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Survey on Brain Tumor Detection Techniques Using Magnetic Resonance Images

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***Abstract*- The brain tumor is abnormal growth of cells inside skull which causes damage of the other cells necessary for functioning human brain. The brain tumor detection is challenging task due to complex structure of human brain. MRI images generated from MRI scanners using strong magnetic fields and radio waves to form images of the body which helps for medical diagnosis. This paper gives the overview of the various techniques used to detect the tumor in human brain using MRI images.**

Keywords: MRI, Tumor, Brain, Processing, Extraction, detection, classification

1. Introduction

According to the World Health Organization (WHO) estimates, one of the most common brain diseases is tumor and this is the reason for the diagnosis & treatment of the brain tumor have vital importance for more than 400000 persons each year in the world. The brain tumor is unnecessary growth of mass or a group of abnormal cells inside or around the brain.The brain tumor is classified into two types first one is malignant or cancerous & second is benign tumors. Malignant or cancerous tumors are classified into primary and secondary tumors. Malignant or cancerous tumor is more harmful than benign because cancerous tumor spreads rapidly by attacking on other tissues of brain progressively improving the condition causing death.

The development in medical imaging techniques in recent years allows us to use these techniques in several domains of medicine like surgical planning, statistical and time series (longitudinal) analysis, computer aided pathologies diagnosis, surgical guidance. Magnetic Resonance Imaging (MRI) is the most frequently used imaging technique in neuroscience and neurosurgery for these applications. MRI helps to perfectly visualizes anatomic structures of the brain such as deep structures and tissues of the brain by creating 3D image. Some of the datasets of MRI images of brain with tumor & non-tumor is as shown in Fig. 1.

2. Literature Survey

T.Rajesh et al [1] represents the paper that shows that MRI image given as input & features are extracted from that image based on Rough Set Theory. In next step selected features are given to the Feed Forward Neural Network classifier as input. These Feed Forward Neural Network classifier is used to perform two functions. The first one is to differentiate between abnormal & normal. The second one is to classify that the type of abnormality is malignant or benign. A.Islam et al [2] represents a stochastic model using MRI for characterizing tumor texture in brain.

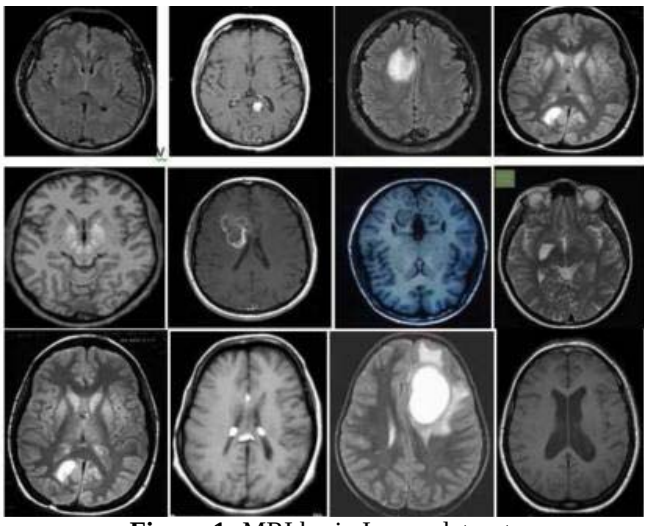

Figure 1: MRI brain Image dataset

This model implements patient-independent task of texture feature extraction and segmentation of brain tumor.Multi-resolution-fractal model is used for brain tumor texture formulation.The new patient-independent scheme for tumor segmentation is proposed by extending the AdaBoost algorithm which is well known. The modification in AdaBoost is done by allocating weights to component classifiers depending on the ability to classify difficult samples & confident in such samples.

E.E.Ulku et al [3] demonstrate the brain tumor detection using Computer-aided detection i.e. CAD system. The system basically based on morphological image processing & histogram equalization techniques. In the last stage of computer aided detection system which is classification, 6 classification algorithm in the RapidMiner program is tested & the comparison of all algorithm is done to show CAD system accuracy. Pavel Dvorak et al [4] represent the technique that determines whether the input MRI image of brain contains a tumor or not. It is done by checking the left-right symmetry of the brain which is considered as assumption for healthy brain.The fivefold cross validation technique is used for testing the implemented algorithm. J.Vijay et al [5] describes the brain tumor detection technique using K-means clustering. The automatic

segmentation of brain tumor is done for the extraction of the tumor tissues from the brain.

Ishita Maiti et al [6] developed a new method for brain tumor detection using watershed method. This is color based brain tumor detection algorithm which uses color MRI images of brain in HSV color space. Initially the input RGB image is converted to HSV color image which separates the image in three regions i.e. saturation, hue and intensity. For each region of image contrast enhancement watershed algorithm is applied. After that for output image Canny edge detector is applied.

The combination of all three images gives the final brain tumor segmented image. Natarajan P [7] et al represents the technique with three steps i.e. preprocessing, histogram equalization & segmentation. By using sharpening and median filters preprocessing is done. Histogram Equalization is used for enhancement of image. Thresholding is used for the segmentation of the image. Finally the technique of subtraction is used to obtained tumor region.

Azian et al [8] describes the detection method based on cellular neural networks (CNNs).The CNN simulator is used with grey scale MRI image to detect the tumor. Phooi Yee Lau et al [9] represent the detection & visualization of brain tumors on T2-weighted MRI images using multiparameter feature blocks. The three parameters i.e. edge, grey & contrast values are used for brain tumor detection. M.Subhashini et al [10] describe the model Pulse coupled neural network by giving segmented MRI as input which detects the presence of tumor in the brain image. S.Ghanavati et al [11] describe the brain tumor detection method by extracting the features like intensity, deformation, symmetry and texture features. Tumor detection with average accuracy of 90.11% gets by preliminary results on simulated & patient MRI.

U.Akram et al [12] represents the automatic brain tumor diagnostic system using MR images. The system works in three stages for detection & segmentation of brain tumor. Prepocessing is done in first stage to remove noise and to sharpen image. Global threshold segmentation is on preprocessed image in second stage. Finally in third stage the post processing is done by morphological operations & tumor masking. It removes the false segmented pixels.

T.Logeswari et al [13] represents the tumor detection using segmentation by soft computing. First the artifact & noise are removed from input MRI image then for image segmentation that Hierarchical Self Organizing Map (HSOM) is applied.A.Kharat et al [14] represents methodology with three steps i.e. enhancement, segmentation and classification.To increase the contrast of the image the mathematical morphology is adopted. Wavelet Transform applied in the segmentation process to decompose MRI images & at last K-means algorithm is implemented to extract the tumor region. S.Chandra et al [15] proposed a clustering based algorithm on on Particle Swarm Optimization (PSO). From the input MRI image, the algorithm finds the centroid of all clusters & each cluster groups together and form brain tumor pattern.

3. Conclusion

MRI images are more useful & provide much better result about soft tissues of human brain compared to computerized tomography (CT) images. MRI images help to brain tumor detection by accurate segmentation which is very crucial otherwise the wrong identification of disease can lead to several consequences. Accuracy and reliability are always assigned much importance in tumor diagnosis as it is complex process.

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