensional twenty five neighbourhood cellular automata.

III. METHODS OF TUMOUR SEGMENTATION

There are various methods used for image segmentation. Some of them are thresholding, region growing, classifier, clustering, atlas-guided approaches ,artificial neural networks, level set methods, deformable models.

A. Threshold

One of the most oldest method is Image segmentation. The segmentation is through by grouping all pixels with intensity between two such thresholds into one class. On the identification of a good threshold, this method relies and failing of such threshold may direct to unfortunate segmentation. A process to determinate more than one threshold value is called multithresholding [21]. For initial step for sequence of image processing operations [22] thresholding is used. In digital mammography it has been used in which two module of tissue are present; one is healthy and other is tumorous [23]-[24].

B. Region Growing

Region growing method is a well developed technique in image segmentation.Image region extracted from based on some predefined criteria and which mainly based on edges in the image or intensity information. There is need to select the seed point and extracts all pixels that are connected to the initial seed based on some predefined criteria. An algorithm called as split and merge algorithm. This algorithm is related to region growing algorithm but it does not require seed point. Region growing can also be susceptible to noise, causing extracted regions to have holes or even become detached. Homotopic region-growing algorithm used to remove this problem.

C. Classifier

Classifier methods is also known as supervised methods. This method is pattern recognition techniques that separation a characteristic space derived from the image by using data with known labels. A trouble-free classifier is the nearest-neighbor classifier, in which each pixel is classified in the similar class as the training datum with the closest intensity.The k-nearest-neighbor classifier is a simplification of this approach. The k-nearest-neighbor classifier is well thought-out a nonparametric classifier for the reason that it makes no underlying hypothesis about the statistical structure.

D. Clustering

Clustering is one of the technique of unsupervised methods which can be distinct as the process of organizing objects into groups

whose members are similar in several way. Fuzzy c-mean algorithm, expectation-maximization algorithm[25]and k means algorithm are the most commonly used algorithm in clustering. GM,WM and CSF are the three types of classes. Soft segmentation based on fuzzy set theory which allows by k means algorithm of FCM algorithm.Expectation Maximization(EM) algorithm[25] applies the same clustering principles with that the data pursue a Gaussian mixture model.

IV. PROPOSED METHODOLOGY

A. Image Acquisition

Publicly available MRI Images are generally used for the brain tumor identification. Images are used as .jpg format. To detect and visualize finer particulars in the inside structure of the body ,MRI used. With this technique is generally used to find out the differences in the tissues which have a far better technique as compared to computed tomography. So this makes this method a very unique one for the brain tumor detection and cancer imaging Images are stored in MATLAB.

B. Pre-processing

In the pre-processing technique image is enhanced in such a way that finer details are enhanced and noise is apart from the image. Most commonly used improvement and noise reduction techniques are implemented that can give best probable results.

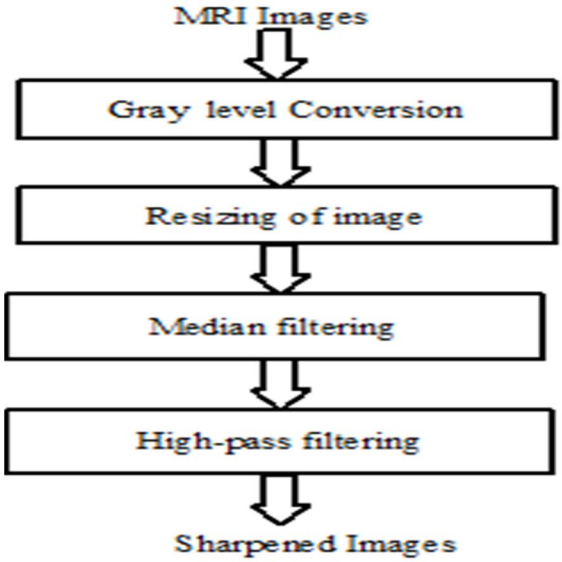

Fig.3: Steps in pre-processing

More prominent edges are obtained in enhancement. Reduction of noise and sharpened images is obtained by reducing the blurring effect from the image. Image segmentation will enhances the segmentation techniques. This enhanced and superior image will assist in detecting edges and recovering the quality of the in general image. Edge detection will guide to finding the exact location of tumor.

Following steps will be followed in the pre-processing stage:

1) Gray-Level Conversion: The image which is read in .jpg format is first converted from RGB model to gray-level image,size of gray scale image as 256*256[26]-[27] which display the image. The range of gray scale image from 0 to 255, where 0 shows entire black color and 255 shows pure white color. Entries between 0-255 range[26]-[27]vary in intensity from black to white.

2) Resizing Of Image: The gray-level image is then resized[28] to a suitable size of 200×200 for providing uniformity.

3) Median Filtering: Function of the filter is to remove the noise from the image. Linear filters can also serve the purpose like Gaussian[29], averaging filters[30]-[31]. Here Median filter[31] is used to remove the noise like salt and pepper and weighted average filter is the distinction of this filter and can be implemented straightforwardly and give good results. In the median filter[32] assessment of pixel is strong-minded by the median of the neighboring pixels.

