A Novel Algorithm To Detect Brain Tumor In Ct Scan Images

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Abstract: In this research paper, finding tumor area of human brain in CT scan brain images are accessible based on computerized method. Initially the classification is done by either brain consuming a tumor or healthy brain and then the classification is further divided into either benign type of tumor or malignant type of tumor. This proposed method involves the following steps namely image pre-processing, segmentation of an image, edge detection of an image, feature extraction of an image and clustering of an image using a novel algorithm,A MATLAB software is used for test the proposed novel algorithm in a user friendly manner. Finally the region of interest of brain tumor area is done by the validation phase.

Keywords: Clustering of an Image, CT Scan Brain Image, Segmentation of an Image, Feature Extraction of an Image, Brain tumor.

1. INTRODUCTION:

Nowadays, Computerized Tomography (CT) scan imaging is considered as an important device for radiotherapists. Inside the human body it brings the high quality of images. In our human body one of the sensitive organs is brain. We have to deal with very careful when handling such human brain. An uncontrolled growth of cell division and abnormal tissues are formed in human brain is termed as brain tumor. The swelling of brain causes the brain tumor ad it damages the brain cells or it can also causes the cancer. It destroy other parts of the human brain like cerebral edama and some internal growing cells. The primary and secondary brain tumors are the two classifications of brain tumor.At the first type of primary brain tumors are either non-cancerous or cancerous tumors, that is either benign or malignant type of tumors, while the second type of secondary brain tumors are localized in different positions of brain and it may extended. Nowadays, detection of human brain tumor from CT scan images are presented in various research papers. In this proposed method, the new novel algorithm is used for brain tumor detection and it is further classified into either normal healthy brain or abnormal brain. In case of any abnormalities occurred it classified by either benign or malignant type of tumor. This method is suggested to used as second opinion for the radiotherapists. In this paper we focuses on a novel algorithm called KFC algorithm which is the combination of K – means and Fuzzy C – means algorithm. In the K-means algorithm is used to clustering the segmentation of an images to extract the brain cells, and fuzzy C means algorithm is used to diagnose the

accurate region of brain tumor of CT scan image and the novel image mining KFC algorithm is used to detect better results of human brain tissues.

SEGMENTATION METHODS OF AN IMAGE

In the pre-processing stage, image segmentation is one of the important phase of analysing the image. Global Thresholding based segmentation, Region based segmentation, Marker-based segmentation and clustering based segmentation are the different categories of the segmentation methods. In this research paper, the clustering of an image segmentation were tested such as threshold based segmentation method, region based segmentation method, Watershed algorithm, canny edge detection and a proposed KFC algorithm. In human brain, the tumor region of brain tissues are detected by applying the global thresholding, region based segmentation and canny edge detection. These methods are more suitable for segmentation of an CT scan brain image. The proposed algorithm makes the result of sufficient accuracy. The original image of CT scan brain tumor patient is illustrated in fig.1.
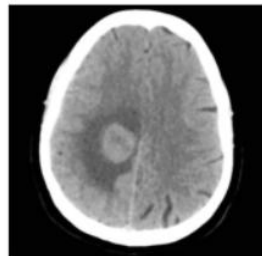

Fig.1. CT scan brain tumor image

The region based segmentation is applied to the original CT scan brain image is illustrated in fig.2.
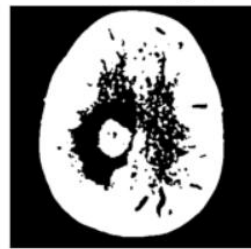

Fig.2. Region based segmentation of brain tumor image

This segmentation algorithm calculates the small regions of brain tumor to give the exact results. In threshold based segmentation is chosen and applied to the brain image to distribute the threshold binary values to be zero shown in fig.3.
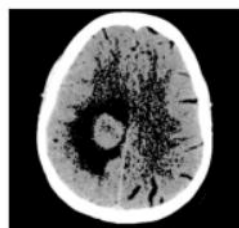

Fig.3. Threshold based segmentation of brain tumor image

The marker based image segmentation is done by watershed algorithm. This pixel point of an image is merged by its tumor regions. The marker based watershed algorithm is applied to the CT scan brain image is illustrated in fig.4.

