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MRI Image of Brain Tumor Detection Using Threshold and Watershed Segmentation

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ABSTRACT

Brain tumor is a life threatening infection. The brain contains more than 20 billion working brain cells. The damaged brain cells are analyzed 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. Recognition, diagnosis and evaluation of Brain tumor is an important task in recent days. Most recently Apollo hospital Chennai introduce the Asia's first Proton cancer therapy. 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.

KEYWORDS

Brain MR Images, Image Enhancement, Image Segmentation, PCNN and BPN, K-Mean clustering, Artificial Neural Network.

1. *Introduction*

The main purpose of the project is to successfully detect brain tumor 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 tumor in humans. The aim of the project is to detect if a patient is infected with brain tumor in a non-invasive way. In the current scenario radiologists go through the MRI images of a patient to detect if he has a brain tumor. 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 tumor[1]. The shortage of radiologists and the large volume of MRI to be analyzed make such readings labor intensive and cost expensive. This calls for an automated system to analyze 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 tumor 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 tumor. Increase the efficiency of detection and as a whole the system will drastically reduce the time and cost to detect tumors. 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.

2. *Method*

The work carried out involves processing of MRI images that are affected by brain tumor, detection and classification on different types of brain tumors. The image processing techniques like histogram equalization, image segmentation, image enhancement and then extracting the features using Gray Level Co-occurrence Matrix are used for enhancing the features of the images. Extracted features are stored in the knowledge base[2,3]. A suitable Neuro Fuzzy Classifier is developed to recognize the different types of brain cancers.

The system is designed to be user friendly by creating Graphical User Interface (GUI). The designed and developed system works in two phases namely Learning Phase and Testing Phase. In Learning/Training Phase the ANN is

trained for recognition of different types of brain cancer[2,4].The known MRI images are first processed through various image processing steps such as histogram equalization, thresholding and sharpening filter etc. and then textural features are extracted using Gray Level Co-occurrence Matrix. The features extracted are used in the Knowledge Base which helps in successful classification of unknown Images. These features are normalized in the range -1 to 1 and given as an input to Artificial Neural Network Based Classifier[3,5].After scanning the algorithm of artificial Neural Network it will get the result tumor is identified or not according to that will get the conformation & then it will be classified the various stages in that generally there are four types grade I,II,III,IV will be analyse in a analysis window in this way tumor is classified.We take scanned MRI image for the classification of tumor. After that apply image processing technique on that with the help of following figure we perform operation on that and identified tumors. in this way tumor is identified and classified.

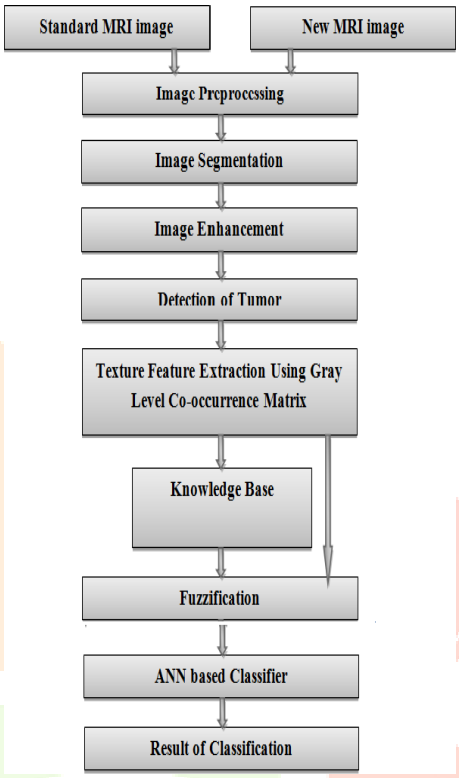

Figure 1

3. Image Classification Stage

3.1 Stage one: Tumor Segmentation.

The first step of the system is to isolate the tumor region from the rest of the image. With the help of various image processing techniques such as Histogram Equalization. The main problem in the process edge detection in tumor is that the tumor appears very dark on the image which is very confusing. To overcome this problem, Histogram Equalization was performed. Segmentation divides an image into its constituent parts. Segmentation should stop when the edge of the tumor is detected, and the main interest is to isolate the tumor from its background. Thresholding has been used for segmentation in order to obtain a binarized image with gray level 1 representing the tumor and gray level 0 representing the background segmentation is determined by a parameter known as the Intensity Threshold. Each pixel in the image is compared with this threshold. If the pixel's intensity is higher than the threshold, the pixel is set to white, If it is less than the Threshold, it is set to black in the output.

$$T = \frac{\sum_{i=0}^{M-1} \sum_{j=0}^{N-1} e_{i,j} * M_{i,j}}{\sum_{i=0}^{M-1} \sum_{j=0}^{N-1} M_{i,j}}$$

Fig 2. Equation for calculating threshold value.

