Survey on Brain Tumor Segmentation Using Neural Networks

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Abstract- *Image processing plays a major role in biomedical applications in order to detect many diseases which affects the human .Brain tumours was developed in order to detect and classify the presence of brain tumours according to magnetic Resonance (MR) image and which type of ANNs and activation function for ANNs is the best for image recognition. Neural networks must be able to determine the state of the brain according to MR images .In all procedures ,image processing and ANNs design ,MATLAB was included.*

Keywords- Magnetic Resonance

I. INTRODUCTION

Brain tumours was developed in order to detect and classify the presence of brain tumours according to magnetic Resonance (MR) image and which type of ANNs and activation function for ANNs is the best for image recognition. Neural networks must be able to determine the state of the brain according to MR images .In all procedures, image processing and ANNs design, MATLAB was included

II. LITERATURE SURVEY

Brain tumor is one of the major causes for the increase in mortality among children and adults. A tumor is a mass of tissue that grows out of control of the normal forces that regulates growth (Pal and Pal, 1993). The complex brain tumors can be separated into two general categories depending on the tumors origin, their growth pattern and malignancy. Primary brain tumors are tumors that arise from cells in the brain or from the covering of the brain. A secondary or metastatic brain tumor occurs when cancer cells spread to the brain from a primary cancer in another part of the body. Most Research in developed countries show that the number of people who develop brain tumors and die from them has increased perhaps as much as 300 over past three decades.

The National Brain Tumor Foundation (NBTF) for research in United States estimates that 29,000 people in the U.S are diagnosed with primary brain tumors each year, and nearly 13,000 people die. In children, brain tumors are the cause of one quarter of all cancer deaths. The overall annual incidence of primary brain tumors in the U.S is 11 - 12 per 100,000 people for primary malignant brain tumors, that rate is 6 - 7 per 1,00,000. In the UK, over 4,200 people are diagnosed with a brain tumor every year (2007 estimates). There are about 200 other types of tumors diagnosed in UK each year. About 16 out of every 1,000 cancers diagnosed in the UK are in the brain (or 1.6%). In India, totally 80,271 people are affected by various types of tumor (2007 estimates).

"Artificial Neural Networks (ANNs) are mathematical analogues of biological neural systems, in the sense that they are made up of a parallel interconnected system of nodes, called neurons. The parallel action is a difference between von Neumann computers and ANNs. Combining ANN architectures with different learning schemes,

Results in a variety of ANN systems. The proper ANN is obtained by taking into consideration the requirements of the specific application, as each ANN topology does not yield satisfactory results in all practical cases.

The evolution of digital computers as well as the development of modern theories for learning and information processing led to the emergence of Computational Intelligence (CI) engineering. Artificial Neural Networks (ANNs), Genetic Algorithms (GAs) and Fuzzy Logic are CI non-symbolic learning approaches for solving problems (Mantzaris et al., 2008).

The Segmentation of an image entails the division or separation of the image into regions of similar attribute. The ultimate aim in a large number of image processing applications is to extract important features from the image data, from which a description, interpretation, or understanding of the scene can be provided by the machine. The segmentation of brain tumor from magnetic resonance images is an important but time-consuming task performed by medical experts The digital image processing community has

developed several segmentation methods, many of them ad hoc. Four of the most common methods are:

1) **amplitude thresholding,**
2) **Texture segmentation**
3) **Template matching, and**
4) **region-growing segmentation.**