Fig.4. Marker based segmentation of brain tumor image

EDGE DETECTION METHODS OF AN IMAGE

The ultimate aim of an edge detection in a CT scan brain image is to mark the regions and get the results of thin and clean edges as well as nearby connected edges. The canny edge detection process involves the following stages:

- Sharp and smooth changes of images with a gaussian filter of the matrix done by noise reduction stage.
- The gradient of an image is to detect the intensity levels of pixels are calculated.
- The upper bound of threshold values of thin edge image is applied using Non-maximum suppression method.
- The highest boundary and lowest boundary threshold values of edge points are tracked using thresholding with hysteresis method.
- To fill the small gaps in an image edge linking method is applied.

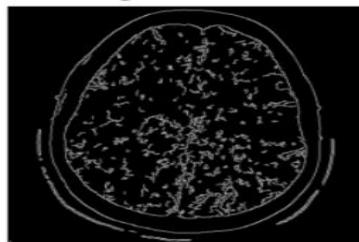The canny edge detection method is applied to the CT scan brain image is illustrated in fig.5.

Fig.5. Canny edge detection of brain image

This method gives the best results and shows the inner details of human brain tissue.The tumor regions of segmentation methods which gives the finest parts of recognition rate in CT scan brain image.

FEATURE EXTRACTION METHODS OF AN IMAGE

Non-negative matrix factorization (NMF) algorithm is used for feature extraction methods for CT scan brain image analysis. It can be reduced the complexity and processing time of brain images of tumor regions. The NMF algorithm is mainly used for large volumes of data. It could be represented by the important parts of feature vectors in the input image as best as possible of accurate results. In image mining, the feature extraction a method of an image is focuses on extracted NMF features of both clustering and classification techniques.

The usages of Non-negative matrix factorization algorithm are characterized by the following classes:

- The input matrix contains the columns including EEG data and sounds are applied in one dimensional image varying from time to time.
- The input matrix contains the vectorized columns of face image objects are applied in two dimensional images.
- The text data and e-mail classification are the other applications of NMF algorithm.

The feature extraction method of NMF algorithm is applied to the CT scan brain image is illustrated in fig.6.
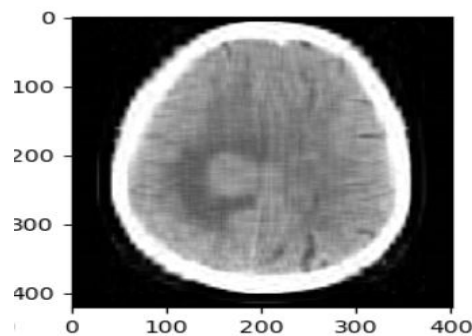

Fig.6. Feature extraction of brain tumor image

CLUSTERING METHODS OF AN IMAGE

In Image mining, there are many clustering algorithms like K-means clustering and Fuzzy C means clustering algorithms are available for feature extracted vectors of an image. A novel KFC algorithm is used for automatic detection of brain tumor in CT scan images. The gray level intensity levels of CT scan brain image is retrieved and the objective function of distance measurement in Euclidian distance is modified using extraction of features from a brain image. Image segmentation, edge detection, feature extraction and image clusters are performed to detect the patient brain image is healthy or abnormal conditions. The following methods are considered by how the novel KFC algorithm works on:

- The data points on image matrix are initialized.
- An image pixel in centers of the cluster and pixel points is detected.
- The distance between each centers of the cluster and pixel points are computed.
- Again compute the pixels of the segmented image.
- Repeat the process until it reaches the cluster centers.
- Now compute the membership value and update the centroid distance.
- Based on these features detect the exact region of the tumor in brain image.

