MIP AND UNSUPERVISED CLUSTERING FOR THE DETECTION OF BRAIN TUMOUR CELLS

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ABSTRACT:-Image processing is widely used in biomedical applications. Image processing can be used to analyze different MRI brain images in order to get the abnormality in the image .The objective is to extract meaningful information from the imaged signals. Image segmentation is a process of partitioning an image in to different parts. The division in to parts is often based on the characteristics of the pixels in the image. In our paper the segmentation of the tumour tissues is carried out using k-means and fuzzy c-means clustering.Tumour can be found and faster detection is achieved with only few seconds for execution. The input image of the brain is taken from the available database and the presence of tumourin input image can be detected.

Keywords: Morphological Image Processing (MIP), Image Segmentation, K-Means, Fuzzy C-Means

I.INTRODUCTION

Brain tumour is an abnormal growth of the cells inside the brain. Tumour can be cancerous or noncancerous. It is generally caused by abnormal and uncontrolled cell division which is normally in the brain itself or in the cranial nerves, or in the brain envelopes, skull, pituitary glands or spread from cancer primarily located on other organs. [1].Image Processing can be used to analyse different medical and MRI images to get the abnormality in the image. Medical Image segmentation deals with segmentation [9] of tumour in MRI images for improved quality in medical diagnosis. Magnetic resonance imaging (MRI) is an advanced medical imaging used to produce high resolution images of the parts contained in the human body. MRI is used when treating brain tumour. These high resolution images are used to examine human brain development and discover abnormalities. Morphological filtering of a binary image is conducted by considering operations like opening and closing. K-means clustering is suitable for biomedical image segmentation that solves the well-known clustering problem. It is one of the simplest unsupervised learning algorithms. Segmentation is carried out using K-means clustering algorithm for better performance. This paper proposes automatic method to find the tumour cells using morphological technique. It is a tool to extract the region of interest among the image. [4] Image compression is a technique that removes the pixel redundancy and compresses the image without any loss of information. We need compression we use JPEG 2000 standard for compressing with no error. Fig1 shows an example of segmentation, where the original image is segmented based on individual surfaces, objects texture, boundary. Image segmentation has wide applications like image database, image compression, recognition of objects, boundary calculations etc. The aim of segmentation is to change the representation of an image which is simpler, easier and meaningful to analyze

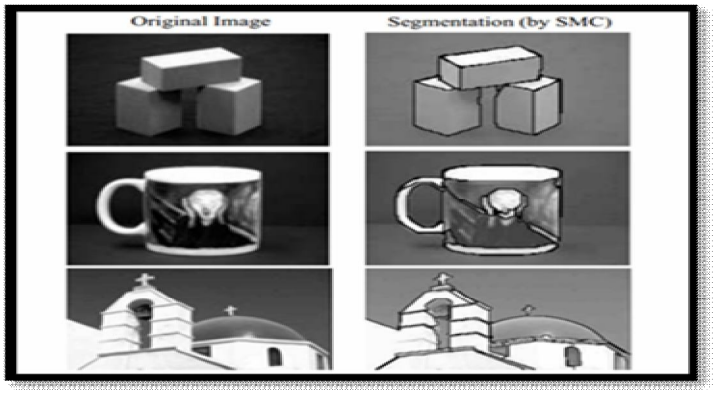

Fig.1 Example of segmentation

II.METHODOLOGY

Clustering is used in image segmentation where data is organized in to groups (clusters) such that the data objects that are similar to each other are put in the same cluster. Clustering is a form of unsupervised [5] learning in which no class labels are provided but data records need to be grouped based on how similar they are to other records.

A.Image Enhancement

Image enhancement is a process of adjusting digital images so that the results are more suitable for display or further image analysis .it improves the qualities of an image.

Fig.2 Image enhancement

Fig2 shows image enhancement where the input image is enhanced in order to get a better image.

B.Morphological operations

Morphological image processing is a collection of nonlinear operations related to the shape or morphology of features in an image. Morphological filtering of a binary image is conducted by considering operations like opening and closing. The morphological operations are applied to gray scale images to segment the tumour [2, 3]. Morphological process is conducted to extract the required region. The use of this operation is to show only the part of the image which has tumour which is identified as white color that is specified using the operation strel command, which acts as a morphological structuring element.