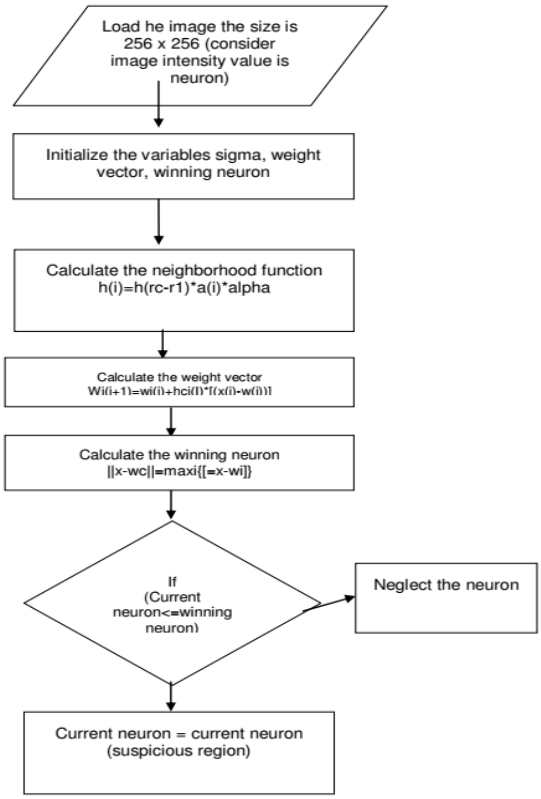
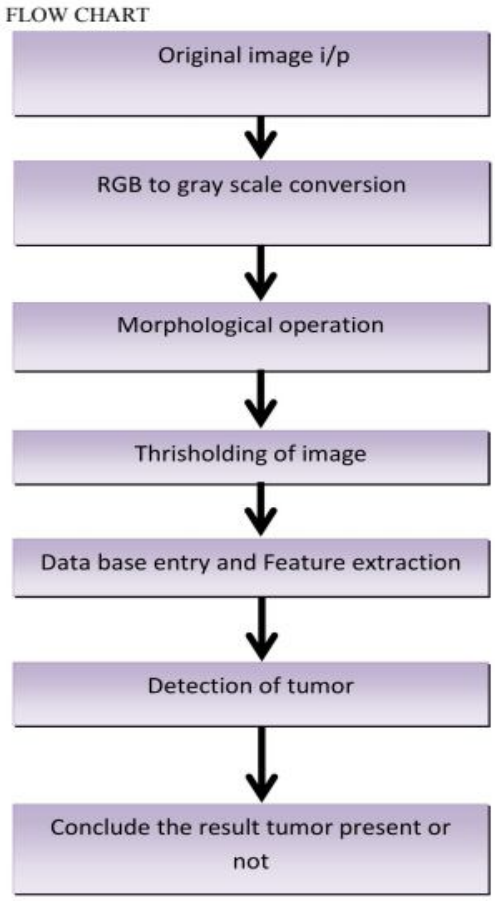


Figure 1. Flow digram HSom for detection of brain tumor.

It is very important for detecting tumors**,** edema and necrotic tissues. These types of algorithms are used for dividing the brain images into three categories (a) Pixel based (b) Region or Texture Based (c) Structural based. Several authors suggested various algorithms for segmentation (Hillips etal., 1995; Aidyanathan et al., 1995; Sai et al., 1995;HanShen et al., 2005; Livier et al., 2005). [1].

Brain tumor is one of the most serious diseases occurring among the human beings. This paper describes the proposed strategy to detect & extraction of brain tumor from MRI scan images of the brain. The proposed method is based on back propagation neural network technique for the classification of MRI image. In particular, it has been developed using image enhancement, segmentation, registration, feature extraction & recognition techniques .In segmentation process it includes the morphological operations and thresholding process and in neural network technique it performs the trainingand the testing of image and it gives the result that the tumor is present or not.



In early days cancer patients are increasing day by day and it very hard to detect the tumour in early stage, because the diagnosis of tumour is quite difficult. It is identify by the techniques such as chemotherapy, radiotherapy, but these techniques are too costly and not affordable to common people. In such cases brain tumour detection is carried out by MRI image i.e. magnetic resonance image which uses the image segmentation and neural network technique. It gives the effective diagnosis of tumour and it treatment also in suitable cost.A tumour is a uncontrolled growth of tissue in any part of the body. It creates the uncontrolled cell division usually in the brain. Processing segmentation is done and it locates the objects and boundaries of image. Mainly the segmentation is subdivision of image into its constituent regions.

The segmentation is complete when the object is detect and then the neural network technique is start. In this the training and testing of image is done. In training various features of brain tumour is extracted and then these features are tested and matched. And at the end it gives the output that tumour is present or not. [2].

This paper introduces automatic framework brain tumor detection, which detects and classify brain tumor in MR imaging. The proposed framework brain tumor detection is an important tool to detect the tumor and differentiate between patients that diagnosis as certain brain tumor and probable brain tumor due to its ability to measure regional changes features in the brain that reflect disease progression.

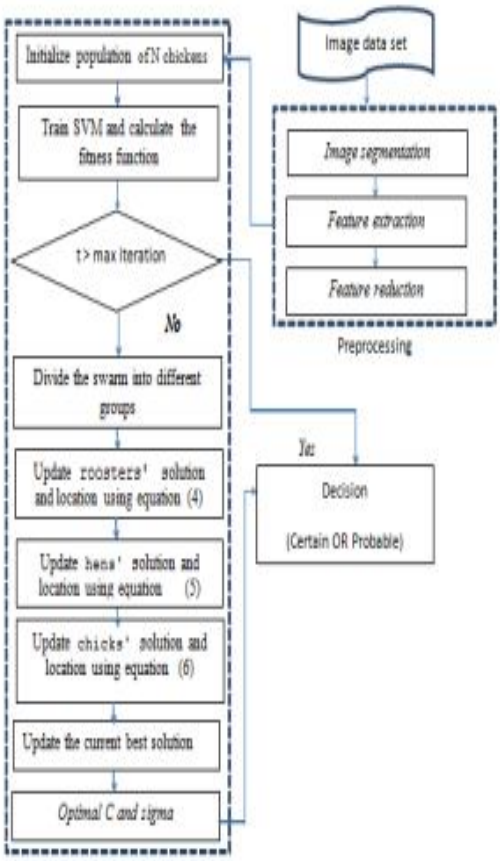


Fig1: The proposed model structure.

