MRI BRAIN IMAGE SEGMENTATION USING MODIFIED FUZZY C-MEANS CLUSTERING ALGORITHM

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Abstract- Brain tumor extraction and its analysis are challenging tasks in medical image processing because brain image and its structure is complicated that can be analyses only by expert radiologists. Segmentation plays an important role in the processing of medical images. MRI (Magnetic resonance imaging) has become a particularly useful medical diagnostic tool for diagnosis of brain and other medical images. Apply different pre-processing method on MRI image. In the first, MR image of brain is acquired and pre-processing is done to remove the noise and to sharpen the image. Segmentation by using Modified Fuzzy c-mean. Other segmentation methods, fuzzy c-mean clustering result analysis. An experiment show that the techniques are accurately identifies and segments the brain tumor in MR images.

Index Terms- brain tumor segmentation, magnetic resonance image, FCM, and Modified FCM segmentations.

I. INTRODUCTION

A brain tumor is an abnormal development of the cells inside the brain, which can be cancerous or non-cancerous. It is abnormal and uncontrolled cell division, which is ordinarily either in the brain themselves, or in the cranial nerves, or in the brain tissues, skull, pituitary and pineal organ, or reach from malignancies fundamentally situated on different organs. Brain tumors are of two categories: primary and secondary. Primary brain tumor comprises of any tumor that begins in the brain, which can begin from brain cells, the tissues all over the place the brain, nerves, or organs [5].

Primary brain tumors are classified benign and malignant. Benign tumors can be eliminated and the occasional develop back. Benign tumors for the most part have a marginal or an edge. They don't spread to different it's of the body. Malignant tumors are more sincere and regularly are a risk to life. They develop quickly in group and attack the close-by healthy tissue. Growth cells can split far from dangerous brain tumor and spread to alternate parts of the brain or to the spinal string however it once in a while spread to different parts of the body [5]. The most well-known essential brain tumors are Gliomos, Meningioma's, Pituitary adenomas, and Nerve sheath tumors. Many techniques are being explored and practiced to improve clinical diagnosis.

MRI (Magnetic Resonance Imaging):

The locations of Brain tumors are different imaging system are issued for diagnosis purpose. These frameworks are imaging positron emission tomography (PET), magnetic resonance imaging (MRI) and then the computed tomography (CT) [5]. Most MRI ruled for investigating brain tumor recognition and arrangement Thought About computed tomography imaging method. Basically, for the investigation of ionizing radiation during CT using MRI uses strong magnetic field. MRI provides real-time (soft tissue). The MRI scans can be taken in various parts of the body without changing the physical positions of the patients are under examination procedure. Uses an attractive intensive MRI field, radio frequency and computer pluses to moderate Recorded image of bone and soft tissue organs in principle, all other internal body structures not use MRI ionizing radiation (X-ray). Then the image on a computer can be evaluated, are transmitted electronically to print CD. MRI may be used broadly to identify of brain tumors.
II. PROPOSED WORK FOR BRAIN TUMOR DETECTION

MRI Image

Preprocessing by Median Filter

Feature Extraction Using Thresholding

Segmentation by Modified FCM

Tumor area detected

Figure-1 Proposed Algorithm of Brain Tumor Detection

Preprocessing by Median Filter

Median filter is used for the noise removal in order to obtain a noise-free image. Due to its good smoothing effect, it can also be used to fill the small holes that might appear on the segmented diseased cell. Here, the neighborhood of \( n \times n \) (\( n=7 \)) pixels is used because large neighborhoods produce more severe smoothing. The median is calculated by first sorting all the pixel values from the window into numerical order, and then replacing the pixel being considered with middle pixel value.

2D Median filtering using a \( 3 \times 3 \) sampling window

Thresholding

Thresholding is the technique which utilized for image segmentation. In this strategy, image is partitioned into region. For every single diverse region separate gray scale are utilized. Histogram of this image can be plotted with peak and valleys between peaks denotes to threshold value. Histogram thresholding partitions image into two equivalent parts and these histograms are contrasted with recognize brain tumor. At that point, to locate a proper dimension brain tumor, gathering technique is utilized

Morphological Operation

Morphological operations are connected on the image to obviously discover the tumor part in the brain. The essential motivation behind the morphological operations is to show just that a part of the image which has the tumor that is the part of the image having more intensity and more area. Morphological operations may be considered as form filters that remove information from an image according to the shape of objects in the image and retaining only the interest information in the image. There are two basic morphological operators: erosion and dilation. Opening and closing are two derived operations in terms of erosion and dilation. These operators are created on some structural element.