The clustering method of novel KFC algorithm is applied to the CT scan brain image is illustrated in fig.7.
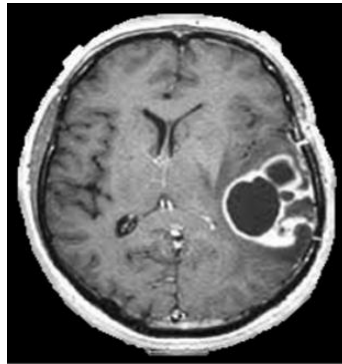
Fig.7. Clustering of brain tumor image

THE PROPOSED ALGORITHM TO DETECT BRAIN TUMOR

In the proposed method is used to suggest a second opinion to make the decision of CT scan brain images to the surgical specialists and radiotherapists. In CT scan brain images detects the human brain with healthy or tumor images with specific type such as malignant or benign type. This methodology consists of following stages, which are pre-processing of an image, segmentation methods of an image, edge detection methods of an image, feature extraction methods of an image, clustering methods of an image and detection of brain tumor. The flowchart of the different stages of proposed method is shown in fig.8.
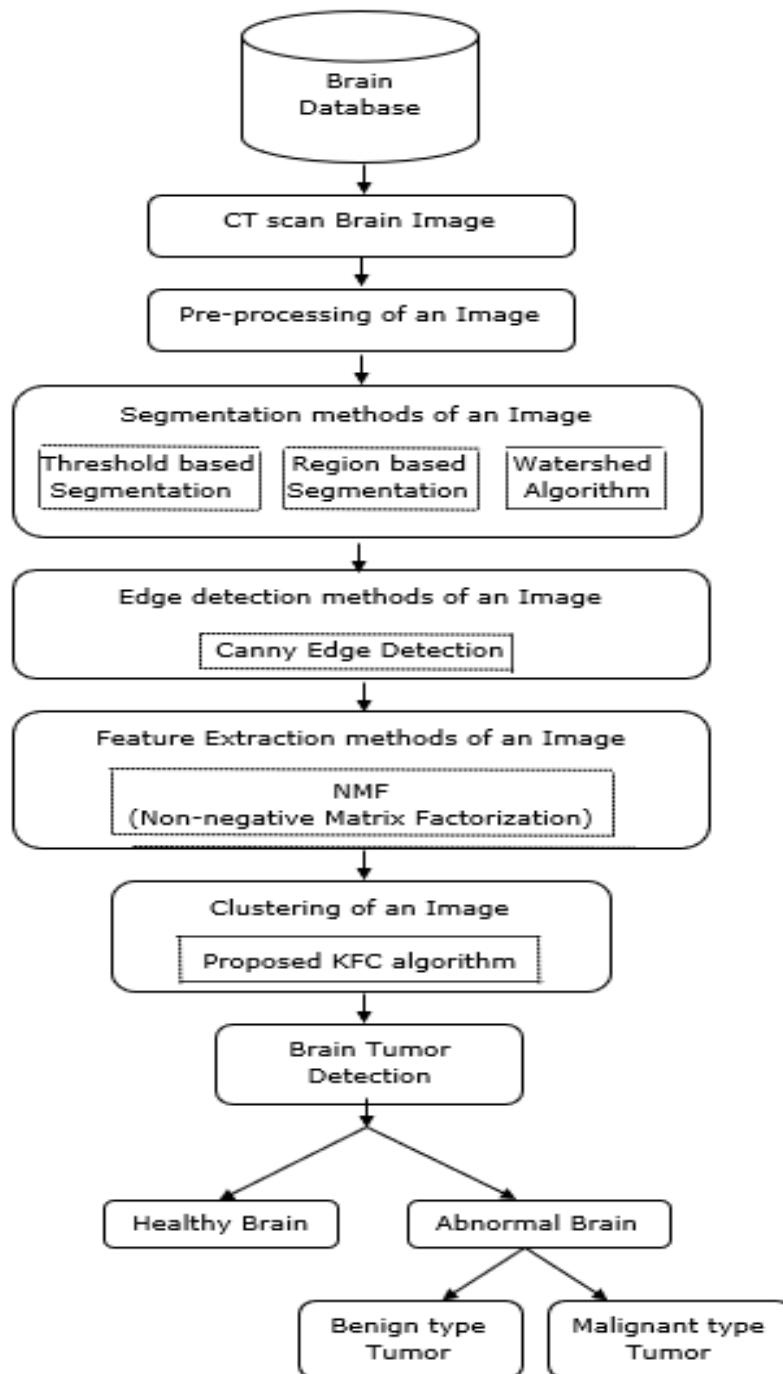
Fig.8. Flow chart of proposed methodology

