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AUTOMATIC NEURAL NETWORKS BASED BRAIN TUMOR SEGMENTATION AND CLASSIFICATION USING SUPPORT VECTOR MACHINE

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Abstract— ***A tumour is a abnormal growth of tissues in the brain. It will be destroy the life of ongological patients. The motive of this paper is to come up with a fully automatic tumor segmentation approach using convolution neural networks. Tumors can appear anywhere in the brain and have almost any kind of shape, size, and contrast. Automated methods are sought in order to avoid the time consuming burden of manually contouring the structures. The problem is particularly difficult in the context of brain tumors. The proposed fuzzy segmentation algorithm can be used, in particular, for segmentation of tissues which contain rather different structures. The core of this approach is determination of a suitable membership function for each pixel in the input image and matching of the pixels of same properties into the output classification classes.***

Index Terms—Automated Methods, Brain Tumour, CNN, and Fuzzy Segmentation.

I. INTRODUCTION

Image segmentation is commonly used for measuring and visualizing the brains anatomical structures for analyzing brain changes. The presence of a necrotic core is frequent resulting on a strong contrast with the "active" tumor. Prior information regarding the shape of the tumor cannot be used as they have variable sizes and shapes. DLGGs in particular, have very fuzzy and irregular boundaries due to their infiltrative nature. Edema (swelling of brain tissue around the tumor) and mass effect (tissue displacement induced by the tumor) are quite uncommon due to the slow-growing nature of the DLGGs. In this context, the simplest segmentation methods such as thresholding or region growing are insufficient. The objective of surface based methods is to find the organ or tumor's boundary by propagation a curve/surface with a flow that is determined according to curvature and image constraints (generally the image gradient).

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Despite extensive and promising work in the tumor segmentation field, obtaining accurate and reliable segmentations of brain tumors remains a difficult task.

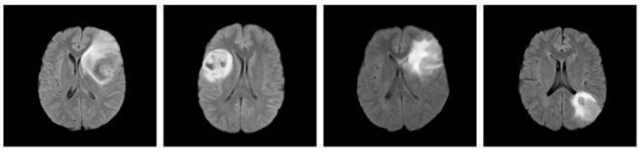

Fig.1 Examples of different tumours appearances on brain in MRIs

Segmentation methods can be grouped in two categories: surface and region-based approaches. The objective of surface based methods is to find the organ or tumor's boundary by propagation a curve/surface with a flow that is determined according to curvature and image constraints (generally the image gradient). Snakes and level sets are typically used in this context. The former defines the object's boundary explicitly as a parametric curve, while the latter defines the contour via an implicit function allowing for more complex geometries and topological changes. Region based methods consider the segmentation problem from a different angle. Here, the goal is to identify all voxels belonging to the object and separate them from the rest of the image.

The structural or anatomical modalities aim at visualizing the different structures and tissues of the brain. Among them, the most popular for Neuro imaging studies are the Computed Tomography (CT) and MRI. CT imaging relies on X-ray technology that is based on the absorption of X-rays beams as they pass through the different tissues of a patient's body. CT scans are constructed by using a series of X-ray beams that rotate around the patient's head.

II EXPERIMENTAL METHOD

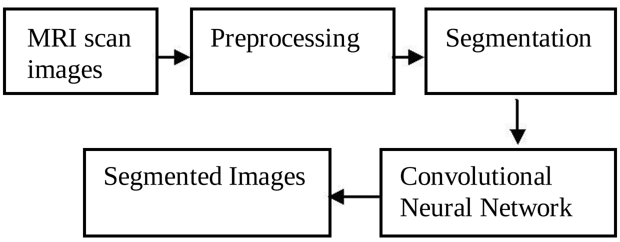

Fig.2 Block Diagram

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A.PREPROCESSING

The pre-processing of the input MRI image is carried out using three techniques of RGB to grey conversion, skull strip removal and histogram equalization.

CONVERSION TO GRAYSCALE

Image obtained after scanning, usually in RGB (Red, Green and Blue) color format. The image contain three independent planes namely Red, Green and Blue components. In the case of RGB image, pixel intensity represented by the combination of these three plane intensity values. In the case of grey scale image pixel values represented by the intensity values ranges from 0 to 256. Grey scale image ranging from black to white with different shades of grey.

SKULL STRIPING

Skull striping refers to the removal of non-brain structure and unwanted portions of image from scanned image to have the required image for tumour detection. Scanned image consists of brain area, scalp and skull . The unwanted portions can be separate with the aid of rim of cerebrospinal fluid (CSF) .Skull removing can be done with the help of intensity thresholding followed by morphological operation to obtain required brain area for tumor detection. Let the input image can be represented by an array of pixels, which hold the values of intensity at corresponding positions in an image.

