A SURVEY ON BRAIN TUMOR IDENTIFICATION THROUGH MEDICAL IMAGES

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Abstract: This paper presents a survey on the detection of brain tumor. Brain Tumor can be described as a cluster of abnormal cells which grows inside the brain by uncontrolled growth in tissues of the brain which needs to be treated, If left untreated it can grow beyond to other parts of brain too. It is very difficult and challenging to detect the brain tumor in initial phase as there are very few or no symptoms in the early stage. Detecting the brain tumor in early stage can provide more treatment options. There are various methods which can be used to detect the tumor such as Segmentation, Thresholding, Fuzzy clustering or Artificial neural network.

Keywords: Brain Tumor, Magnetic Resonance Imaging (MRI), Image Segmentation, Thresholding, ANNs, FCM.

1. INTRODUCTION

Brain Tumor is a disease of abnormal cells growing and multiplying in an undisciplined manner. It has become one of the most common and major causes for the increase in Mortality among children and adults in the world. Brain tumor cells grow inside and along the brain. Brain is portion of central nervous system which is located into the skull. It is soft spongy mass of tissue that is protected by bones of skull and three slim membranes called meninges.

Brain tumor is cluster of abnormal cells which indirectly destroys healthy cells of brain and causes inflammation, brain swelling and pressure within the skull. Brain tumors can be divided into main two types one is benign and second one is malign. Brain tumor can be found in different sizes and shapes which differ case by case. But the effects of both the types of tumor are mostly same and can cause similar problems depending on their kind. Benign Tumor is a non cancerous type of tumor which does not grow in nearby tissues or spread to other parts [1].

Malignant tumors are cancerous tumor and are dangerous since they spread to distinct parts of body. Tumors in critical area of brain can cause weakness, stiff muscles or problem with sensation, facial or eye movement such as Double vision is a common early symptom of brain stem tumors. The grade of tumor refers to way the cells look under a microscope.

➢ Grade 1- Benign tissues, these tissues looks like normal tissues slowly give rise to these cells.
➢ Grade 2- The cells are malignant these tissues looks like normal tissues alike grade-1 tissues.
➢ Grade 3- They are the malignant tissues which are different from normal cells. As they are abnormal cells so are fast growing.

➢ Grade 4- These are mostly abnormal cells and are rapidly spread.

In this paper, the reviews of techniques have been done which can be used to detect the tumor such as Segmentation technique, Thresholding technique, Edge detection, Watershed segmentation etc. Brain tumor segmentation and detection using Magnetic Resonance Imaging has become as one of the most popular research field in medical imaging system during the past some years [2].

This paper reviews the proposed strategies in identification of the brain tumor from MRI as well as CT scan images of the brain.

2. RELATED WORK

In 2009, Ahmed Kharrat et al.[3] proposed the methodology of enhancement, segmentation and classification for detection of brain tumor. In Enhancement, it is used in medical imaging to make images clearer and ensure optimum presentation. It aims at improving the quality of images. After Preprocessing, Segmentation algorithm is used. The main aim of segmentation is dividing or portioning the image into homogeneous regions. After this, classification is used to regroup heterogeneous elements into a small no. of classes.

In 2010, T.Logeswari et al[4] proposed the segmentation methods into two phases. In first phase, the MRI image of brain is acquired from the data and noises are removed from it. In second phase, Hierarchical Self Organizing Map(HSOM) is employed for image segmentation. A Self Organizing Map(SOM) is a type of neural network. SOM works in two stages: Training and mapping. Where training is a competitive process and Mapping automatically Differentiates a new input vector. In a CAD analysis

execution time is an important parameter of image segmentation.

In 2011, K.S. Angel Viji et al.[5] proposed that after a manual segmentation procedure of the tumor identification, the investigations has been done for the potential use of MRI data for enhancing brain tumor shape approximation and also for 2D & 3D visualization for surgical planning and assessing tumor. The CAD system provides the precious outlook and accuracy of earlier brain tumor detection. The steps followed are image acquisition then preprocessing & enhancement and last is feature extraction & selection.

In 2011, Mohammed J. Islam[6] discovered that computer vision is the best solution for real time checking of capsules and medicines in pharmaceutical industries in which the author has made a system for inspection of quality using edge based segmentation technique.

In 2012, Nagalkar et al. reviews a work on CT scan technique which is used for monitoring the images of part of the brain which is damaged. The RGB components are invisible in CT Scan images. In CT scan images the tumor is shown white in color and the damaged cells of brain are shown in black color, therefore the values of pixels shows the destroyed brain cell as 0 and the tumor cells as 1. Thus the extraction of the tumor can plotted in MATLAB [7].

In 2012, Pratibha Sharma et al[8], proposed an efficient algorithm for the detection of edges of brain tumor. In which the initial stage is image acquisition of MRI scan then the noise filters are used to remove the noises from the MRI Scan images then the images are enhanced and at last the morphological operations are used for the extraction of region suffering from tumor. Noise removal can be done using filters such as linear &non linear filters. Using these methods gives accurate and clear results.

In 2012, S. Kobashiet. al.[9] proposed image segmentation using scale based Fuzzy and fuzzy object model to segment the parenchym of part of newly born brain MRI scan image. In first step the suthor has separated foreground region. In next step MRI intensity homogeneity is corrected and lastly the scale base Fuzzy object model is applied to the final images. This method has given maximum accuracy.

In 2014, Muhammad WaseemKhan[10] reviewed the different Image segmentation techniques such as Threshold, edge detection and Region based. In this paper he has reviewed techniques which are Edge based detection, Fuzzy theory based segmentation, PDF based segmentation, ANN (Artificial Neural Network) based segmentation, Threshold segmentation, Region based segmentation.

In 2015, S. Mahalakshmiet. al.[11], proposed a detection and separation of brain tumor through MRI images using Particle Swarm Optimization(PSO) which is a heuristic global optimization method on swarm intelligence. It works in four steps: Conversion then Implementation , Selection and finally Extraction [12]-[17].

3. DISCUSSION

In this paper, a review is done on different data mining and image processing methods or techniques which can be used in automated brain tumor detection system. In this paper, various techniques for brain tumor detection have been reviewing which may be employed in recent years for the detection of brain tumor but the main focus was on different image segmentation techniques for the detection of brain tumor. For Brain tumor detection MRI images are widely used however CT scan image are widely used for Lung cancer detection [18]-[21]. The summary of different segmentation classification based on the years they were used and their algorithm has been presented in Table 1.

TABLE 1: Summary of Various Techniques for Brain Tumor Detection

Author	Images	Different Method used for Image Segmentation	Year
Ahmed Kharrat	MRI & CT	Image Enhancement	2009
T.Logeswari	MRI	Soft Computing	2010
K.S. Angel Viji	MRI	CAD System	2011
Nagalakr V.J	CT	Soft Computing	2012
Pratibha Sharma	MRI	Edge Detection	2012
S.Mahalakshmi	MRI	Particle Swarm Optimization	2015

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