USE OF IMAGE PROCESSING TECHNIQUE FOR DIAGNOSING BRAIN TUMOR

Gare M.V [1] ,Gurav P.P [2] , Katakdhond R.N [3] , Prof. Shahane A.R [4]

[1,2,3,4]*Dept. of Electronics and Telecommunication,*

Brahmdevdada Mane Institute of Technology, Solapur (India)

ABSTRACT

Now a day's cancer growth is so much high in that, Brain tumor is also major problem. In analysis by doctors the grading gives different conclusions which may vary from one doctor to another. So for the convenience of doctors, a research will carried out by which made the use of software with edge detection and segmentation methods used on the MRI image which will give the edge pattern and segment of brain and brain tumor itself. Medical image segmentation had been a vital point of research, as it inherited complex problems for the proper diagnosis of brain disorders. In this research, it provides a foundation of segmentation and edge detection, as the first step towards brain tumor grading. Current methods as preprocessing and other techniques segmentation approaches are reviewed with an emphasis placed on revealing the merits and demerits of these methods for medical imaging applications. We use MRI because of it provide accurate visualize of anatomical structure of tissues and then process on it.

Keywords *-- **Artificial Neural Network, Computed Tomography, Diffusion Tensor Imaging, Functional Magnetic Resonance Imaging, Magnetic Resonance Images, Positron Emission Tomography***

I. INTRODUCTION

Brain tumor is one of the types of tumor; it has an abnormal growth of cells inside the skull. In general the tumor will grow from the cells of the brain, blood vessels, nerves that emerge from the brain. There are two types of tumor which are- benign (non-cancerous) and malignant (cancerous) tumors. The Benign tumor is described as slow growing tumors that will exert potentially damaging pressure but it will not spread into surrounding brain tissue. However, the malignant is described as rapid growing tumor and it is able to spread into surrounding brain. Tumors can damage the normal brain cells by producing inflammation, exerting pressure on parts of brain and increasing pressure within the skull. Radiologists examine to patient physically by using Computed Tomography (CT scan) and Magnetic Resonance Imaging (MRI). This technique is basically used to detect the differences in the tissues which have almost better technique as compared to computed tomography. So this makes this technique a very special one for the brain tumor detection and cancer imaging. MRI images showed the brain structures, tumor's size and location. From the MRI images the information such as tumors location provided radiologists, an easy way to diagnose the tumor and plan the surgical approach for its removal. And we used to improve the quality of MRI image by applying preprocessing, edge detection, segmentation and any other image processing tools.

II. LITERATURE REVIEW

In this paper we will enhance the brain tumor in MRI by image processing tools. That means for enhancement of MR image we will use edge detection and segmentation methods. In The image segmentation is entailed with the division or separation of the image into regions of similar features. In this paper, we will discuss an illustrate a number of approaches and show improvements in segmentation performance that can be achieved by combining methods from distinct categories such as techniques in which edge detection is combined with Thresholding. The definitive aim in image processing applications is to extract important attributes from the image data, from which a descriptive, interpretative, or understandable prospect can be obtained by the machine. Time consumption during the segmentation of brain tumor from magnetic resonance imaging is a crucial drawback. Thus, we have studied the foundations of brain segmentation and edge detection, by various techniques employed by researchers. The segmentation & edge detection approaches were studied under 4 categories. These are as follows- 1) Thresholding approaches, 2) Region growing approaches, 3) Clustering approaches, 4) Neural network approaches.

2.1 In Efficient Way of Skull Stripping in MRI to Detect Brain Tumor by Applying Morphological Operations, after Detection of False Background paper we are using The morphological techniques (Erosion and Dilation) used in this is an effective and fully automated but inefficient way of stripping skull. Erosion and Dilation are two basic operators in the area of mathematical morphology [4]. As erosion is a technique which uses background and the foreground for the processing. In Brain MRI there is a particular intensity of the back-ground that appears before brain image. Unfortunately in brain MRI, the same intensity is appeared as a part of the brain. And this appearance is a false background. Dialation-The Boundary of the skull is a false background. Now if these values can be changed before the process of erosion. The first thing is to identify the area where the false background is appeared. This is done by applying the “Dilation” only at once it will detect the boundary.

2.2 Digital Image Processing (R.C.Gonzalez and Redwoods.)

2.2.1 Edge Detection: In analysis of the image using edge detection is done on the CT/PET (Computed Tomography/Positron emission tomography) image. Objective of the edge detection on this image is done by three basic principles in edge detection. In this we extract the edges of the outer contour of the brain (the gray region in the image), the contour of the spinal region(Behind the nose, toward the front of the brain) ,and the outer contour of the head[1].

