A Survey On Brain Tumor Segmentation And Detection Using Genetic Algoriyhm

Snehal Kharche[1], Pranav Chippalkatti[2]
[1, 2] Dept of Electronics and Telecommunication
[1, 2] GHRCEM, Pune, India

Abstract- *In this paper, the survey has been proposed on Genetic Algorithm for brain tumor detection. The Genetic Algorithm available in the literature for tumor detections have been discussed. The segmentation, detection, and extraction of infected tumor area from magnetic resonance (MR) images are a primary concern but a monotonous and one of the most challenging task performed by radiologists. Medical image analysis and processing has great importance in the field of medicine, especially in non-invasive treatment and clinical study. It helps the doctors to visualize and study the image for understand abnormalities in internal structures of the brain. This proposed technique consists of four stages. In first stage MRI image is acquired by using MATLAB. In the second stage preprocessing has been done. This pre-processed MRI brain image is clustered by using K-clustering algorithm to achieve computational consistency. In the third stage high frequency noise components are removed by suitable filters and SVM is used. In fourth stage the tumor part has been segmented using effective Genetic Algorithm and the performance analysis has been made. PSNR and MSE is calculated.*

Keywords- Image segmentation Genetic Algorithm, Image Segmentation, Morphological operation.

I. INTRODUCTION

The brain is the most significant part of the central nervous system. The framework and operation of the brain required to be studied noninvasively by doctors and researchers using MRI imaging methods. The body is composed of various types of cells. Individual type of cell has extraordinary operations. When cells growth capability can't be controlled they split too often and without any order. The extra cells form a mass of tissue called a tumor. MRI acts as an assistant diagnostic tool for the doctors at the time of disease diagnosis and treatment. This imaging modality generates images of soft tissues. The accomplished medical images proves the internal structure, but the doctors want to know more than peer images, such as emphasizing the abnormal tissue, quantifying its size, depicting its shape, and so on [3]. If such tasks are covered by the doctors themselves, it may be inaccurate, time consuming and burden them heavily.

In the field of medical science an abnormal cell growth inside the brain is known as tumor. Human brain is considered to be the most sensitive part of the body. It control muscle movements and interpretation of sensory information like sight, sound, touch, taste, pain etc. A tumor can affect such sensory information and muscle movements or even results in more dangerous situation which includes loss of life as well. Since the position of the tumor is not fixed thus it can be formed in any part of the brain or human body. Depending upon the place of origination tumor can be categorized into primary tumors and secondary tumors. If the tumor is originated inside the skull then the tumor is known as primary brain tumor otherwise if the tumor's origination place is somewhere else in the body and moved towards brain then such tumors are called secondary tumors.

The exact cause of cancer is unknown. Brain cancer that originates in the brain is called a primary brain tumor. It can spread and destroy nearby parts of the brain. Cancers of the lung, skin, or blood cells (leukemia or lymphoma) can also spread (metastasize) to the brain, causing metastatic brain cancer. These groups of cancer cells can then single area or in different parts of the brain [13].

A. Types of tumors

1) Based on the location of the origin of tumors, they are classified as following:

a) Primary brain tumors: Tumors which originates in the brain cells are called as primary brain tumors. In the case of primary brain tumors, sometimes they spread to other parts of the brain or to the spine. But spreading to other organs occurs only rarely.
b) Metastatic brain tumors: Metastatic or secondary brain tumors are those which originate in other parts of the body and then spread to the brain. These tumors are named according to the location which they originate.

Segmentation of MR brain images is the first step of quantitative analysis. In medical imaging analysis field, segmentation is very challenging for both normal and abnormal tissues of the brain that have complicated structures. While segmentation methods have been successful on normal Tissues, but in the abnormal tissues theoretical and experimental work still remains. Brain tumor vary greatly in size and position, variety of shape and appearance properties, intensities overlapping with normal brain tissue. Over the last 15-16 years, researchers has been focused on semi-automatic and fully automatic methods for detecting and segmenting brain tumors from MRI scans.

