International Organization of Research & Development (IORD)
ISSN: 2348-0831
Vol 01 Issue 02 | 2014

Review on Detection and segmentation of brain tumor using watershed and thresholding algorithm

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ABSTRACT

The main objective is to detect and segment the brain tumor using watershed and thresholding algorithm. Brain tumor segmentation in magnetic resonance imaging (MRI) has become an emergent research area in the field of medical imaging system. Brain tumor detection helps in finding the exact size, shape, boundary extraction and location of tumor. The system will consist of three stages to detect and segment a brain tumor. An efficient algorithm will proposed for tumor detection based on segmentation and morphological operators. Firstly quality of scanned image will enhanced and then morphological operators will be applied to detect the tumor in the scanned image. To improve the quality of images and limit the risk of distinct regions fusion in the segmentation phase an enhancement process will be applied. It will be simulate on Matlab Software.

Index Terms— Brain tumor, MRI, Morphological operator, Segmentation.

I. INTRODUCTION

Now days one of the main cause for increasing mortality among children and adults is brain tumor. Medical image segmentation is an important step for medical image processing, which is a complex and challenging task especially in brain magnetic resonance (MR) image segmentation. Also the Accurate measurements in brain diagnosis are quite difficult because of diverse shapes, sizes and appearances of tumors. So that the study of the Detection of Shape, Size and the appearance of Brain Tumor is very much important. For Detection of Shape, Size and boundary Extraction we are using Threshold and Watershed Algorithm.

Digital image processing is a vast field which can be use various application. Which include Detection of criminal face, figure print authentification system, in medical field, object recognition etc. Brain tumor detection plays an important role in medical field. Brain tumor detection is detection of tumor affected part in the brain along with its shape size and boundary, so it useful in medical field.

Recent techniques achieved in researches for detection of brain tumor can be broadly classified as

- Histogram based method
- Morphological operation is applied to MRI images of brain
- Edge base segmentation and color base segmentation
- Cohesion self merging based partitional K-mean algorithm

Brain tumor detection can be done gray as well as color image researches in the field is still going on but remarkable result is not achieved until now.

Accurate measurements in brain diagnosis are quite difficult because of diverse shapes, sizes and appearances of tumors. Tumors can grow abruptly causing defects in neighboring tissues also, which gives an overall abnormal structure for healthy tissues as well. In this paper, we will develop a technique of 3D segmentation of a brain tumor by using segmentation in conjunction with morphological operations.

A. Tumor:

The word tumor is a synonym for a word neoplasm which is formed by an abnormal growth of cells Tumor is something totally different from cancer.

Types of Tumor:
There are three common types of tumor:

a) Benign
b) Pre-Malignant
c) Malignant

a) Benign Tumor:

A benign tumor is a tumor is the one that does not expand in an abrupt way; it doesn't affect its neighboring healthy tissues and also does not expand to non-adjacent tissues. Moles are the common example of benign tumors.

b) Pre-Malignant Tumor:
Premalignant Tumor is a precancerous stage, considered as a disease, if not properly treated it may lead to cancer.

c) Malignant Tumor:

Malignancy (mal- = "bad" and -ignis = "fire") is the type of tumor, that grows worse with the passage of time and ultimately results in the death of a person. Malignant is basically a medical term that describes a severe progressing disease. Malignant tumor is a term which is typically used for the description of cancer.

B. Magnetic Resonance Imaging (MRI):

MRI is basically used in the biomedical to detect and visualize finer details in the internal structure of the body. This technique is basically used to detect the differences in the tissues which have a far better technique as compared to computed tomography. So this makes this technique a very special one for the brain tumor detection and cancer imaging. [1]

II. RELATED WORK

Anam Mustaqeem have proposed the brain tumor segmentation in magnetic resonance imaging (MRI) has become an emergent research area in the field of medical imaging system. Brain tumor detection helps in finding the exact size and location of tumor. An efficient algorithm is proposed in this paper for tumor detection based on segmentation and morphological operators. Firstly quality of scanned image is enhanced and then morphological operators are applied to detect the tumor in the scanned image. [1]

