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Recognization and Systematization of MR Imagesusing K Means Clustering and DNN

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Abstract: ***Brain tumors are the result of unusual growth and unrestrained cell disunity in the brain. Most of the medical image application lack in segmentation and labeling. Brain tumors can lead to loss of lives if they are not detected early and correctly. Recently, deep learning has been an important role in the field of digital health. One of its action is the reduction of manual decision in the diagnosis of diseases specifically brain tumor diagnosis needs high accuracy, where minute errors in judgment may lead to loss therefore, brain tumor segmentation is an necessary challenge in medical side. In recent time numerous ,methods exist for tumor segmentation with lack of accuracy. Deep learning is used to achieve the goal of brain tumor segmentation. In this work, three network of brain MR images segmentation is employed .A single network is compared to achieve segmentation of MR images using separate network .In this paper segmentation has improved and result is obtained with high accuracy and efficiency.***

Keywords: Deep neural network, K means clustering, Median filtering, Histogram equalization

I. INTRODUCTION

Medical image processing is a digital foundation employed in most of the medical application. Medical imaging is nothing but creating images of various parts of human body for diagnosis and treatment purpose within digital health. Some of the approaches based on generative models and approaches based on discriminating models [1]. Critical component in diagnosing tumor, designing treatment for evaluation must be highly accurate and reliable. Good achievement in 2D image segmentations made possible by deep neural networks (NNs) and machine learning techniques , but it's not easy for neural network to segment images from 3 dimensional medical MR images. Applying the deep neural network concept tumor detection includes several enhancement techniques that are sequenced into Pre-Processing, Segmentation, Optimization and Feature Extraction. This conceptual study states the most advanced method of segmentation and Detection of tumor- through deep learning models based on image processing [2].

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Benign and malignant are the two types of brain tumor. Early and efficient detection of brain tumor help in providing appropriate treatment purposes that increases apparent increase in life span and healing purpose. Deep Neural Network (DNN) is most important method and observatory in real time methods . Test data produces the accuracy 99.12% in this DNN method. This accuracy and results provided by physician is the most important factor for the doctors to diagnosis the brain tumor patient with better treatment and diagnosis planning. [3]. Images are easiest method of data representation, learning images and take out the information from them and used for upcoming processes .Initially segmentation is carried out to identify the distinct objects. In this study K-means clustering algorithm is used for segmentation process. [4] . For predicting growth rate and diagnosis purpose the segmented MRI datasets is the necessary factor. The low grade form of brain tumor is not more aggressive one compared to other form, the life expectancy is for several years. On the other hand the high grade form of brain tumor are the aggressive one that shortens the life of patient possibly to two years. The affected brain can be examined deeply through magnetic resonance imaging for both low grade and high grade form , and is one of the most usual magnetic resonance imaging arrangement is used to differentiate the present and past diagnosis to establish hint about the disease oddity. Using MR images as input the process of segmentation is carried out which has the highest ability to provide diagnosis for patient with at most rate of growth detection and diagnosis planning [5].Only two steps are carried out in every existing outline-based edge detecting algorithms. The initial part is to get the normal pattern of curve at each pixel towards the boundary. The sub sequential step is to find the location where the degree to which maximum value occur and the degree values are above a particular critical value and the edge points are declared [6] Efficient magnetic resonance image with minimal noise is necessary in the systemized field in digital image processing and increase in variance of image. Histogram equalization is used to denote the segmented image that is the most easiest way of conventional pack of data used for further more calculations[7]. According to survey, in United States half of the diagnosed patient die due to primary brain tumor. Computerized models are used to treat brain tumors. For treating brain tumor the magnetic resonance imaging is used which is one of the most popular method among computerized model. For detecting brain tumor conversion RGB to gray-scale images is essential process . Removal of noise by retaining the edge is made to achieve better segmentation result [8].

