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Multiscale Modeling For MRI Analysis of Brain Cancer

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ABSTRACT
The tumor detection, segmentation, classification is used as the processing method for cancer growth. By applying noise filtering the unwanted pixels or error can remove. For improving the appearance of the image we use content enhancement it sharpening the image and find the edges of the tumor. Extraction of feature helps to remove the redundancy and optimized the performance of classifier. Thresholding give the location of the tumor. Back propagation improves the accuracy and efficiency of the MRI images.
***Keywords* -** brain cancer detection, noise filtering, content enhancement, Thresholding, Back propagation

I. INTRODUCTION

Brain structure is very complex in nature. It is made up of spongy mass tissue and protected by mainly in three areas. 1. Bones of the skull.2. Three thin layers of tissue called ‘meanings’ and 3. Watery fluid ‘cerebrospinal fluid’ that fluid flows from the spaces between the meanings and through spaces called ‘ventries’ within the brain.

In brain a network there are nerve cells that help to carry message forward and backward to the rest of the body. Some are goes directly from the brain to the eyes; ear and other parts of the head and others are run through spinal cord to connect brain with other parts of the body. When this message sending and receiving cycles goes on the normal cells grows old or get damaged, they die. For continuing this cycle other nerve cells are take their places of old cells. But sometimes this process is grows wrong. New cells form when the body does not need them and old or expired cells don’t die as they should. In this case in brain there are number of extra cells build-up from a mass of tissues. This is the abnormal growth of cells within the brain. As this process goes on the mass of the tissue also grows continuously and more and more abnormal cells are added in that mass. This abnormal growth of extra cells often from of tissue called a growth or tumor.

To find the tumor in the brain is the challenging task for professionals. The professionals are not directly operated on to the brain tumor, before operating on brain tumor they firstly knows the position of tumor where it is located into the brain. In this days digital image processing is the field which help to solve such type of complex problems using a computer. This image is composing of basic units called picture elements are also called as pixels. Every pixel has some information of location and gray level value. Medical imaging system which is application of digital image processing we use it contain, the technique of image segmentation divides an image into its sub parts constituent objects or regions.

This may or may not be meaningful and may require further processing to find the meaning or to analyze it. Image segmentation forms a basic step in the analysis of medical images [1]. The rest of the paper is organized as follows: this paper gives a brief literature review about the related work done. We have presented the details about the noise filtering, content enhancement Thresholding and back-propagation techniques applied to MRI images of tumor.

II. COMPONENTS AND METHODOLOGY

This work implements a system for the improved detection of brain tumor using various steps of processing steps. The implemented work can be useful for biomedical early and improved brain cancer detection.

This method will focused on 2 major tasks: 1. Improvement of pictorial information for human interpretation. 2. Processing of MRI image data for storage, transformation, and representation for autonomous machine perception. The continuous from this processing for the computer vision it can be divided into 3 parts:

1: low level processing:
Input: - image
Output: - image (noise removal, image sharpening)
2:- middle level processing
Input: -image
Output:- attribute(object recognition, segmentation)
3: high level processing
Input: - attribute
Output: - understanding (scene understanding)

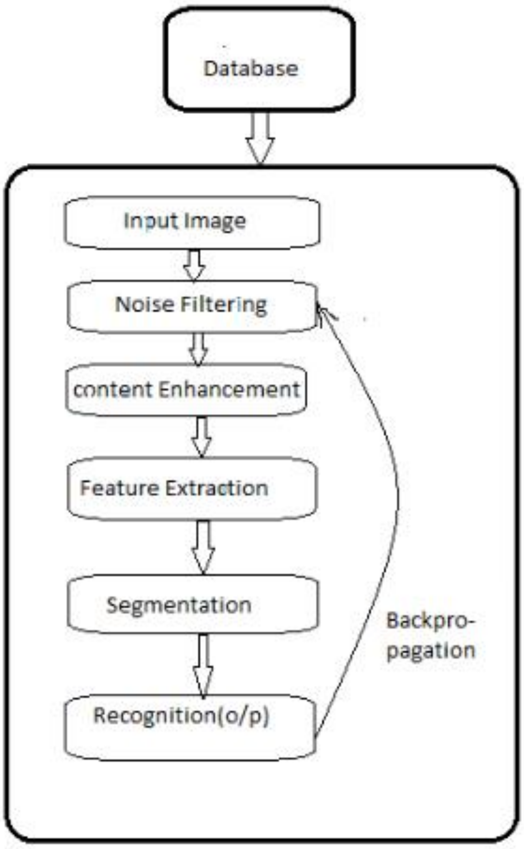

Fig1: block diagram of proposed work

This figure shows number of components. They work as in following steps

In step 1 for implementation of this work we need to have different types of the MRI images from number of patients are capture and store into the database. Those images are useful for understanding in which category tumor lies. When we find the category of tumor it will help to proceed into the next step. For this reasons. We need to store the various classes of MRI images into the database.