HISTOGRAM EQUALIZATION

Histogram is a graphical representation of tonal distribution in a digital image. It contains number of pixels for each tonal value. Histogram equalization refers the process to improve the dynamic range of the histogram of the image, to obtain output image with a uniform distribution of tonal values. This process improves the contrast of the image which will improve the feature extraction . Let be a given image represented IM as an Imr X Imc matrix of integer pixel intensities ranging from 0 to N-1. Here, N is the number of possible intensity values and 256 in case of gray-scale images.

TABLE I ARCHITECTURE OF HGG IN CNN

	Type	Filter size	HGG stride
Layer 1	Conv.	3 3	1 1
Layer 2	Conv.	3 3	2 2
Layer 3	Conv.	3 3	1 1

B.SEGMENTATION

Image segmentation is the fundamental step in medical image analysis. Segmentation is a procedure to separate similar portions of images showing resemblance in different features like shape, size, color, etc. For the segmentation of medical images, mostly grayscale images are used. Tumors are commonly stated as the abnormal growth of tissues and the brain tumor is a diseased part in the body tissues that is an abnormal mass in which growth rate of cells is irrepressible.

A set of 40 images have been taken from self-collected dataset, tumor region is extracted in all of these images using segmentation methods, Figure Shows scheme of segmentation criteria is given in the flow graph below. A flowchart of the adopted scheme is presented below accompanied by a brief overview of segmentation methods..

C.CONVOLUTIONAL NEURAL NETWORKS

At the most basic level, a convolutional neural network is just a multilayer, hierarchical neural network. There are three principal factors that distinguish the CNN from the simple feedforward neural networks described local receptive fields, weight sharing, and spatial pooling or subsampling layers. In particular, suppose that the input to the CNN consists of a single 32-by-32 image patch. For instance, this input can be a 32-by-32 grid of pixel intensity values.

In the simple neural networks described , each neuron was fully connected to each of the neurons in the subsequent layer. More concretely, each neuron in the hidden layer computed a function that depended on the values of every node in the input layer. In visual recognition, however, it is often advantageous to exploit local substructure within the image. For example, pixels that are close together in the image (e.g., adjacent pixels) tend to be strongly correlated while pixels that are far apart in the image tend to be weakly correlated or uncorrelated.. In the CNN architecture, we capture this local substructure within the image by constraining each neuron to depend only on a spatially local subset of the variables in the previous layer. For example, if the input to the CNN is a 32-by-32 image patch, a neuron in the first hidden layer might only depend on an 8-by-8 sub window within the overall 32-by-32 window. The set of nodes in the input layer that affect the activation of a neuron is referred to as the neuron's receptive field. Intuitively, this is the part of the image that the neuron "sees." Thus, in a CNN, individual neurons generally have a local receptive field rather than a global receptive field. In terms of network architecture, this translates to a sparser set of edges since adjacent layers are not always fully connected.

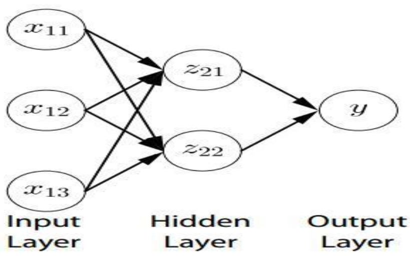

Fig 3.Simple feed forward networks

A.MATHEMATICAL EQUATIONS

Fuzzy c-means (FCM) is the clustering algorithm which allows one piece of data may be member of more than one clusters. It is based on reducing the following function

The update of membership Mij and the cluster centers R, Where

m- Any real number greater than 1,

Mij- degree of membership of Xin the cluster j,

x- Data measured in d-dimensional,

$$M_{ij} = \frac{1}{\sum_{K=1}^{C}\left(\frac{||x_i - c_j||}{||x_i - c_j||}\right)^{\frac{2}{m-1}}}$$

$$max_{ij}\{|M_{ij}^{(K+1)} - M_{ij}^{(k)}|\} < \delta$$

The algorithmic steps involved for brain tumor shape detection is as follows,

1. Begin the procedure.
2. Get the MRI examines picture data in JPEG position.
3. Check whether the info picture is in required configuration and move to step 4 if not show blunder message.
4. On the off chance that picture is in RGB format change over it into gray scale else move to next step.
5. Discover the edge of the grayscale picture.
6. Ascertain the quantity of white focuses in the picture.
7. Ascertain the extent of the tumor utilizing the equation.
8. Show the size and phase of tumor.
9. Stop the project.

III EXPERIMENTAL RESULTS

The ouput result of the segmented images using convolutional neural networks.

