DETECTION AND SEGMENTATION OF BRAIN TUMOR FROM MRI IMAGES

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Abstract— MRI Imaging plays a vital part in brain tumor for diagnosis, analysis and treatment planning. It is useful for doctor to determine the former steps of brain tumor. Brain tumor detections are using MRI images is a most challenging task, because of the complex structure of the brain. Brain tumor is a strange development of cell of brain. MRI images offer better contrast concern of different delicate tissues of human body. MRI Image gives preferred outcomes over CT, Ultrasound, and X-ray. In this paper we propose image segmentation with k-means and fuzzy c-means algorithm. The experiment is performed using MRI brain dataset. The evaluation result shows that the fuzzy c-means algorithm outperforms k-means algorithm.

Keywords— Brain Tumor (BT), MRI-Images, CT Scan, IP, X-Ray, K-means, Fuzzy C-Means

I. INTRODUCTION

Human body is comprised of a different types of cells. Brain is a highly specific and delicate organ of human body. Brain tumor is an exceptionally harmful disease for human being. The brain tumor is intracranial mass made up by abnormal growth of tissue in the brain or around the brain.

Brain tumor can be identified by amiable or dangerous type. The considerate being non-cancerous and threatening is cancerous. Malignant tumor is distinguish into two sorts; primary and secondary tumor, benign tumor is less destructive than malignant. The malignant tumor it spread quickly entering different tissues of the brain and therefore, worsening condition patients are loosened. Brain tumor detection is extremely challenging issue because of complex structure of brain [7].

Brain tumor diagnosis is very troublesome as a result of differing shape, size, area and appearance of tumor in brain. To detect Brain Tumor is hard in starting stage since it cannot locate the exact measurement of tumor. Be that as it may, once it gets identified the brain tumor it provides for begin the best possible treatment and it might be curable. And therefore, the treatment depends on tumor like; surgery, chemotherapy, and radiotherapy.

PC algorithm for the depiction of anatomical structures and different region of interest are a key segment in helping and automating particular radiological tasks. These algorithm, called image segmentation algorithm, plays a crucial part in various biomedical imaging applications, for example, investigation of anatomical structure, treatment planning, partial volume correction of functional imaging information, the measurement of tissue volumes, diagnosis, localization of pathology, and PC integrated surgery. Segmentation of brain tumor considers the separation of tumor tissues(tumor, edema and necrosis) from ordinary brain tissues: gray matter(GM),white matter(WM) and cerebrospinal fluid (CSF).Brain tissues segmentation particularly tumor and edema, is an intricate task as a result of artifacts in tumor, complex shape, heterogeneous intensity distribution and variability of the position of tumor. Since brain tumor division has extraordinary effect on monitoring, diagnosis, treatment planning for patients, and clinical trials [8].

Brain tumor is one of the main sources of death among individuals. It is evidence that the shot of survival can be expanded if the tumor is identified effectively at its initial stage. As a rule, the doctor gives the treatment for the strokes instead of the treatment for the tumor. In this manner, location of the tumor is fundamental for the treatment. The lifetime of the individual who influenced by the mind tumor will increment in the event that it is recognized early. MRI is a noninvasive and great delicate tissue differentiate imaging methodology, which gives important data about shape [10].

There are numerous division procedures which can be comprehensively utilized, for example, histogram based strategies, edge-based techniques, manufactured neural system based division techniques, physical model based methodologies, region based techniques (area part, developing, and combining), and clustering strategies (Fuzzy - implies grouping, K-implies grouping, Mean Shift, and Expectation Maximization).Our primary focus is on the procedures which utilize image segmentation to identify brain tumor [8][9].

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In this section, the proposed working of proposed framework is explained in detail with algorithm. The proposed framework divided into various stages

- Pre-processing Phase
- Feature Extraction Phase
- Segmentation Phase
- Classification Phase

These phases are executed one by one for detection of brain tumor. The pre-processing phase involves various phases such as:

- Normalization
- Skull Stripping
- Median Filtration

After preprocess, extraction of features are performed which includes features like

- Contrast
- Correlation
- Energy
- Homogeneity

After extraction of features, the segmentation of brain images are performed using two popular approaches

- K-Means
- Fuzzy C-Means
A. Preprocessing
Brain MRI images are taken as input for detection and classification of tumors. The preprocessing step is carried out to remove unwanted noises so that the classifier works well with the given input image without affecting the efficiency. MRI images are firstly converted to the grey scale image so that the intensities are identified. Then removal of other unwanted substance from the image are done which include skull stripping. The skull stripping remove other part of the image except the core brain image object.

B. Image Feature Extraction
Various features of the image are extracted for classification of region of image to have tumor content.

Contrast
Contrast measures the amount of nearby changes in a picture. It mirrors the affectability of the texture in connection to changes in the intensities. It restores the measure of power contrast between a pixel and its neighborhood.

Correlation
This component measures how correlated a pixel is to its neighborhood. It is the measure of dark tone direct conditions in the picture. Feature values go from -1 to 1, these extremes demonstrating immaculate negative and positive correlation individually.

Homogeneity
Homogeneity calculates the similarity between pixels. A diagonal dark level co-event framework gives homogeneity of 1.

Energy
Energy additionally implies consistency, or angular second moment (ASM). The more homogeneous the picture is, the bigger the value.

C. Segmentation
Segmentation is the method for dividing the source image into different region. These region contain similar intensities images.

IV. RESULT
To evaluate our metrics we have used MATLAB. Image Processing tools are used in our evaluation. We have taken 3 dataset for brain tumor detection. It is present online.

V. CONCLUSION
From the images in figure 4 and 5 it is clearly visible that the Fuzzy C-Means algorithm outperforms the k-means algorithm in terms of detection of tumor regions. The k-means algorithm unnecessarily selecting the tumor
region of brain when compared with the ground truth. The truth is far from the result produced by the K-means algorithm. Fuzzy C-Means algorithm smartly select the tumor region and output only those regions which are relevant. The output of Fuzzy C-Means is the minimal of k-means, because the output produced by k-means contains in the output of fuzzy c-means. Hence fuzzy c-means is better for MRI brain segmentation.

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<th>TABLE: I Presents region of tumor in the brain</th>
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<tbody>
<tr>
<td>Attributes</td>
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<tr>
<td>K-Means</td>
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<td>Tumor Area (%)</td>
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<td>ROI Compression Ratio (CR)</td>
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<td>Non-ROI After Compression (AR)</td>
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<td>Non-ROI AR Bits Per Pixel</td>
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