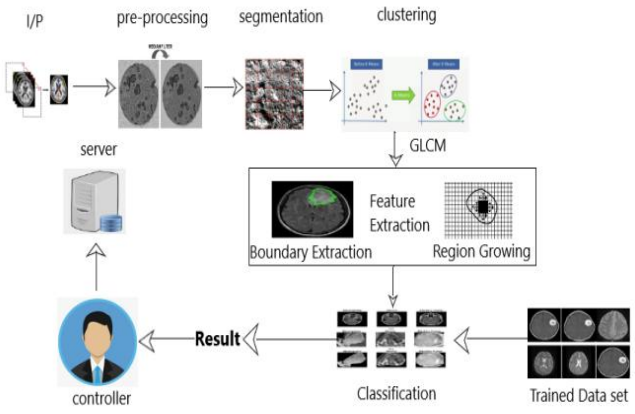
At present ,better performance is aimed by k means clustering algorithm employed in segmentation process. This sharpens the tumor outlines and is fast when compared watershed algorithm. The proposed technique produce appreciative result system [9]. MRI image are used to get the detailed description of the brain. Separation between normal tissue and abnormal tissue is difficult due to same color [10]. The Region growing technique is used to find the growth rate that in turn used in treatment and diagnosis purpose. The initial seed element detection has to be made to calculate the rapidness spread of tumor.

II. EXISTING SYSTEM

Using machine learning techniques that learn the pattern of brain tumor is useful because it is time consuming for humans to segment image and being susceptible to human errors or mistakes. That is,3064 dataset are saved in the database that are extracted from 233 patients. Where the tumors are detected respect to the texture and feature of normal brain. Gabor filter is employed in pre-processing. Segmentation process is denoted in graphical representation used. Clustering of segmented image is made possible through watershed algorithm. Feature extraction are made from segmented image through grey level co-occurrence matrix and for classification purpose support vector machine algorithm is used .

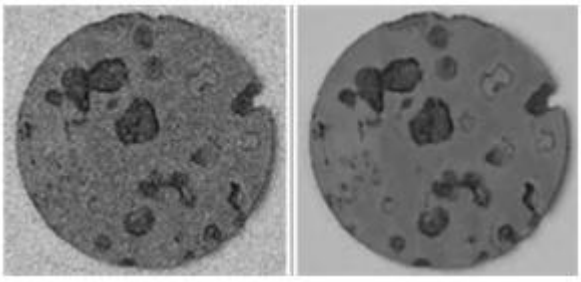
III. PROPOSED SYSTEM

An automatic brain tumor segmentation technique using deep neural network is specialized in this study. We have used three MRI views of human brain. MRI scan is used because it is less harmful and more accurate than CT brain scan. All previous works on the dataset that we are working with are for classification of tumor types such as meningioma, glioma, pituitary tumor. None of the previous works performed on this dataset are intended for segmentation. The partitioning of the images based on the direction of captured MR images is worked well in deep learning. Hence, three networks are trained separately to achieve better segmentation result. In this system. we use median filtering for pre-processing, the processed image is segmented through k means clustering algorithm and represented as histogram equalization. The segmented image is converted to grey scale image through GLCM for feature extraction in which boundary extraction and region growing are occurred and classified using deep neural network.



A. Pre - processing

It is enhancement technique and the initial step made in input image. The input image is of RGB form, the median filtering technique is used to process image for noise removal because, it removes noise while preserving edges which is not achieved in Gabor filtering. Median filter is a unusual action of pixels that later combined with neighboring pixel of short distance. Median filtering produces noise free image with high accuracy. The arrangement of near by pixel is called 'window', which move smoothly pixel by pixel, over the image. The median is resulted by arranging all the pixel values number by number and substituting the pixel that considered with middle value of pixel.



(a)Before filtering (b)After filtering

B. Segmentation

Segmentation using the histogram equalization works well for maintaining and improving accuracy. The pre-processed image is divided into separate sections with respect to pixels. The input image is compared with the reference image and pixels are segmented corresponding to reference image. That is, n*n pixels such that both the image have equivalent number of pixels, comparison between the images is made for feature extraction through pixel by pixel for calculating the difference between the image. Histogram equalization gets the input image, analyze and the overall difference is summed to result in percentage of how much amount of abnormalities being detected from normal image and input image.