C. Proposed method

In the detailed level design the details and flowchart of each of the module has been described .This involves module specification such as

Brain Image from MRI scan
Image enhancement
Morphological operations
Fuzzy C-Means clustering
K-Means clustering
Performance analysis

Fig3 explains the flowchart of the proposed method the input to the system would be MRI images of the brain. Image enhancement is carried out to produce the clear visual of the image after the enhancement of the image morphological process is carried out to extract the required region. Next by implementing the two unsupervised algorithms K-means and Fuzzy C-Means with clusters the exact result is produced. In the proposed approach we combine both segmentation and clustering. Due to the unsupervised nature the proposed method is efficient and less error sensitive. At the end the output is image where tumours are segmented and can be differentiated from other parts of the brain.

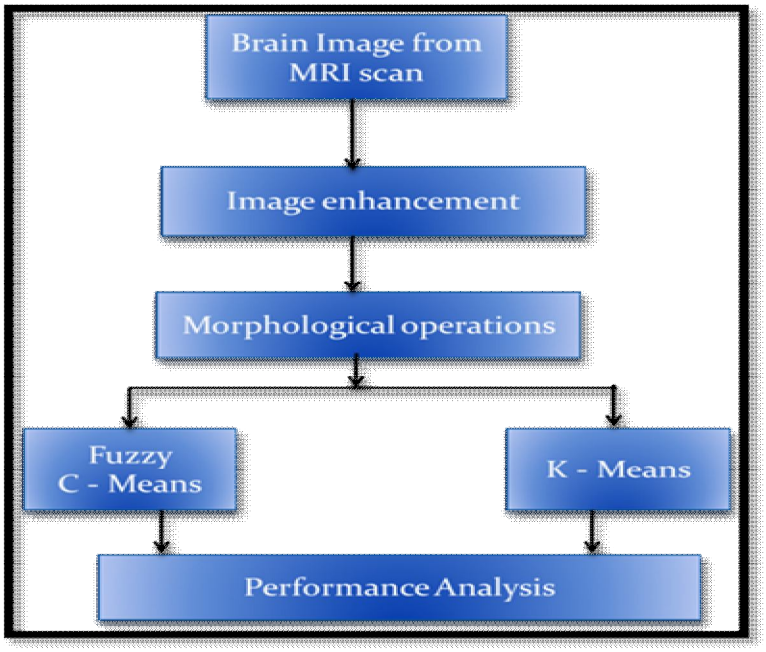

Fig.3 Proposed Method

D. Sequence Diagram

Fig4 shows the sequence diagram which defines between user input brain images and by sequences it works and finally gives the output result. The input to the system is the original images from MRI scan of a brain, image enhancement is carried out to get clear representation of an image and then the morphological operations are carried out through processes like erosion, dilation, opening and closing. Next by implementing K-means and Fuzzy C-means with clusters the tumors are segmented and the final result is obtained.

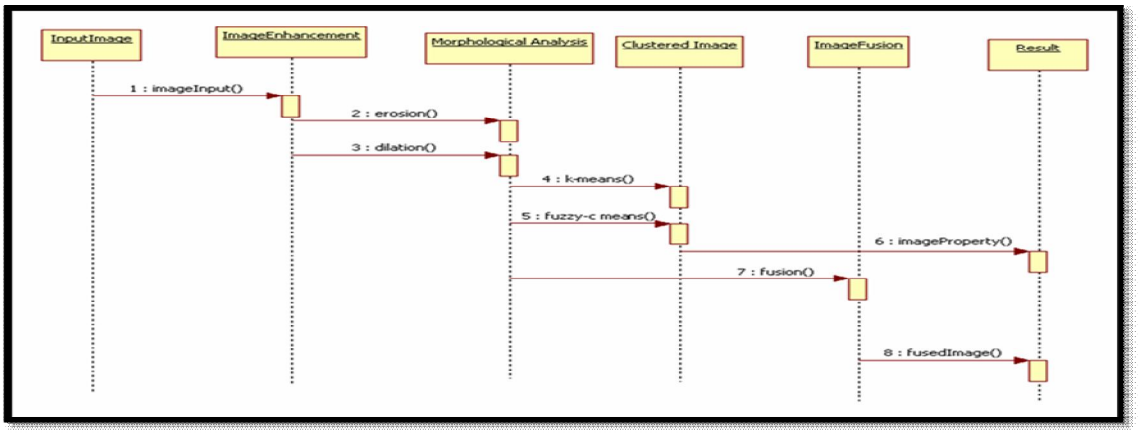

Fig.4 Sequence Diagram

III .PROPOSED ALGORITHM

Segmentation

Segmentation is a process of partitioning an image in to different parts. The division in to parts is often based on the characteristics of the pixels in the image. In our paper the segmentation of the tumour tissues is carried out using k-means and fuzzy c-means clustering.