2.3 Digital Image Processing (A.K.Jain)

2.3.1 Image Enhancement: The requirement by the use of image enhancement is to accentuate certain image features for subsequent analysis or for image display. Including contrast and edge enhancement, pseudocoloring, noise filtering, sharpening and magnify that image. This is useful for features extraction, image analysis and visual information display. This will not increase the inherent information content in the data. It simply emphasizes certain specified image characteristics. Enhancement algorithms are generally interactive and application dependent. Image enhancement techniques, such as contrast stretching, map each gray level into another gray level by a predetermined transformation. An example is the histogram equalization method, where the input gray levels are mapped so that the output gray level distribution is uniform. This has been found to be a powerful method of enhancement of low contrast images. Other techniques perform silar operations as in

convolution, transformation as in the discrete Fourier transform as well as in pseudo colouring where a gray level image is converted into colour image by assigning different colours.

2.4 Online view: Diffusion Tensor Imaging (DTI) DTIs measure the flow of water through the white matter tracts of the brain. This provides a snapshot of the brain's structure and can be used to compare changes over time [3]. Patients can receive a scan called Diffusion Tensor Imaging (DTI). This scan allows the surgeon and treating team to visualize the circuitry (or wiring) of the brain to guide the surgery can also be helpful in diagnosing primary brain tumours. Functional Magnetic Resonance Imaging (fMRI) scans: FMRI is used to determine the specific location of the brain where a certain function, such as speech or motor function, occurs. During functional resonance imaging of the brain, the patient is asked to perform a specific task, such as recite the Pledge of Allegiance, while the scan is being done[2]. By pinpointing the exact location of the functional centre in the brain, physicians can plan surgery or other treatments for a particular disorder of the brain. Magnetic resonance spectroscopy (MRS) and positron emission tomography (PET) scans can also be helpful in diagnosing primary brain tumour. Patients can undergo functional MRIs (fMRI) to help delineate a roadmap of important structures (such as areas that control the arms, legs, or speech) prior to surgery. The blue and red areas specify the part of the brain that moves the arms and legs.

2.5 Expert View :(Prof.S.P.Patil.) Basic Neural Network: The simplest definition of a neural network, more properly referred to as an 'artificial' neural network (ANN), is provided by the inventor of one of the first neurocomputers, Dr. Robert Hecht-Nielsen. He defines a neural network as: "...a computing system made up of a number of simple, highly interconnected processing elements, which process information by their dynamic state response to external inputs".ANNs are processing devices (algorithms or actual hardware) that are loosely modelled after the neuronal structure of the mammalian cerebral cortex but on much smaller scales. A large ANN might have hundreds or thousands of processor units, whereas a mammalian brain has billions of neurons with a corresponding increase in magnitude of their overall interaction and emergent behaviour. Although ANN researchers are generally not concerned with whether their networks accurately resemble biological systems, some have. For example, researchers have accurately simulated the function of the retina and modelled the eye rather well. Although the mathematics involved with neural networking is not a trivial matter, a user can rather easily gain at least an operational understanding of their structure and function. Neural networks are typically organized in layers. Layers are made up of a number of interconnected 'nodes' which contain an 'activation function'. Patterns are presented to the network via the 'input layer', which communicates to one or more 'hidden layers' where the actual processing is done via a system of weighted 'connections'. The hidden layers then link to an 'output layer' where the answer is output. Most ANNs contain some form of 'learning rule' which modifies the weights of the connections according to the input patterns that it is presented with. In a sense, ANNs learn by example as do their biological counterparts; a child learns to recognize dogs from examples of dogs.

III. SCOPE AND OBJECTIVES

1. To achieve the process of making computer aided diagnosis for brain tumor grading will be easier.
2. The segmentation of medical images will lead towards improving the accuracy and exactness.
3. Soft computing deals with approximate models and gives solution to complex problems.
4. To improve the quality of MRI image use edge detection and segmentation.

5. To identify difference between non-malignant (non-cancerous) and malignant (cancerous) tumors.

6. From MRI image to diagnose the tumor and plan the surgical approach for its removal.

IV. PROPOSED WORK

4.1 Research Methodology to be used

MR imaging:

This method is used to capture the image of brain as like scanning. It shows detailed view of brain including skull, nerves, etc.

Edge detection:

It provides the actual view of brain and removes other parts as skull, nerves, etc.

It elaborates view of brain only for detailed scan.

Segmentation:

It will make the small segments of edge detected image to analyse each part of cells, tissues and check for tumorous and non-tumorous part.