The accurate and automatic segmentation of brain MRI image is of great interest for assessing tumor growth and enhancing computer-assisted surgery, planning radiation therapy, and constructing tumor growth models.

Difficulties in segmentation of brain MRI: the problems of MRI include- Noise, Intensity in homogeneity, Shading artifact, Partial volume.

There are still some challenges such as accurate and reproducible segmentation and characterization of abnormalities using intelligent algorithms due to the variety of shapes, locations and image intensities of different brain tumors.

II. MOTIVATION

Brain tumor is most severe disease; most of populations in world affected due to brain tumor. Now day death rate because brain tumor gradually increases. For that consideration, most prominent method implemented for brain tumor detection and segmentation. When most normal cells grow, old cells die or damaged and new cells take their place. Sometimes this process goes wrong. New cells form when the body does not need them, and old or damaged cell do not die as they should .The buildup of extras cells often forms a mass of tissue called a growth or tumor. Earlier detection, diagnosis and proper treatment of brain tumor are essential to prevent human death. An effective brain tumor detection and segmentation using MR image is an essential task in medical field [4]. Detection of brain tumor whether it is cancerous or non-cancerous is only possible after operations of suspicious part of brain. But 90% patients lose their life during this operation. so our aim is to find out the type of brain tumor without any operation by using Genetic Algorithm.

III. LITERATURE SURVEY

R.Preetha and G.R.Suresh [1]: In brain MR images, the boundary of tumor tissue is extremely asymmetrical. Deformable models and Region based techniques are broadly used for medical image segmentation, to locate the boundary of the tumor. Issues related with non-linear distribution of real data, User interaction and poor convergence to the boundary region limited their usefulness. Clustering of brain tumor images, with the use of Fuzzy C means is strong and efficient for tumor localization. Still though the planned technique has high computational confusing, it gives best results in segmentation effectiveness and junction rate. The Fuzzy C means clustering with the addition of Feature extraction and classification shows potential in the field of brain tumor detection.

Amitava Halder, Chandan Giri and Amiya Halder[2]: proposed a well-organized brain tumor detection technique, which can identify tumor and establish it in the brain MRI images. This technique extracts the tumor with the use of K-means algorithm developed by Object labeling algorithm. It has also been found that some preprocessing steps (median filtering and morphological operation) are used for the purpose of tumor detection. It is pragmatic that the experimental outcomes of the suggested technique gives better outcomes in comparison to other methods .

Ankit Vidyarthi and Namita Mittal[3]: a new bi-clustering algorithm has been recommended to cluster out the maximum abnormality area from the brain MR image without any predefined threshold. For tumor segmentation, algorithm is on the basis of CLAP i.e. closely link associated pixel mechanism. Long ago, several types of techniques had useful on brain MR (Magnetic Resonance) imaging to find out the exact abnormality region from on the whole volume of the brain. The literature helps to detect that several bi-clustering algorithms had cluster out the region on the basis of some predefined threshold value which results in generation of cluster which was dependent on particular threshold value only.

Kailash Sinha and G.R.Sinha [4]: presents a relative research of three segmentation technique carried out for tumor identification. The technique involves k-means clustering with watershed segmentation algorithm, optimized k-means clustering with genetic algorithm and optimized c- means clustering with genetic algorithm. Genetic c-means and k-means clustering methods are used to detect tumor in MRI of brain images. At the end of process the tumor is extracted from the MR image and its exact position and the non-linear shape are determined. The experimental outcomes specify that genetic c-means not only terminate the over-segmentation issues, but also supply fast and effective clustering outcomes.

Ahmad Chaddad et al[5]: paper involve new features type of Glioblastoma (GEM) detection on the basis of Gaussian Mixture Model (GMM). The GMM features established the best performance largely. For the Tl and T2 weighted images, the accuracy performance was 100 % with 0% missed detection and 0% false alarm consequently. In FLAIR mode the accuracy decrease to 94.11 % with 2.95 % missed detection and 2.95 % false alarm. All results are very effective to get Genetic algorithm to be proved.