The first stage is the pre-processing of an image for the selected CT scan image of human brain. In this stage noisy data are removed and the input image is reshaped based on the gray level intensity. The second stage of proposed method is segmentation methods of an image, in which the image is segmented by following three methods namely. Region based segmentation, threshold based segmentation and marker based segmentation. In region based segmentation the global threshold values of small regions of tumor images computed. Then the binary values to be zero are calculated using threshold based segmentation. This pixel

points of binary image is merged by its tumor regions of marker based image segmentation is done by watershed algorithm. The third stages of proposed method is edge detection method of an image, in which segmented image is converted into detect the region of an edge. This black and white levels of an image is done using canny edge detection algorithm. The fourth stage is feature extraction methods of an image, in which output image is further process to apply using Non-negative matrix factorization (NMF) algorithm to extract the features. Final stage of proposed method is clustering methods of an image. In this stage a new proposed KFC algorithm is used for detecting the patients having healthy brain or tumor brain. In case of tumor brain occurs further classified into abnormal conditions of malignant or benign type. This novel algorithm is used because it gives the exact threshold value as an output and gives the better results of test images in human brain.

2. RESULTS

The CT scan brains images are used in this research work are obtained from internet databases which are retrieved from data retriever. In image mining, segmentation, edge detection, feature extraction and clustering are done by CT scan images of 87 images. All the test images of human brain are diagnosed and suggested to radiotherapists as the second opinion of detect the brain tumor. Out of 87 images, the normal healthy brain images 42, and abnormal conditions of tumor images are 45. Further identification, out of 45 abnormal images, the benign type of brain tumor images are 16 and malignant type of brain tumor are 29 images. A novel KFC algorithm is used to test by an entire CT scan brain images with the help of programmed using MATLAB software.This system ofimage detection with patient having healthy brain and tumor brain is shown in fig.9 (a, b and c).

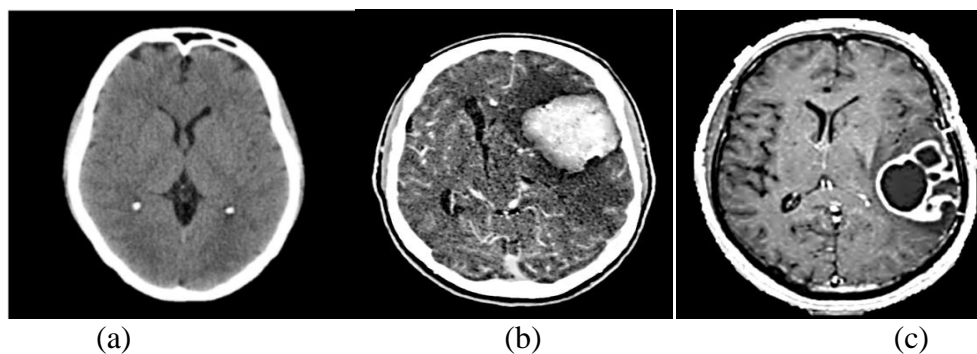| (a) | (b) | (c) |

Fig.9. (a). Healthy brain (b) Benign type of brain tumor (c) Malignant type of brain tumor

3. CONCLUSIONS

A novel algorithm is used to detect the brain tumor with the second opinion to make decisions to radiotherapists is proposed. In an input CT scan brain image is regulates whether the image of its patient having a healthy brain (normal) or tumor brain (abnormal). In case of abnormal images occurs, further determines either benign or malignant type of brain tumor is represented. The proposed method consists of following stages namely pre-processing of an image, segmentation methods of an image, edge detection methods of an image, feature extraction methods of an image, clustering methods of novel KFC algorithms of an image and detection of brain tumor. Based on the available database the brain tumor detection is done with the accurate results.

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