K-Means based segmentation

The k-means clustering [6, 7] was introduced by MacQueen.it is one the simplest unsupervised learning algorithm that solves the well-known clustering problem.

The procedure follows a simple and easy way to classify a given set through a certain number of clusters i.e.; K (fixed)

The k-means based segmentation depends on centroid, the center of mass of geometric objects. The centroid is based on minimum distance.

The k-means is used for image retrieval algorithms, is traditional and just needs to do distance calculation.

1. The idea is to define k centroids one for each cluster. This centroid should be placed in a cunning way because of different locations causes different results. so the better choice is to place them as much as possible far away from each other.
2. Take each point belonging to a given data set and associate it to the nearest centroid when no point is pending the first step is completed and early group is done. At this point we need to recalculate k new centroids as centers of the clusters resulting from the previous step.
3. We have k new centroids and new binding has to be done between the same data set points and the nearest new centroids. A loop has been generated as a result of this loop we may notice that the k centroids change their location step by step until no more changes are done .In other words centroids do not move any more.

Fuzzy C-Means Based Segmentation

A modification by Bezdek[8]of an original crisp clustering method. Bezdek introduced the idea of fuzzification parameter i.e. (M) in the range [1, N] which determines the degree of fuzziness in the clusters when M=1 the effect is a crisp clustering of points. When M>1 the degree of fuzziness among points in the decision space increases.

Here the number of clusters and the fuzzification parameter is fixed.

1. Randomly initialize the cluster center.
2. Creating distance matrix from a point x_i to each of the cluster centers to with taking the Euclidean distance between the points and the cluster centers.
   $d=\sqrt{\sum} (x_{i-} c_{i)}{}^2$
3. Creating membership matrix takes the fractional distance from the points to the cluster centers and makes this a fuzzy[10] measurement by raising the fraction to the inverse fuzzification parameter this is divided by the same of all fractional distances there by ensuring that the sum of all membership is 1.
4. Creating membership matrix fuzzy c-means imposes a direct constraint on the fuzzy membership functions associated with each point as follows the total membership for a point in sample or decision space must add to 1.
5. Generating new centroid for each cluster.
6. Generating new centroid for each cluster with iterations all this step optimize cluster centers will generate.

IV. RESULTS AND DISCUSSION

Input to the system would be MRI images of the brain which are present in database. Output is where tumours are segmented and can be differentiated from other parts of the brain. After the execution of fuzzy c-means and k-means clustering algorithm the output of the GUI is given below

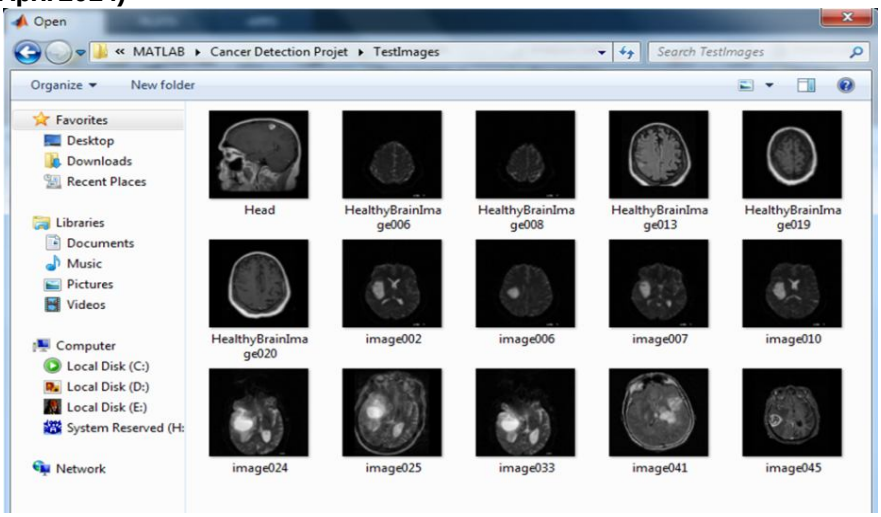

FIG 5 IMAGES OF THE BRAIN FROM MRI SCAN

Fig5 shows the select test images from the database where the images of the brain from MRI scan are stored.