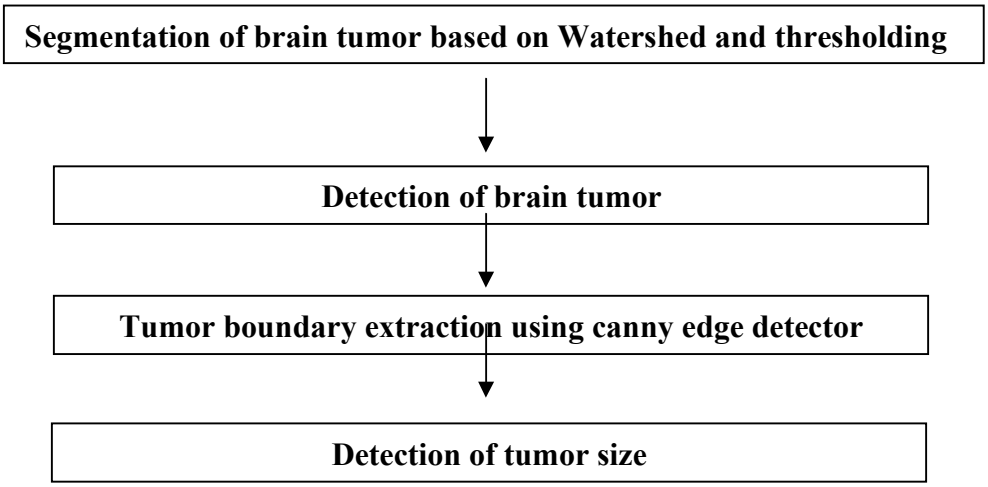
M. Usman Akram uses Magnetic resonance (MR) images, that are a very useful tool to detect the tumor growth in brain but precise brain image segmentation is a difficult and time consuming process. They proposed a method for automatic brain tumor diagnostic system from MR images. The system consists of three stages to detect and segment a brain tumor. In the first stage, MR image of brain is acquired and preprocessing is done to remove the noise and to sharpen the image. In the second stage, global threshold segmentation is done on the sharpened image to segment the brain tumor. In the third stage, the segmented image is post processed by morphological operations and tumor masking in order to remove the false segmented pixels. Results and experiments show that the propose technique accurately identifies and segments the brain tumor in MR images**.**[2]

Subhranil Koley have presents the segmentation of brain MRI for the purpose of determining the exact location of brain tumor using CSM based partitional K means clustering algorithm. CSM has attracted much attention as it gives efficient result as a self merging algorithm compared to other merging processes and the effect of noise is also less and the probability of obtaining the exact location of tumor is more. Their approach is much simpler and computationally less complex and computation time is very less**.** But it contains tumor and edema together. [3]

Ahmed KHARRAT Mohamed Ben proposed an efficient detection of brain tumor from cerebral MRI images. The methodology consists of three steps: enhancement, segmentation and classification. To improve the quality of images and limit the risk of distinct regions fusion in the segmentation phase an enhancement process is applied. They adopt mathematical morphology to increase the contrast in MRI images. Then they apply Wavelet Transform in the segmentation process to decompose MRI images. At last, the k-means algorithm is implemented to extract the suspicious regions or tumors. Some of experimental results on brain images show the feasibility and the performance of the proposed approach**.** The automatic extraction of the tumor is made by k-means method. [5]

III. PROPOSED WORK

This paper will propose design and simulation of brain tumor based on Watershed and thresholding algorithms which will include -



1) **Segmentation of brain tumor based on Watershed and thresholding**: Threshold segmentation is one of the simplest segmentation methods. The input gray scale image is converted into a binary format. The method is based on a threshold value which will convert gray scale image into a binary image format. The main logic is the selection of a threshold value. Watershed Segmentation is one of the best method to group pixels of an image on the basis of their intensities. Pixels falling under similar intensities are grouped together. It will be good segmentation technique for dividing an image to separate a tumor from the image.
2) **Detection of brain tumor**: By applying Watershed and thresholding segmentation we will get a high intensity portion from whole image and this portion is called tumor which is main part of our research.
3) **Tumor boundary extraction using canny edge detector**: Using canny edge detection we will remove noise from the image. Then gradient of the image will be computed by feeding the smoothed image through convolution operation with the derivative of the Gaussian in both the vertical and horizontal directions.
4) **Detection of tumor size:** Tumor size is strongly related to prognosis. In general, the smaller the tumor, the higher the chances are for long-term survival. Finally, we will detect the size of tumor.

IV. CONCLUSION AND FUTURE DIRECTIONS

This paper will analyze how the Edge detection operator techniques will detect the size, shape and Boundary Extraction of Brain tumor. In this research work various methods and techniques will be used to detect the brain tumor from scanned MRI images of the brain. The techniques will show various methods which can detect the tumor and will provide accurate results. Brain will be scan, that is, MRI image of the brain will obtain which should be noise free. This work will be extended for new algorithm for brain tumor detection which will provide more efficient results than existing methods in near future. Computational time will also be considered to compare this technique efficiently.

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