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Brain Tumor Detection using Image Segmentation

Kavya P O[1], Rashmi T.S[2], Sonu R.S[3], Sapna R[4] and Sayada Aasreen Kouser[5]
[1]Assistant Professor, Department of CSE, ATME College of Engineering, Mysore.
[2-5]Department of CSE, ATME College of Engineering, Mysore.

***Abstract*—The brain is the most important organ in the human body, responsible for controlling and regulating all critical life functions for the body and a tumor is a mass of tissue formed by the accumulation of abnormal cells, which keep on growing. A brain tumor is a tumor which is either formed in the brain or has migrated, No primary cause has been identified for the formation of tumors in the brain till date. Though tumors in the brain are not very common (Worldwide brain tumors make up only 1.8% of total reported tumors), the mortality rate of malignant brain tumors is very high due to the fact that the tumor formation is in the most critical organ of the body. Hence, it is of utmost importance to accurately detect brain tumors at early stages to lower the mortality rate.**

***Index Terms*— Magnetic Resonance Imaging (MRI), Brain Tumor, Image Segmentation, CNN, Pre - processing ,Classification.**

I. INTRODUCTION

Brain tumor detection from MRI is one of the most challenging tasks in medical imaging technique. It considers being very powerful diagnostic methods to detect any abnormalities in the brain compared to other medical imaging techniques such as computed tomography (CT), X-ray. Processing of MRI images getting more attention and coming closer to clinical acceptance in this part of field as it provides non- invasive (MR) images with high resolution and excellent contrast between the different soft tissues of the body. Several problems like noise, partial volume effect due to overlapping tissues exist in the brain MRI images, needs to be addressed before, for accurate segmentation which is extremely important and essential for the exact diagnosis by computer aided clinical tools. The aim of removing the irrelevant noises and unwanted parts from the background of the MRI images is to improve the image quality. Different type of methods has been developed for segmentation of brain tumor efficiently. The main goal of segmentation process is to extract the different tumor tissues such as active, tumor, necrosis and edema from the normal brain tissue such as white matter (WM), gray matter (GM), cerebro spinal fluid (CSF) [1].

Brain tumors can be cancerous (malignant) or non-cancerous (benign). When benign or malignant tumors grow, they can cause the pressure inside skull to increase. This can cause brain damage and it can be life-threatening. Therefore early detection of brain tumor is necessity for starting the treatment and saving life.

The proposed method tries to combine region and edge information, thus taking advantage of both approaches while cancelling their drawbacks. We first segment the brain to remove non- brain data. However, in brain pathological cases, standard segmentation methods fail, in particular when the tumor is located very close to the surface. Therefore we propose an improved segmentation method, relying on the approximate symmetry plane.

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II. REVIEW WORKS

Image segmentation represents a method of separating a portion of image into separate areas. A great assortment of dissimilar segmentation approaches for images have been developed. The segmentation of an image entails the division or separation of the image into regions of similar attribute. The ultimate aim in a large number of image processing applications is to extract important features from the image data, from which a description, interpretation, or understanding of the scene can be provided by the machine. Among them, the clustering technique have been comprehensively explore and used by T.Logeswari and M.Karnan [2], a clustering support come closer by using a self- organizing map (SOM) algorithm is projected for medical image segmentation. This paper illustrate segmentation scheme consists of two stages. In the opening stages, the MRI brain image is obtained from patient database. In that film artefact and noise are disconnected. In the subsequent stages (MR) image segmentation is precisely recognize themajor tissue arrangement in these image areas. R. Rajeswari et al. [3] proposed a spectral leakage with the effect of the frequency analysis of finite-length signals or finite-length segments of infinite signals. In brain, the tumor itself comprising a necrotic (dead) part and an active part, the edema or swelling in the nearby brain, as all tumor do not have a clear boundary between active and necrotic parts, there is need to define a clear boundary between edema and brain tissues. Hassan Khotanlou et al. [4] recommend a common automatic scheme for segmenting brain tumors in3D MRI. Our scheme is valid in dissimilar types of tumorswith MRI images. Its effect represent the initialization of a segmentation technique based on a mixture of a deformable model and spatial associations, principal to a particular segmentation of the tumors. P.Narendran, V.K. NarendiraKumar, K. Somasundaram [5] proposed a new method for segmentation of pathological brain structures. This method combines prior information of structures and image information (region and edge) for segmentation. The automated brain tumor segmentation method that we have developed consists of two main components: pre-processing and segmentation. The inputs of this system are twodifferent modalities of MR images: CE-T1w and FLAIR that we believe are sufficient for brain tumor segmentation [6]. The Graph Cut [7] method attempts to solve the min cut/max flow problem. Snakes and Level Sets are active contour methods that evolve a curve based upon geometric and image constraints. For the problem of brain tumor segmentation, Lefohn et al. [8] implemented a level set solver on the GPU. Quantitative results of this level set formulation has been compared well with hand contouringresults. Kaus et al. [9] used an atlas and statistical information to segment brain tumors. Edward Kim et al. [10] utilized the statistical seed distributions to overcome the local bias seen in the traditional cellular automata framework. Our results show improved accuracy, robustness, and competitive usability. Further, with a GPU implementation, the method produces results at interactive rates.