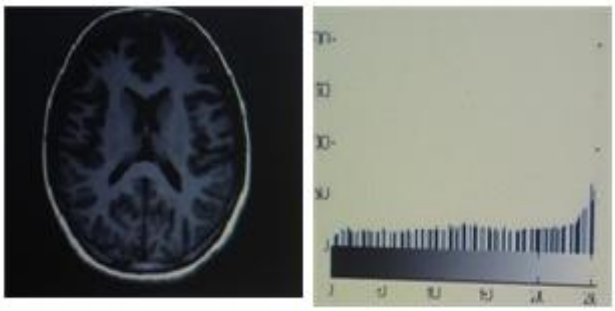
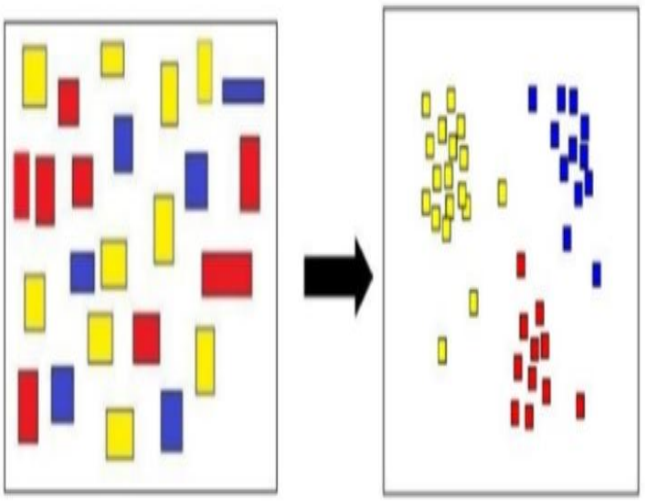


Fig.1 . Histogram equalization for MRI

C. Clustering

Segmented pixel is gathered and grouped. k means clustering is a versatile algorithm and can be used for any type of grouping, it is computationally faster than watershed algorithm K means clustering works in such a way by selecting k random point from the data and assign all points to the closest cluster. All the pixel share similar pixel intensity value and are in the same way connected to each other.



(a)Before clustering (b)After clustering

D. Feature extraction

Feature extraction is one of the most important step in this system. Feature extraction is used to extract the image attribute for further more steps with high accuracy and resolution. Feature define the behavior of the image, efficiency in classification and obviously in time consumption also. Feature is the similarities found in the image. The RGB image is converted to gray scale image to improve the efficiency using GLCM . GLCM is also known as gray level spatial dependence matrix. Feature is nothing but shape, size, scale, orientation and texture. Boundary extraction technique is undertaken in GLCM image for boundary extraction and finally to find the seed and rate of growth of tumor region growing technique is used.