The framework consists of four steps: segmentation, feature extraction and feature reduction, classification, finally the parameter values of the classifier are dynamically optimized using the optimization algorithm Chicken Swarm Optimization(CSO) which is a bio-inspired optimization algorithm, and particle swarm optimization (PSO) optimizers to maximize the classification accuracy. We used 80, 100, 150 neuroimage straining data set sizes to train the system and 100 out of sample neuroimages to test the system. The proposed system preliminary results demonstrate the efficacy and efficiency of the system to accurately detect and classify the brain tumor in MRI, that motivate us to expand applying of this system on other types of tumors in medical imagery.The area of automated surveillance systems is currently of Automatic detection of brain tumor from MRI has many challenges in various disciplines that covering pathology.

The most common problems that associated with brain tumor detection are the different sizes and a variety shapes of the brain tumor that may appear at any location. To detect even a tiny or single tumor at the very early stage prior to the appearance of neurological signs, the patient will go through several tests such as Computed Tomography (CT) and Magnetic Resonance Imaging (MRI). For brain tumor detection with efficient medical imagery the most widely used clinical diagnostic and research technique is MRI [3].

In this study a functional models of Artificial Neural Networks (ANNs) is proposed to aid existing diagnosis methods. ANNs are currently a “hot” research area in medicine, particularly in the fields of radiology, cardiology, and oncology. In this paper an attempt was made to make use of ANNs in the medical field. Hence a Computer Aided Diagnosis (CAD)system using ANNs to classify brain tumors was developed in order to detect and classify the presence of brain tumors according to Magnetic Resonance (MR) Image, and then determined which type of ANNs and activation function for ANNs is the best for image recognition. Also the study aimed to introduce a practical application study for brain tumor diagnosis. Neural network must be able to determine the state of the brain according to MR image. In all procedures, image processing and ANNs design, MATLAB was included. From each MR Image a Harlick texture features was extracted to prepare training data which was introduced to neural network as input and target vectors. ANNs was designed using MATLAB tool "nntool". Results obtained explain Elman Network, with log sigmoid activation function, surpassing other ANNs with a performance ratio of 88.24% One of the important goals of Artificial Neural Networks is the processing of information similar to humor interaction actually neural network is used when there is a need for brain capabilities and machine idealistic. The advantages of neural network information processing arise from its ability to recognize and model nonlinear relationships between data. In biological systems, clustering of data and nonlinear relationships are more common than strict linear relationships Conventional statistical methods can be used to model nonlinear relationships, but they require complex and extensive mathematical modeling.

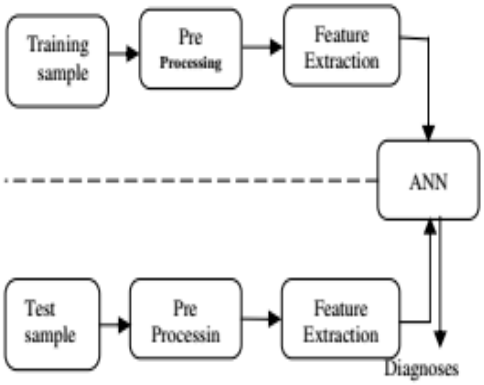


Fig 2: Image recognition system

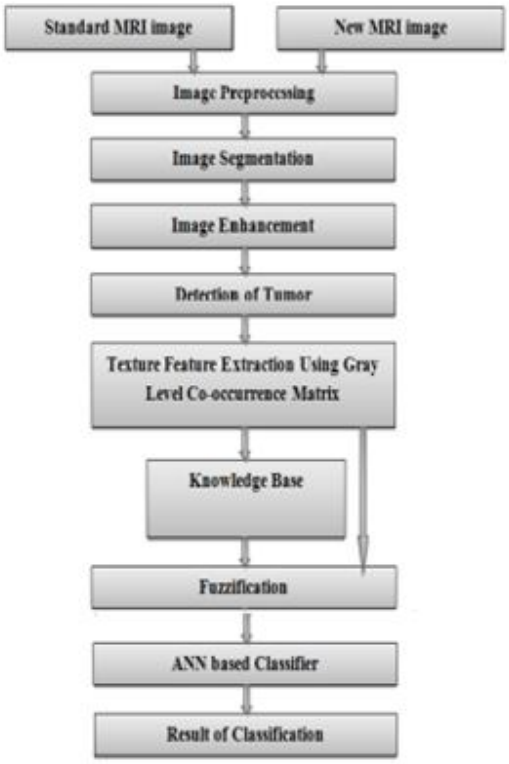
Neural networks provide a comparatively easier way to do the same type of analysis. Well design and training of Neural Network make it qualified for decision making operations when it faced with new data outside training data; this will provide ANNs with high reliability exactly like an expert person.