Koushik Pal and Subhajit Koley[6]: The arrangement of Region Growing Algorithm, Cryptography and Digital Watermarking are used to detect the infected area of brain. This is the very new technique used here to detect brain tumor. The information associated to patients enclosed in the Electronic Patient Record (EPR), Region of Infection (ROI), doctor's name and diagnosis from symptoms are encrypted and embedded in the tomography image itself using the recommended methodology – a combination of the Rivest-Shamir-Adelman (RSA) encryption and bit plane slicing watermarking methods. Region growing and contour detection algorithm are used to detect the suspicious area which must be perfect for accurate ROI identification resulting in a better treatment.

Kimmi Verma and Rituvijay[7]: The main goal of this work is to authenticate a quantitative method to extract various attributes from MR images. A technique known as hybrid segmentation that associate threshold segmentation, watershed segmentation, edge detection and morphological operators is considered jointly. This joined method is experimented with MR scanned images of human brains to detect tumor. The present hybrid segmentation method is used to identify Exact size and location of tumor.

Chaiyanan Sompong, Sartra Wongthanavasu [8] The suggested technique advanced the well-known Grow-cut algorithm with the use of the advanced local transition rule. The correlation of the well-known grow-cut and tumor-cut algorithms use the dice similarity coefficient (DSC). Due to this, the suggested technique gives better results by reporting DSC of 84.17 % higher than Grow-cut and Tumor-cut with 80.81% and 80.14%, respectively.

Deepthi Murthy T.S. and G.Sadashivappa [9]: Various methods were developed to identified and segment the brain tumor. With the use of thresholding and morphological functions effective brain tumor segmentation is implemented. This is the efficient algorithm where segmentation of tumor is carried out and its features such as centroid, perimeter and area are calculated from the segmented tumor. To identified the brain tumor, scanned MRI images are given as the input. The work included here helps in medical field to detect tumor and its characteristics helps in giving the treatment plan to the patient. The whole paper is splitted into seven sections which are described in detailed in the following sections.

Heena Hooda et al[10]: discuss the performance analysis of image segmentation methods, viz., K-Means Clustering, Fuzzy C-Means Clustering and Region Growing for detection of brain tumor from sample MRI images of brain. The performance estimate of the above mentioned methods is done on the basis of error percentage associated to ground truth. The significant task in the diagnosis of brain tumor is regulated the exact location, orientation and area of the abnormal tissues.

G. Kharmega Sundararaj and Dr. V. Balamurugan[11]: a tumor classification system has been considered and developed for MRI systems. The suggested technique composed of three stages namely pre-processing, feature extraction and classification. In their profound system classification has two divisions: i) training stage and ii) testing stage. Thus, the suggested system has been evaluated on a dataset of 40 patients. The proposed system was found effective in classification with a sucesss of more than 95% of accuracy.

Naouel Boughattas et al [12]: suggested a brain tumor segmentation technique from multi-spectral MRI images. The segmentation task is then viewed as a learning issue where only the most important features from the feature base should be preferred and then a classifier can be used. The new concept is to use Multiple Kernel Learning (MKL) by comparing one or more kernels to individual feature in order to solve together the two problems: selection of the features and their corresponding kernels and training of the classifier. Their algorithm was tested on the real data supplied by the challenge of Brats 2012 and was compared to the resulting top techniques. The outcome proves good performance of their technique.

Saif Dawood Salman Al-Shaikhli et al[13]: a unique approach for multi-class brain tumor classification on the basis of sparse coding and dictionary learning is suggested. They recommended an individual (per-class) dictionary learning and sparse coding classification using K-SVD algorithm. This perspective correlate topological and texture features to build and learn a dictionary. Experimental outcomes exhibits that the sparse coding based classification surpass other state-of-the-art techniques.