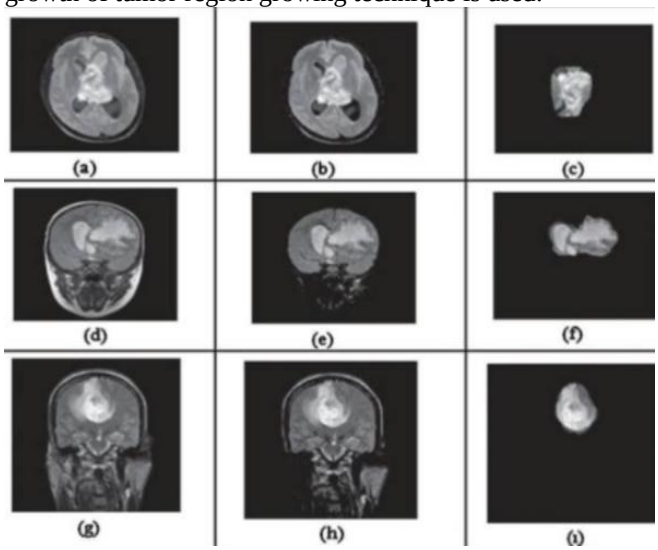


Fig.2 .GLCM feature extraction

E. Classification

Classifications are made based on the feature extracted. It is a technique used to categorize the system based on shape ,position ,texture ,scale and orientation.DNN is employed in classification of tumors by estimating the feature difference between the input image and reference image is taken into account and calculating the overall sum gives the percentage affected. According to the percentage derived the tumor is classified from the dataset trained. The output layer depends on the input layer. The advantage of using DNN is it increases model complexity by adding more layer. Therefore ,it is more accurate compared to SVM.

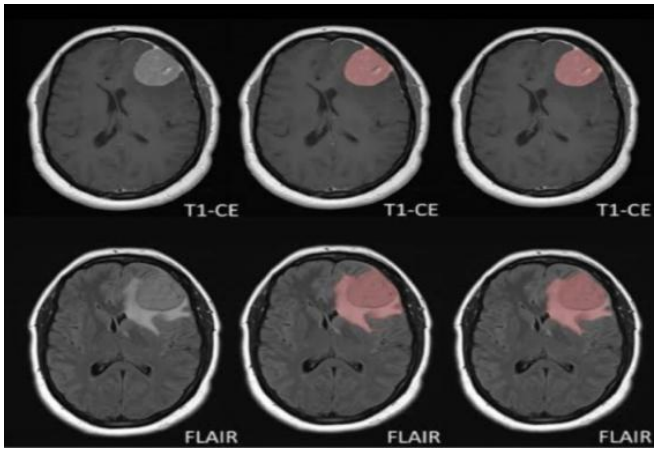


Fig.3. DNN based Classification

IV. RESULT AND DISCUSSION

The main contribution of this paper is partitioning of images based on the direction of captured MR images. Hence three network are trained separately to achieve better segmentation result is obtained it is updated in the controller which in turn maintained in server using internet of things. The process of segmentation is overcome in this paper, and high accuracy, resolution and efficiency is achieved. This paper results in improvement of segmentation and labeling .

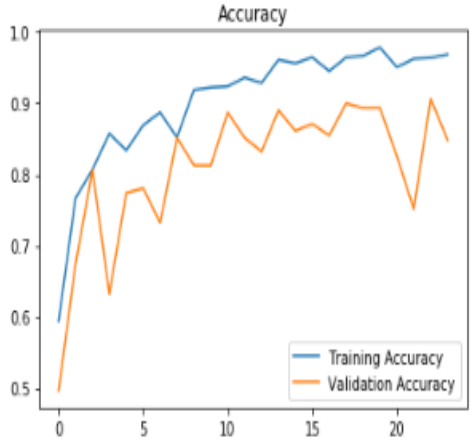


Fig.4 . Performance flow

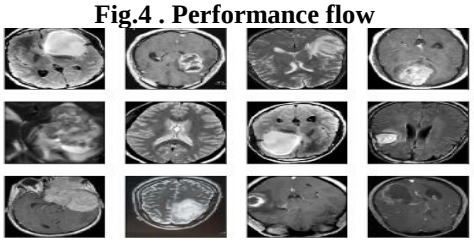


Fig.5. With tumor

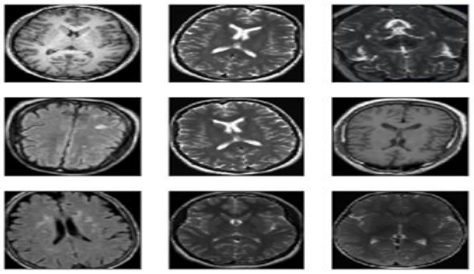


Fig .6. Without tumor

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V. CONCLUSION

The main contribution of the paper concludes that ,the image can be processed from the various direction the image captured. The positivity factor is that the accuracy ,resolution and efficiency is achieved.

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