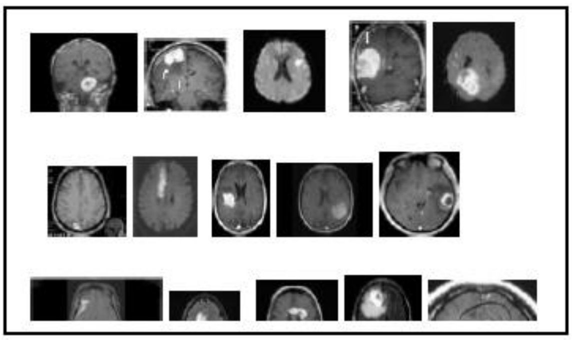

Fig2:- Data set of MRI images [2]

2 step is noise filtering is process of remove the unwanted pixels or error. There are different types of noises in image like Thermal Noise (additive Gaussian noise), Shot noise (random counts, Poisson noise) Salt-and-Pepper (replacement noise), Rician noise (magnitude of 2D Gaussian, MRI).

Noise in Magnetic Resonance Imaging:

1 MRI is acquired in two channels
2 Both channels are corrupted by additive Gaussian noise
3 However, the image we view is the magnitude of the combined channels
4 The resulting noise is Rice distributed
5 It is not additive and not means zero [3]

We remove the noise from MRI image by applying optimization methods were applied to a vector of three measurements taken on the same brain, using MRI, in order to estimate the physical constants:
PD (proton density)
T1 (relaxation time 1)
T2 (relaxation time 2)

When the process of optimization will performing the image was calculating using knowledge of the statistics of the noise process, of the physics of image creation, and of the a-priori characteristics of the tissues and tissue boundaries. This allowed estimation of the characteristic parameters, after the noise had been removed, but removed without blurring of the image. [4] The results are shown Below [4]

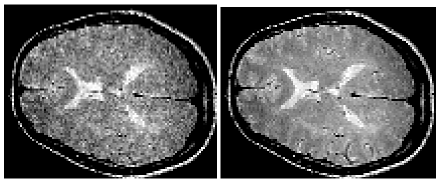

Fig.3This illustrates a very noisy MRI image. The noise is so high in this case because. The same image, after processing using the optimization algorithm.[4]

3 steps is content enhancement it include contrast enhancement and deblurring of images. Contrast enhancement helps to increase the appearance of large scale light-dark translation similar to hoe sharpening with unsharp mask increase the appearance of a small scale edges. For this we load image into matlab, resize that image and enhanced greyscale image or true colour images.

4 steps is Feature extraction general goal of this is pattern recognition and classification. These features are original measurement of variables. This is the process of defining the features which are most meaningful for the analysis and classification. For improving the efficiency and effectiveness of images it can follows the following steps like 1) removing the redundancy from the images. 2) Removing the variability in the image data that is of little of no value in classification -- even discarding entire images if that is appropriate. 3) Rebuilding the data (in feature space) in order to optimize the performance of the classifier. 4) Extracting spatial information (texture, size, shape) which is crucial to target identification. [5].

In 5 steps is segmentation use for partition an image into the multiple segments (set of pixels). It will used to separate several meaningful parts from the images and they are helping us for easy to analyse. It typically locates the object and edges of the images. Image segmentation is the process of assigning a label to every pixel in an image such that pixels with the same label share certain visual characteristics. The simplest method of image segmentation is Thresholding. We use here modified histogram Thresholding

Thresholding value setting involves three methods;

First method

In this original healthy brain image pixel values are subtracted from the tumor affected brain image, quadrants wise (i.e.).Image is segmented into four parts and each part is analyzed separately pixel wise with the original image[6].

Second method

In this the tumor affected image is overlying on the original image and the tumor is analyzed.

Third method [6]

In this histogram values are plotted which gives a better output than above methods. In this threshold value is fixed based on the pixels in the image and gray level value image. First the image in which the values varies between 0 to255. The white have value 255 and black set to zero. 128 as threshold value keeping and the tumor image is processed. Then the values are changed from 128 to132. Of these 129 value produces clear detection of tumor. Beyond 132 tumor is not clearly detected also some portion gets smaller. So we finally set to 129 as threshold. Then the tumor part is extracted by taking the area of interest (AOI) [6]

6 steps recognition here we assigning the label to an output image. But if our actual output and desired output is not match then we can send back that image to step number 2 by help of using back propagation. It can help to improve this accuracy and efficiency of that image.

III. Literature survey / Related work

The image segmentation techniques to be applied to brain MRI images are Thresholding, region-growing, clustering, soft-computing, atlas-based, image/symmetry analysis and other methods. Thresholding groups the image pixels in a manner that the gray-level values lying above (or equal to) a threshold value belong to one class and those having value less than the threshold value are placed into the other class. Thresholding can convert an input image to black and white (i. E. Binary) image [1].

Ct image segmentation kovacevic (1997) they use radial function on neural network. Benefits of training alogorithm are simple as compare to backprob.

Segmentation of MRI images zang (2001) they use exception maximization algo this technique possesses ability to encode both spatial stastical properties of images

MRI segmentation Ahmed (2002) they use modified fuzzy c-means algorithm this technique is faster for a single feature input.

Mr Segmentation Tolba (2003), sing (2005) use exception maximization and fuzzy adaptive radial basic function respectively

Fusing images Li (2004) use discrete wavelet frame transformation.

3 level image segmentation Yu (2008) use QGA algorithm is selected for optimal combination of parameter.

Medical image processing shi1 (2009) use neural network technique

IV. Conclusion

This method is useful in medical imaging processing. This will improve the accuracy and efficiency of the output image by using back propagation. It will able to find the error between the actual and desired output. Threshold value gives us location of tumor and clear result.

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