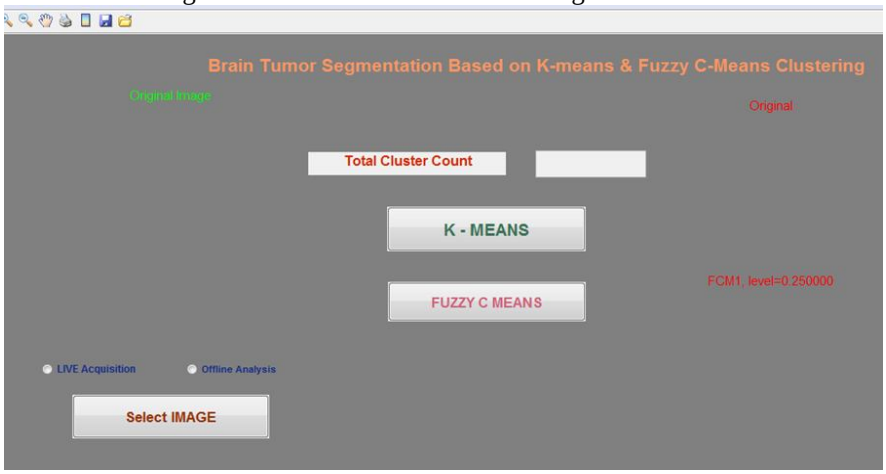

FIG 6MAIN GUI WINDOW

Fig 6 shows the representation of a main graphical user interface window.

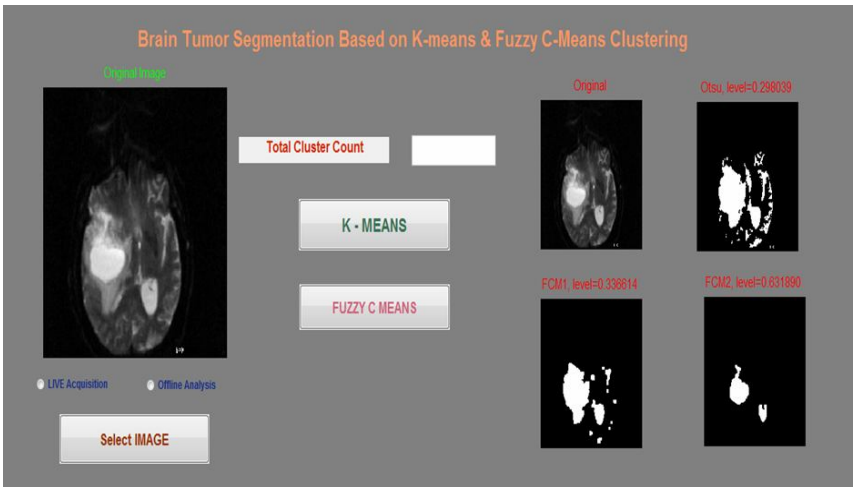

FIG 7RESULT WINDOW AFTER EXECUTION OF FUZZY C-MEANS CLUSTERING

Fig 7 shows the output after execution of fuzzy c-means clustering where the tumors are segmented.

The proposed method has been successfully implemented and tested with wide range of brain images. The tumours are segmented using k-means and fuzzy c-means clustering, but the segmentation is faster using k-means when compared to tumour segmentation using fuzzy c-means clustering.