4) High Pass Filtering: The median filtered image is high pass filtered and then made enhanced by adding the resultant image with the resized image. Sharpening of the image can be achieved by using different high pass filters[33][34]. As now noise is been removed by using dissimilar low pass filters, we require to sharpens the image as we need the sharp edges since this will assist us to detect the boundary of the tumor. Here Gaussian high pass filter is used to improve the boundaries of the objects into the image. Gaussian filter[29] [34]gives very far above the ground rated results and used extremely extensively to enhance the finer particulars of the objects**.**

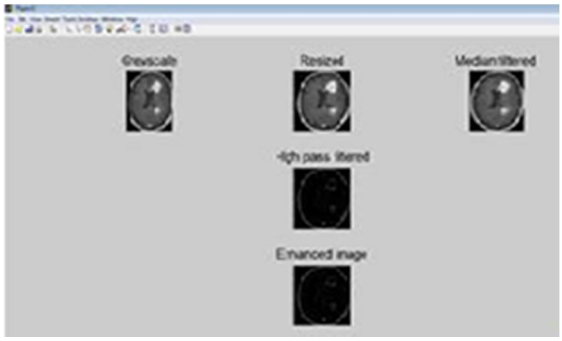

Fig.4: Steps involved in pre-processing

V. CONCLUSION

Brain tumor is one of the mainly life-threatening diseases and hence its detection should be fast and accurate. MRI images are very important for detecting the existence and outlines of tumors. Pre-processing is necessary to enhance the input MRI image. The work of physician makes easier by enhancement of images which gives quick judgment of images. For detecting the survival and outlines of tumors from the brain tissue in the magnetic resonance imaging(MRI)is very important, therefore combination of both modified texture based region growing and cellular automata edge detection is used for detection of brain tumor. cellular automata provide clear and exact edge detection.

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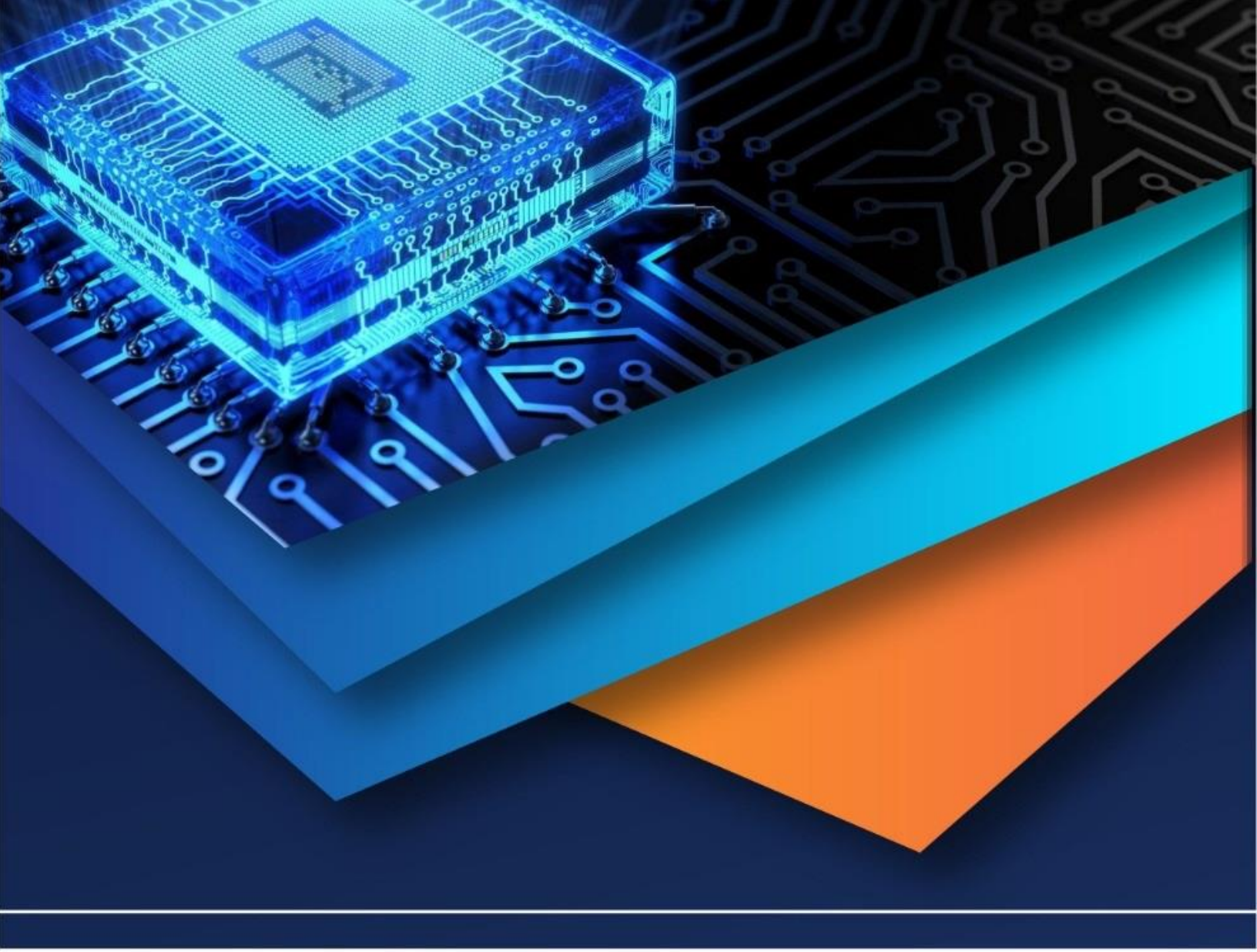

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