III. PROPOSED METHOD AND RESULTS

The purpose of this study is to automatic detection, segmentation and then extraction of the brain tumor region on the MR images which overcome the process of time taking manual segmentation pf large data sets.Various methods are used for image segmentation like thresholding, region growing, clustering, classifier, artificial neural network, deformable models, atlas-guided approaches and level set methods.

In pre-processing some basic image enhancement and noise reduction techniques are implemented. Apart from that different ways to detect edges and doing segmentations have also been used. The purpose of these steps is basically to improve the image and the image quality to get more surety and ease in detecting the tumor. The basic steps in pre- processing are the following:

In first step image is converted into gray scale. Noise is removed if exist. The obtained image is then passed through a high pass filter to detect edges. Then the obtained image is added to original image to enhance it. Segmentation has been done on basis of a threshold, due to which whole image is converted into binary image.

IV. ALGORITHM

Input : MRI Gray Scale Image. Output : Isolation of Tumor.

Step 1: Convert MRI scan image into grayscaleimage.

Step 2: Next the image passed through a high pass filter forremoving noise and other spike fromthe image.

Step 3: Now median filter is used to get the enhance image.

Step 4: Convert the enhanced image (image of step3) in tobinary image with a threshold value.

Step 5: Separate the tumor from segmentedimage by Watershed – Method.

Step 6: Select only that part of the imagefrom step 4 which has the tumor with the part of the image having more intensity and more area.

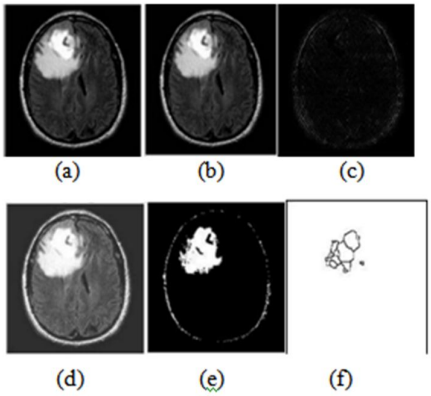

Fig 1: (a) Original Input Image, (b) Grayscale

Image, (c) High Pass Filter Image, (d) Enhanced Image, (e) Thresh- hold Segmentation, (f) Watershade Segmentation.

V. SNAPSHOTS

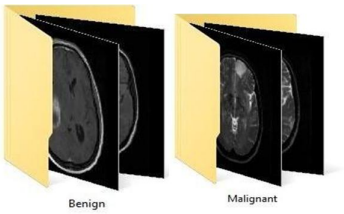

Fig 1. Segregated Dataset

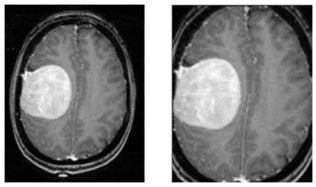

Fig 2. Pre – Processing

Fig 3. Classification

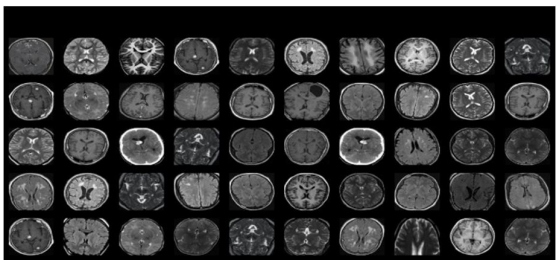

Fig 4. Brain Tumor – No

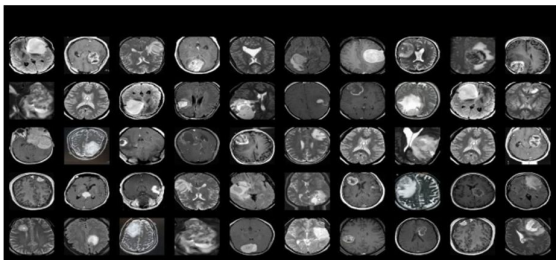

Fig 5. Brain Tumor – Yes

VI. CONCLUSIONS

Abnormal growth of tissue in the brain which affect the normal functioning of the brain is considered a brain tumor. The main goal of medical image processing is to identify accurate and meaningful information using algorithms with minimum error possible. Brain tumor detection and classification through MRI images can be categorized into four different sections: pre-processing, image segmentation, feature extraction and image classification. It can be concluded that the algorithms and the parameters used in the proposed system are all meant to increase the efficiency of the system by achieving better results. The quantitative analysis of MRI brain tumor allows obtaining useful key indicators of disease progression. This paper explores a method to identify tumor in brain disorder diagnosis in MR images.

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