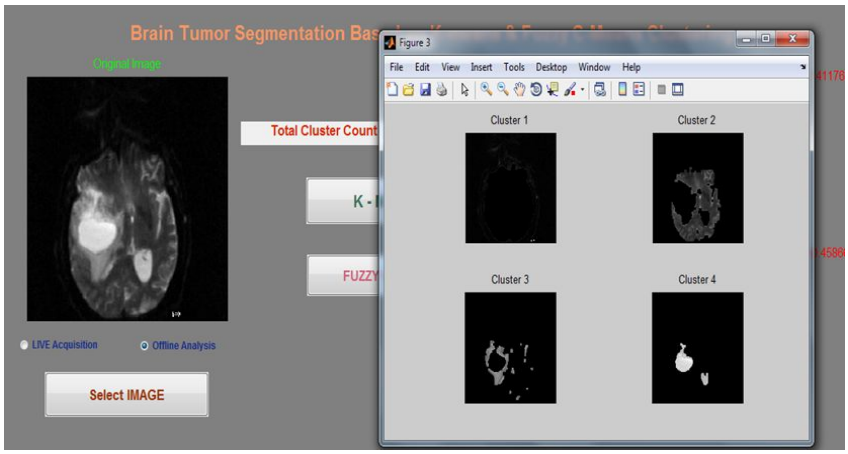

FIG 8 RESULT WINDOW AFTER EXECUTION OF K-MEANS CLUSTERING

Fig 8 shows the output after execution of k-means clustering where the tumors are segmented

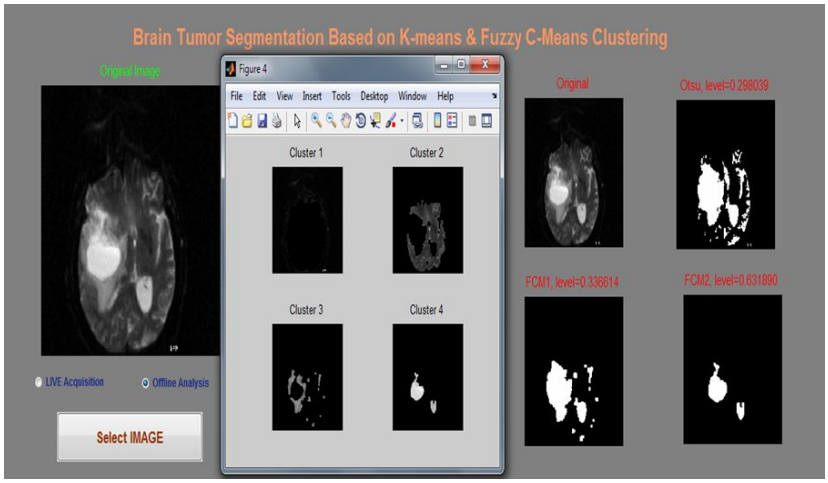

FIG 9 COMPARISON OF K-MEANS AND FUZZY C-MEANS CLUSTERING

V.CONCLUSION

Segmentation algorithms used were k-means and fuzzy c-means which made segmentation work easier. Samples of human brains were taken which were scanned by using MRI process and then applying k-means and fuzzy c-means algorithms the results were processed with less execution time. Morphological techniques with segmentation methods were been used and the tumours were segmented. Unsupervised segmentation is better than supervised segmentation methods, because supervision is not required.

REFERENCES

[1] PratibhaSharma, manojdiwakar,sangamchoudhary "Application of egde detection for brain tumour detection" volume 58 No2(2011).
[2] Digital image processing-Rafael C.Gonzalez,RichardE.woods-ADDISON-WESLEY,an imprint of pearson education ,1st edition.
[3] J.Goldberger,S.Gordon,H.Greenspan, "Unsupervised Image-set clustering using an information theoretic framework",IEEE Transactions on image processing,vol 15,No 2,February 2006.
[4] Morphological image processing approach on the detection of tumour and cancer cells ICDCS,2012 International conference on march 15-16.
[5] S.R.Kannan,jan 2005"segmentation of MRI using new Unsupervised Fuzzy C means algorithm "ICGST-GVIP jornal,Volume 5,Issue2.
[6] Kharrat, A.Benamrane, N.BenMessaoud, M.Abid, Comput. &Embedded Syst Lab. (CES),Net.Eng.Sch. ofSfax, Sfax, Tunisia, Nov,2009.
[7] Fahim.A.M ,Salem A.M, Torkey F.A, Ramadan M.A "An Efficient enhanced K-Means Clustering Algorithm" Journal of Zhejiang University Science A 2006
[8] Juraj Horvath,2006 "Image segmentation using Fuzzy C-Means" SAMI 206
[9] Y.Zhang,"A Survey on evaluation methods for image segmentation ",Pattern Recognition,vol.29,pp.1335-1346,1996.
[10] S.R.Kannan,jan 2005"segmentation of MRI using new Unsupervised Fuzzy C means algorithm "ICGST-GVIP jornal,Volume 5,Issue2.