Above equation is used for calculating Threshold value T where row i is the 0 means its start from initially & j is the column start from 0 & M is the median of an image. With the help this equation we can easily calculate the threshold value. After calculating threshold value we get the segmented image[2,3,7].

3.2 Stage two: Feature Extraction.

The features extracted are the property of the texture, and are stored in knowledge base. The extracted features are compared with the features of trained dataset Images for classification Gray Level Co-occurrence Matrix (GLCM) features are used to distinguish between normal and abnormal brain tumors. Co-occurrence matrices are constructed in four spatial orientations horizontal, right diagonal, vertical and left diagonal [7,9].

3.3 Stage three: ANN classifier.

A suitable artificial neural network classifier is designed in this paper to identify the different types of brain tumors. Artificial neural networks are composed of different simple elements operated in parallel. These elements are inspired from biological nervous system. Each element in a network called neuron. The sum of multiplication of weights and inputs plus bias at the node is positive then only output elements are generated. Means it discharges energy to next element. Otherwise it doesn't generate [2, 7].A ANN Classifier is used to detect candidate circumscribed tumor. ANN'S are networks of interconnected nodes. The input of a specific node is the weighted sum of the output of all the nodes in which it is connected. The output value of a node is, in general, a non-linear function (referred to as the activation function) of its input value. The multiplicative weighing factor between the input of node j and the output of node i is called the weight wji[2, 7, 9].

An Artificial Neural Network is an adaptive, most of nonlinear system that learns to perform a function (an input/output map) from data.

Adaptive means the system parameters are changed during operation, normally called the Learning/Training phase. After the training phase the Artificial Neural Network parameters are fixed and the system is used to solvethe problem at this stage. there have mainly two methods for performing operation in that feed Forward & Back-propagation we had implementing Feed-Forward method where ANN's used in this study consist of one input layer, one or two hidden layers, and one output layer. With back-propagation, the input data (Extracted Features) is repeatedly presented to the Artificial Neural Network, with each presentation the output of the neural network is comp compared to the desired output (Grade of Tumor) and an error is computed[8,10].

The Artificial Neural Network is used to adjust the weights such that the error decreases with each iteration and the neural model gets closer and closer to producing the desired output. ANN is an algorithm in this case we have to apply this algorithm on segmented image because of that will get the specified tumor [10].

In this paper we trained the neural network with 39 MRI brain tumor samples. Total four classifications are in the brain tumors .Each of 10 samples for three different classes & 9 are of remaining one class. Total
39 input MRI brain tumor samples are trained to neural network through back propagation learning/training. Train the neural network until it gives proper output [11].

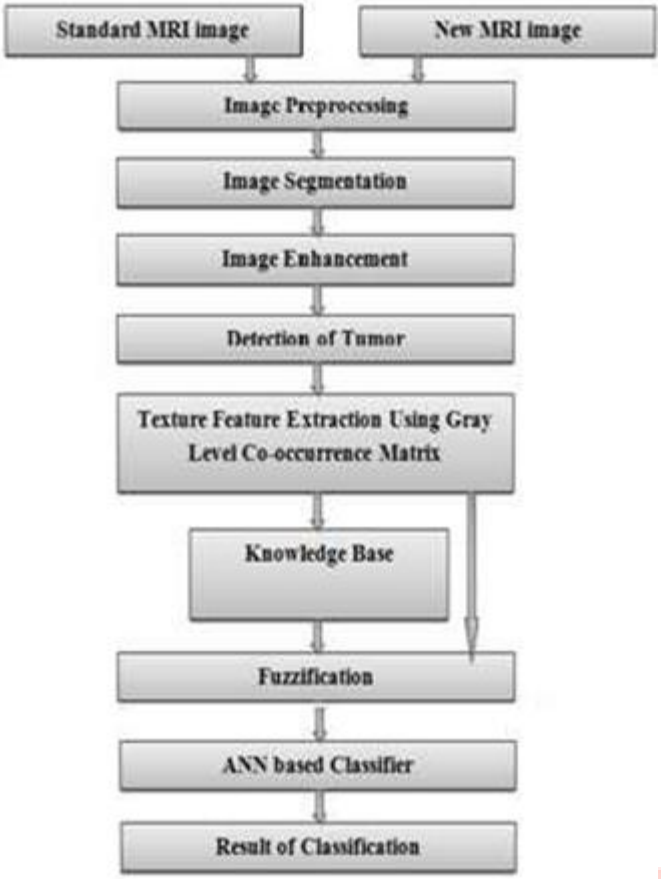

Figure 3

4. Result & Analysis.

The proposed Brain tumor detection technique is implemented using java on windows 7 with core i3 processor. The proposed system efficiently classifies the input MRI brain tumor images. The tumor is extracted from the MRI brain images by using mentioned techniques/ methods & the extracted tumor image further classified on ANN classifier in this way The Classification of MRI brain cancer images are also successfully implemented by using artificial neural networks. The developed system efficiently classifies the brain tumor MRI images into different grades. Following Figures shows the working of the proposed Software explains the creation of an new user as a doctor which is for the secure access for the system.