4.2 Work to be carried out

Implement the enhancement of brain tumor using the MATLAB by using image processing tools. The process is done on MRI by edge detection and segmentation. Segmentation: Now a days, image segmentation play vital role in medical image segmentations. The Segmentation of brain tumor from magnetic resonance images is an important task. Manual segmentation is one of the techniques for finding tumor from the MRI. This Method is time consuming but also generates errors. Segmentation by expert is variable manually segmentation takes at least three hours to complete. Several automated techniques have been developed for MRI segmentation. Thresholding is one of simple image segmentation technique. It is process of separating pixels in different classes depending on their pixels gray levels. A Thresholding method determines an intensity value, called the threshold, which separate the desired classes. The segmentation is achieved by taking threshold value. Based on threshold value, pixels are grouping with intensity greater than the threshold into one class and remain pixels grouping into another class. The mains disadvantage are that, in the simplest form only two classes are generated and it cannot be applied to multichannel images. In Thresholding technique, image having only two values either black or white. MR

Image contains 0 to 255 grey values. So, Thresholding of MR images ignores the tumour cells.

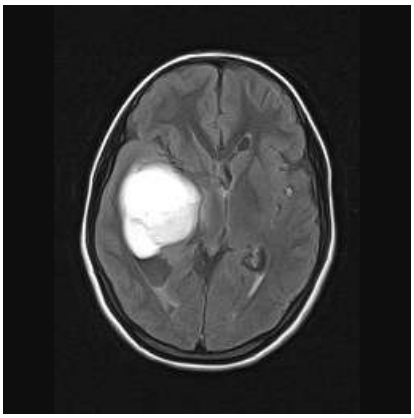

Fig.: tumor in brain.

Edge Detection**:** In this we extract the edges of the outer contour of the brain (the gray region in the image), the contour of the spinal region (Behind the nose, toward the front of the brain) ,and the outer contour of the head. We should get thinnest edge, continuous contours possible, while eliminating edge details related to the gray content in the eyes and brain areas. The original image is smoothened using averaging filter as threshold gradient image. The threshold required to achieve the result was 15% of maximum value of the gradient image. By using Marr-hildreth edge detection algorithm with the threshold of 0.002 thresholds. And, the canny algorithm 3 times low value of the threshold. It gives good edge quality and ability to eliminate irrelevant details. The canny algorithm gives only totally unbroken edge for the posterior boundary of the brain.

V. FUTURE SCOPE

Future research in the segmentation of medical images will lead towards improving the accuracy, exactness, and computational speed of segmentation approaches, as well as minimising the amount of manual interaction. These can be improved by incorporating discrete and continuous-based segmentation methods. Computational effectiveness will be crucial in real-time processing applications. Segmentation methods have proved their utility in research areas and are now emphasizing increased use for automated diagnosis and radiotherapy. These will be particularly important in applications such as computer integrated surgery, where envision of the anatomy is a significant component [1].

VI. CONCLUSION

Relevance of these approaches is the direct medical application for segmentation and edge detection. We have reviewed the techniques of the MRI image enhancement in terms of tumour pixels detected as well as we studied the previous techniques CT/PET,MRS,FMRI,etc. We have studied several digital images processing methods and discussed its requirements and properties in brain tumour detection .This paper gives enhanced information about brain tumour detection and segmentation. The marked area is segmented and the assessment of this tool from the radiologist, whom the project is concerned with, is positive and this tool helps them in diagnosis, the treatment procedure and state of the tumour monitoring.

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References

[1].Kimmi Verma, Aru Mehrotra, Vijayeta Pandey, Shardendu Singh, Image processing techniques for the enhancement of brain tumour patterns Assistant Professor, Dept of Instrumentation & Control Engg, Galgotias College Of Engg & Tech. Vol. 2, Issue 4, April2013.

[2].Jay Patel and Kaushal Doshi, A Study of Segmentation Methods for Detection of Tumor in Brain MRI, M.Tech Student, EC Department, Gujarat Technology University, Kalawad Road, Rajkot-360001, India. Assistant Professor, EC Department, MEFGI Collage, Rajkot Kalawad Road, Rajkot-360001, India.

[3].K.Somasundaram , R.Siva Shankar, A novel skull stripping method for T1 coronal and T2 axial magnetic resonance images of human head scans based on resonance principle, Image processing Lab, Department of Computer science and applications,Gandhigram Rural institute-Deemed University, Gandhigram-624302,Tamilnadu,India.

[4]. Sajjad Mohsin, Sadaf Sajjad, Zeeshan Malik, and Abdul Hanan Abdullah**,** Efficient way of skull stripping in MRI to detect brain Tumor by applying morphological operations after Detection of false background, International Journal of Information and Education Technology, Vol. 2, No. 4, August 2012.