Modified Fuzzy c-means (FCM) Clustering

A new algorithm is proposed here in order to overcome the drawbacks of other methods. We have invented it improved fuzzy c-means clustering (IFCM). The improved FCM algorithm is in view of the fundament of information weight where the dimensionality of the data is redesigned. The information compression involves two stages: quantization and aggregation. The quantization of the component space is accomplished by covering the lower \( "m" \) bits of the element esteem. The quantized yield will achieve the regular intensity values for more than one element vector. In the system for aggregation, highlight vectors which share typical intensity worth are gathered together. An agent highlight vector is perused each gathering and they are given as information for the customary FCM figuring. The improved FCM figuring uses the same steps of customary FCM beside the change in the group redesigning and enrollment quality fill in measures. The proposed philosophy utilizes Density based division strategy. Density-based grouping method utilize a local cluster measure in which clusters are mentioned as regions in the data space, where the objects are dense, and continue divided from one-to-other by low-density regions. Group measure in which bunches are said as districts in the information space, where the items are thick, and continue divided from one-to-other by low-density areas. Density- based
grouping strategies have as of late pulled in numerous hobbies because of their alluring properties, for example, reality ready to find self-assertive formed cluster and filter through noise. Systems for this category by and large incorporate Density- Based Spatial Clustering of Uses with Noise (DBSCAN), Generalized DBSCAN (GDBSCAN), and Ordering Points to Identify the Clustering Structure (OPTICS), Valley Seeking and Density-based Clustering (DENCLUE). DBSCAN is a classification algorithm which has been used in many fields due to its simplicity. DBSCAN is capable to deal with hidden clusters. Hidden clusters may be of different shapes and size. In addition to also deals with noise present in those clusters. It efficiently detects the boundaries of adjacent clusters in images. DBSCAN requires two parameter: 1) \( \varepsilon \) and 2) min points. DBSCAN start with an arbitrary starting point that has not been goes to yet. These points \( \varepsilon \) (neighborhood) is recovered and if it contains sufficient points to form a cluster then a cluster is started else the point is consider as noise in image. OPTICS works with two parameters: \( \varepsilon \) (esp.) & Min Points. EPS describes the maximum distance (radius) to consider. Min Points represents the number of points. The number of points that are essential to create a cluster. Point p is a core point, if Min Points, points are found within its EPS, then \( N \in \varepsilon (P) \). Hence each point is assigned a core distance that explained the distance to the Min Pts. closest point. A special distance is stored for each point that represents density. Density needs to be accepted for a cluster in order to have both Points to the same clusters.

III. IMPLEMENTATION

On Original MRI image
Single patient MRI images from database:
- Real world MRI images of a single patient having 7 slices.
- Examine each slice to find the tumor.
- We have input MRI images of 7 slices.
The modified FCM overcome the limitation of FCM. It discards all other unwanted regions which have not probability of having tumor. It mostly gives the exactly extracted tumor. But it depends upon area so all time not possible to detect the exact tumor. Sometimes it also considers the skull part or something that is connected to brain directly. It always takes the biggest part as a tumor which is not true in all cases.

OPTICS overcomes all the limitations of Modified FCM. Optics is density based clustering and not just region based clustering, and is not dependent of parameters which do not have a co-relation. Optics forms a better and stronger option when we have blobs, and we need to determine which such blobs when taken together repeat in multiple slices of MRI Imaging. Optics is also faster than these conventional methods, as just simple, if else rules are considered.

IV. CONCLUSION

Brain tumor removal and its analysis are challenging tasks in medical image processing. MRI is most efficient for the research of brain tumor detection and cataloging as compared computed tomography imaging techniques, X-ray etc. The information about different kind of MRI images data which are frequently use for research studies. For the pre-processing the used median filter. Segmentation done by Fuzzy c-mean and modified fuzzy c-mean clustering. There are various segmentation algorithms for brain tumor, but modified Fuzzy c-mean clustering, better than other algorithm for brain tumor detection. Modified FCM is done by the optic. Using original database 1 person 7 different slices. Clustering group’s pixel based on some feature or characteristic.

REFERENCES