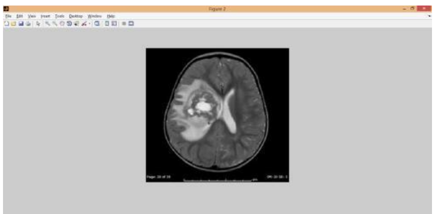

Fig 4: Input Image of MRI image

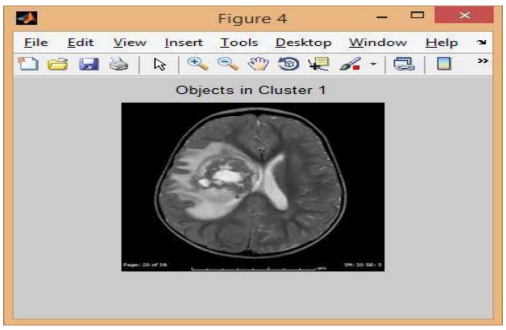

Fig 5: Segmentation Process

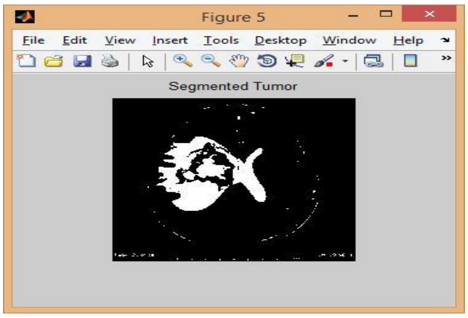

Fig 6:Segmented Images

IV PROPOSED SYSTEM

FUZZY LOGICS

The proposed fuzzy segmentation algorithm can be used, in particular, for segmentation of tissues which contain rather different structures. The core of this approach is determination of a suitable membership function for each pixel in the input image and matching of the pixels of same properties into the output classification classes. This approach represents the main difference against standard hard thresholding methods where the input decision-making criterion is a fixed thresholding value. In clinical diagnosis, the image is not usually evaluated as a whole but only a part of it is analysed.

Fuzzy C-Means (FCM) is an iterative process that allows data that belong to two or more clusters with different membership coefficients. The initial fuzzy partition matrix is generated and then the initial fuzzy cluster centers are calculated. The cluster centers and the membership grade point in each step of the iteration are updated, and the objective function is minimized to find the best position for the clusters. The process stops when the maximum numbers of iterations is reached, or when the objective function improvement between two consecutive iterations is less than the minimum amount of improvement specified.

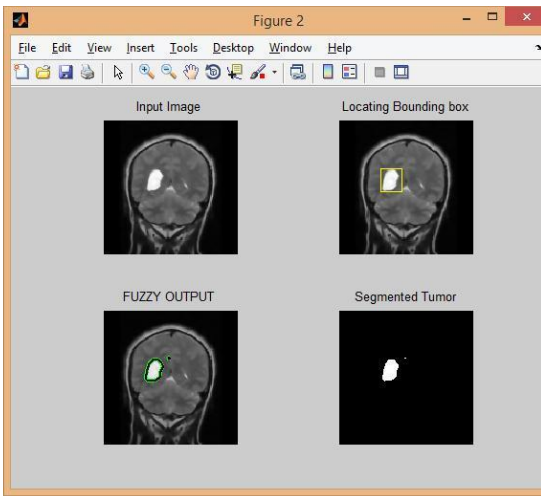

Fig 7: Result of Fuzzy logic

FCM is also known as a data clustering method in which each data point belongs to a cluster to a degree specified by a membership value. FCM divides a collection of n vectors into c fuzzy groups and finds a cluster centre in each group. FCM uses fuzzy partitioning such that a given data point can belong to several groups with the degree of belongings specified by membership values between 0 and 1.

V CONCLUSION

In summary,It is propose a fuzzy logic to segment the brain tumours in MRI images. Preprocessing stage to remove the noise from brain tumours.Segmentation to segment the anotamical structures of the brain.And also automated neural network classify the image without any human interaction. Finally get segmented part of the brain tumour in MRI images.

REFERENCES

[1]Bengio A. and Vincent P.(2013),'Representation learning: A review and new perspectives', IEEE transactions on,vol.35,no.8,pp.1798-1828.

[2]Geremia E. and Menze B.H.(2013),'Spatially adaptive random forests',IEEE transaction on pp. 1344-1347.

[3]Gooya A.(2012),'Glistr:glioma image segmentation and registration',IEEE transactions on ,vol.31,no.10,pp.1941-1954.

[4]Islam A. and Reza S.(2013),'Multifractal texture estimation for detection and segmentation of brain tumours',IEEE transaction on bio medical engineering,vol.60,no.11,pp.3204-3215.

[5]Jarrett K.(2009),'What is the best multistage architecture for the object recoginition?',IEEE international conference,pp.2146-2153.

[6]Menze B.(2015),'The multimodal brain tumour image segmentation benchmark(brats)',IEEE transaction on medical imaging, vol.34,no.10,pp.1993-2024.

[7] Nyul L.G. and Udupa J.K.(2000),'New variants of a method of mri scale standardization',IEEE transactions on medical imaging,vol.19,no.2, pp.1-50.

[8] Pinto A.(2015),'Brain tumour segmentation based on extremely randomized forest with high level features',International conference of the IEEE,pp.3-40.

[9]Tustison N.J.(2010),'N4itk:improved n3 bias correction',IEEE transaction on medical imaging,vol.29,no.6,pp.1310-1320.