Tomas Martinez-Cortes[14]: handles the problem of automatic brain tumor classification from Magnetic Resonance Imaging (MRI) where, usually, general-purpose texture and shape features extracted from the Region of Interest (tumor) have become the usual parameterization of the problem. Their experimental outcomes shows that the use of clinical-based feature leads to an important increment of performance in terms of Area Under the Curve (AUC) when associated to a state-of-the art reference. Moreover, the suggested Bayesian fusion model clearly surpass other fusion mechanism, particularly when few diagnostic tests are accessible.

Solmaz Abbasi and Farshad TajeriPour[15]:this paper presents a technique for 3D medical image segmentation. This technique is used to identify brain tumor in MRI images by correlating Clustering and Classification techniques to reduce the difficulty of time and memory. This technique has obtained a fast speed for segmentation of MRI 3D images and has been classified with criteria of Dice's and Jacquard's coefficient on the brain tumor from magnetic resonance image retrieved from the Brats2013 database.

IV. OBJECTIVES

The objectives of the proposed system are given below

1. To detect the suspicious part of the brain from MRI images. Segmentation and clustering of the tumor.
2. To implement the Genetic Algorithm that would be used to detect the tumor accurately.
3. Suggest the type of tumor that it is cancerous or non-cancerous.

V. PROPOSED SYSTEM

The proposed system consist of the software part to detect the brain tumor using genetic algorithm. The description of block diagram given as follows.

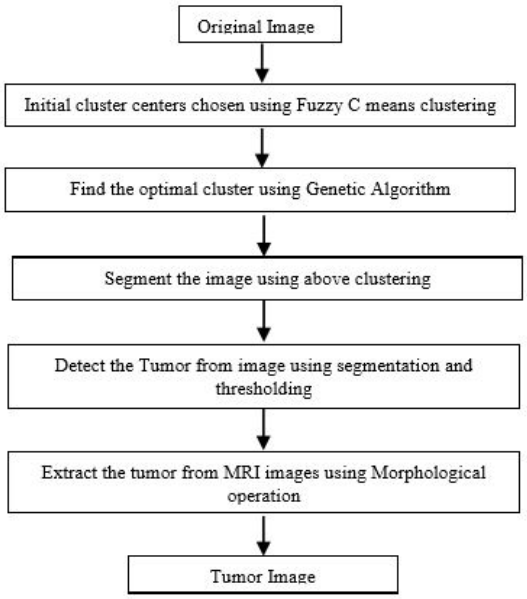

Figure 1. Block Diagram Of The System

Here in this system brain tumor is detected from MRI images, the MATLAB code is executed; in the MATLAB, following procedure is done. First the dataset of various images of the defected portion of the brain are trained in MATLAB and then the preprocessing of the dataset is done in preprocessing the enhancement of the image is done, after enhancement the segmentation of the done using MATLAB. After segmentation of the image, the feature extraction is done using the texture and colour so in this we are dealing with the colour. The feature is extracted. After the extraction the extracted part is given to the classifier for the disease classification here,

we are using SVM for the classification purpose. It is very efficient and supervised method of classification. After the classification, the GUI shows the tumor, tumor classification and number of clusters are find out. Genetic Algorithm implemented after clustering. Non-invasive classification of tumor is done.

VI. CONCLUSION

To reduce brain tumor growth in a sustainable manner, there is a need to move from input intensive to technology intensive and skill intensive medical field. This helps to cure the tumor by properly consulting patient with the treatment details and their requirements at very early stage. The methods and techniques used during brain tumor detection through MRI image segmentation. This paper focuses on developing a automated brain tumor detection and segmentation system. This will enhance the detection and visualization of brain tumors from the output of MRI scans. A

series of filters will be used including Gaussian, linear and average filters to remove noise The MATLAB ANN Toolbox is the software domain in which the GUI is built and then Algorithm is implemented. Most important advantage of using this method is that tumor can be identified at early stage or the initial stage.

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