4.1 Pulse coupled Neural Network (PCNN)

A PCNN neuron contains two main compartments: the Feeding and Linking compartments which are shown in Figure 3: Schematic Representation of a PCNN Processing Element. References [1], [5] give a detailed structure and functioning of the PCNN model. Each of these communicates with neighbouring neurons through the synaptic weights M and W respectively. Each retains its previous state but with a decay factor.

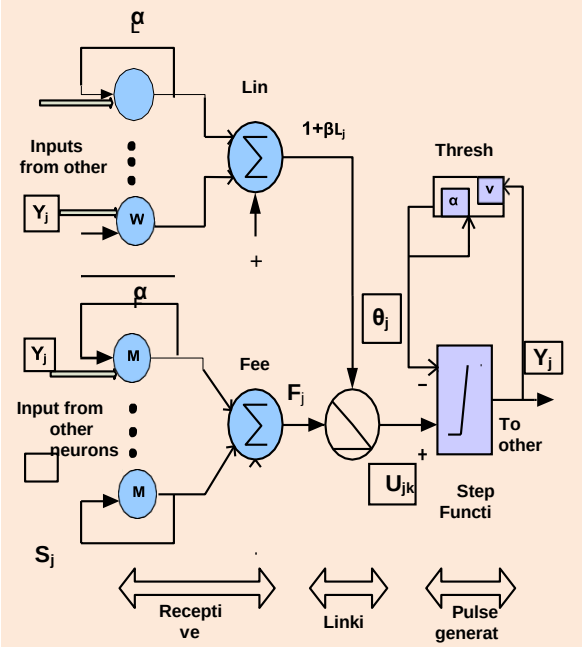

Fig 4. Schematic Representation of a PCNN Processing Element

5. Conclusion.

The proposed approach using ANN as a classifier for classification of brain images provides a good classification efficiency as compared to other classifiers. The sensitivity, specificity and accuracy is also improved. The proposed approach is computationally effective and yields good result. This automated analysis system could be further used for classification of images with different pathological condition, types and disease status. The future work is to improve the classification accuracy by extracting more features and increasing the training data set.

6. References.

[1] Meghana Nagori, Shivaji Mutkule, Praful Sonarkar "Detection of Brain Tumor by mining fMRI images" International Journal of Advanced Research in Computer and Communication Engineering Vol.2, Issue 4, January 2013.

[2] Arati Kothari "Detection and Classification of brain cancer using ANN in MRI images" World journal of Science and Technology Vol.5, Pg.26-29, April 2013.

[3] Madhusudhana Reddy, Dr. I Shanti Prabha. "Novel Approach in Brain Tumor Classification using Artificial Neural Networks", International Journal of Engineering Research and Applications, Vol. 3, Issue 4, August 2013.

[4] Dr. P.S. Hiremath, Dr. B.V. Dhandra, Dr. Mallikarjun Hangarge; "Recent Trends in Image Processing and Pattern Recognition", (2010), Excel India Publishers, New Delhi, India.

[5] Sonka, M. Hlavac, V. Boyle, R. "Image processing, Analysis, and Machine Vision," (2004) II Edition, Vikas Publishing House,New Delhi, India.

[6] Mehmed Ozkan, Benoit M. Dawant, Maciunas and Robert J.Member, IEEE, "Neural Network Based Segmentation of Multi-Modal Medical Images: A Comparative and ProspectiveStudy," IEEE transactions on medical imaging, Vol. 12, No. 3, September 1953

[7] Jason J. Corso, Eitan Sharon, Shishir Dube, Suzie El- Saden, Usha Sinha, and Alan Yuille, "Efficient Multilevel Brain Tumor Segmentation with Integrated Bayesian Model Classification", IEEE Transactions on Medical Imaging, Vol: 27, No:5, PP: 629 - 640,2008.

[8] J,Jaya, K Thanushkodi, M. Kaman, "Tracking Algorithm for DeNoising of MR Brain Images", UCSNS International Journal of Computer Science and Network Security, Vol. 9.