For image recognition application; Feed Forward Back Propagation neural network is good choice. The number of layers, nodes and activation functions are determined according to the application needed and there is no specific rule for choice. This study suggests a new approach using trial and error but with specific strategy.

Firstly, the initial number of layers, nodes and activation function determined; and the value of performance error recorded. Then, for the same architecture; activation function type changed and the performance error recorded. This procedure repeated, and the activation function that provides the least performance error selected. [4].

Brain tumor is a life threatening disease. The brain contains more than 10 billion working brain cells. The damaged brain cells are diagnosed themselves by splitting to make more cells. This regeneration takes place in an orderly and controlled manner. If the regeneration of the cells gets out of control, the cells will continue to divide developing a lump which is called tumor. In this paper a Brain Cancer Detection and Classification System has been designed and developed. The system uses computer based procedures to detect tumor blocks and classify the type of tumor using Artificial Neural Network in MRI images of different patients with astrocytoma type of brain tumors. The image processing techniques such as histogram equalization, image segmentation, image enhancement, and feature extraction have been developed for detection of the brain tumor in the MRI images of the cancer Detected patients.

The main purpose of the project is to success fully detect brain tumour and classify it with the aid of Artificial Neural Network (ANN) The objective of the system is to provide quality software for detection of brain tumour in humans. The aim of the project is to detect if a patient is infected with brain tumour in anon-invasive way.



In the current scenario radiologists go through the MRI images of a patient to detect if he has a brain tumour. The classifications of brain MRI data as normal and abnormal are important to prune the normal patient and consider only those who have the possibility of having abnormalities or tumour.

The shortage of radiologists and the large volume of MRI to be analysed make such readings labour intensive and cost expensive. This calls for an automated system to analyse and classify all the medical images. In dealing with human life, the results of human analysis involving false negative cases must be at a very low rate. A double reading of medical images could lead to better tumour detection. Recent study has shown that the classification of human brain in Magnetic Resonance (MR) images is possible by supervised techniques such as Artificial Neural Network[1,2,4]. The proposed method will drastically reduce the time required for detection and classification of brain tumour. Increase the efficiency of detection and as a whole the system will drastically reduce the time and cost to detect tumours. The main scope of the

proposed system is that due to its reduced cost for the process of detection it can be used for everyone. [5].

Among brain tumours, gliomas are the most common and aggressive, leading to a very short life expectancy in their highest grade. Thus, treatment planning is a key stage to improve the quality of life of on cological patients. Magnetic resonance imaging (MRI) is a widely used imaging technique to assess these tumours, but the large amount of data produced by MRI prevents manual segmentation in a reasonable time, limiting the use of precise quantitative measurements in the clinical practice. So, automatic and reliable segmentation methods are required however, the large spatial and structural variability among brain tumours make automatic segmentation a challenging problem. In this paper, we propose an automatic segmentation method based on Convolutional Neural Networks (CNN), exploring small kernels.

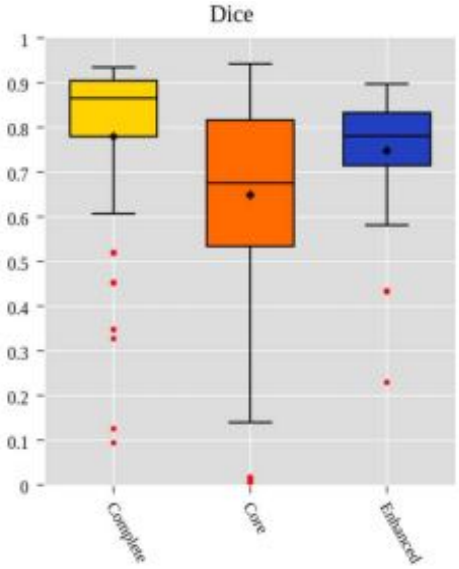


Fig. Boxplots of DSC obtained in the Challenge set of BRATS 2015. The diamond marks the mean.

III. CONCLUSION

In this paper are analysis of different type of diseases caused in our body and when easily identifies the brain tumours and which very helpful for doctor for diagnosis

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