International Journal of Research in Advent Technology, Vol.2, No.4, April 2014
E-ISSN: 2321-9637

A Review Paper Based On Hybrid Technique of Medical Image Segmentation Using Marker Controlled Watershed Algorithm

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ABSTRACT: Image segmentation is very important part of digital image processing. It is used for the segmentation of various types of images. In this paper segmentation has been performed on medical images. There are various techniques are used for segmentation, In this paper marker controlled watershed algorithm has been performed. This segmentation technique is based on the computation of background and foreground markers. It is interactive image segmentation. What we do is to give different labels for our object we know.

KEY WORDS: Magnetic Resonance Imaging; Vector Median Filter; Marker Controlled Watershed Algorithm.

1. INTRODUCTION

Medical image segmentation is very important in computer based diagnosis; because manual segmentation performs very slow and less accurate result then computer based segmentation. The objective of image segmentation is to partition an image into uniform and meaningful parts with admiration to intensity and texture of that medical image. For this method the first step is preprocessing step. In preprocessing step denoising of image has been performed. Denoising of images are totally depends on the type of noise presented in that image because according to the type of noise the filter should be decided. There are various types of noise can be present in any MRI. It can be salt-and-pepper type noise also called impulse noise, shot noise or spike noise. It is typically grounds by invalid pixel elements in the camera sensors, imperfect memory locations, or timing errors in the digitization process .For the amputation of noise filters can be useful, in this project vector median filter has been introduced for removing salt and pepper noise. After that the segmentation will be performed on the image for segmentation Marker controlled watershed algorithm has been used.

2. LITERATURE SURVEY

After literature survey some segmentation techniques has been concluded. There is so numerous research works has been achieved on segmentation of medical images, which are follows [11]:

- Thersholding approach
- Region growing approach
- Classifiers
- Clustering approach
- Markov random field approach
- Artificial neural networks
- Deformable modals
- Atlas guided approach
- Fuzzy Symmetry Based Genetic Clustering Algorithm.
- Automatic and Semi Automatic segmentation.
- Fuzzy Symmetry Based Genetic Algorithm.
- Segmentation Based On AI.

3. PROBLEM IDENTIFICATION

In literature survey part some problems are identified. There are so many precincts presents in Magnetic Resonance Imaging (MRI) such as[11]:

- Partial volume
- RF noise
- Intensity homogeneities
- Gradients
- Motion
- Wrap Around
- Gibbs Ringing
- Susceptibility

As well as some disadvantages are also presented in MRI as compare with other medical images, which are follows [11]:

- MR acquisition takes considerably longer time as compared to CT.
- In case of MR it is more difficult to obtain uniform image quality.

4. METHODOLOGY

The descriptions of the basic steps of this project are follows:

3.1 Data Collection

Data collection is nothing but collecting those data which will be the input of research process. Data should be collected from authentic place. In this research the MRI images have been collected from diagnosis centers.

3.2 Image Acquisition

Image acquisition in image processing can be broadly defined as the action of retrieving an image from some source. Performing image acquisition in image processing is always the first step in the workflow sequence because, without an image, no processing is possible. The image that is acquired is completely unprocessed and is the result of whatever hardware was used to generate it. In magnetic resonance imaging, a computer must take the output from the MRI and provide it in a visible form for the user, a form of processing. The program can also perform activities like color-coding areas of the scan for added contrast and visibility. In color image processing, tools like filtering and layering may be necessary to clean out noise that obscures the color, clarity, or function of the image.[9]

3.3 Preprocessing

Pre-processing methods use a small neighborhood of a pixel in an input image to get a new brightness value in the output image. Such pre-processing operations are also called filtration.

Local pre-processing methods can be divided into the two groups according to the goal of the processing:

3.3.1 Smoothing:

Smoothing is used to suppresses noise or other small fluctuations in the image; equivalent to the suppression of high frequencies in the frequency domain. Unfortunately, smoothing also blurs all sharp edges that bear important information about the image.

3.3.2 Gradient operators:

Gradient operators are based on local derivatives of the image function. Derivatives are bigger at locations of the image where the image function undergoes rapid changes. The aim of gradient operators is to indicate such locations in the image. Gradient operators suppress low frequencies in the frequency domain (i.e. they act as high-pass filters). Noise is often high frequency in nature; unfortunately, if a gradient operator is applied to an image the noise level increases simultaneously. [10]

Clearly, smoothing and gradient operators have conflicting aims. Some pre-processing algorithms solve this problem and permit smoothing and edge enhancement simultaneously.

Local image smoothing can effectively eliminate impulsive noise or degradations appearing as thin stripes, but does not work if degradations are large blobs or thick stripes.

3.3.3 Median smoothing

- In a set of ordered values, the median is the central value. Median filtering reduces blurring of edges. The idea is to replace the current point in the image by the median of the brightness in its neighborhood.
- The advantages of median filtering are that it is not affected by individual noise spikes , eliminates impulsive noise quite well, and it does not blur edges much and can be applied iteratively.
- The main disadvantage of median filtering in a rectangular neighborhood is its damaging of thin lines and sharp corners in the image; this can be avoided if another shape of neighborhood is used.

In this research salt and pepper noise has been added for removal of this noise vector median filter is used. The resulting images are shown below:

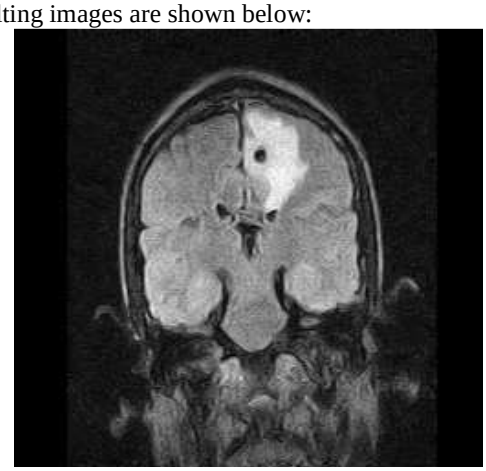

Fig 3.1: Input image

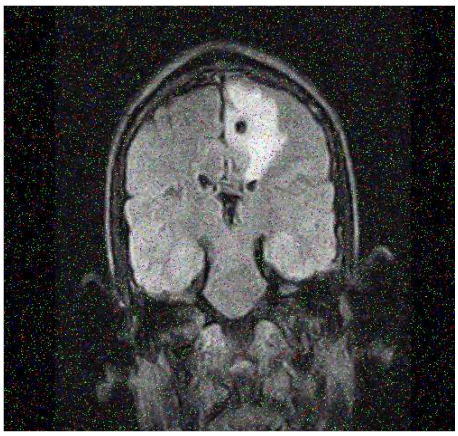

Fig 3.2: Noisy image

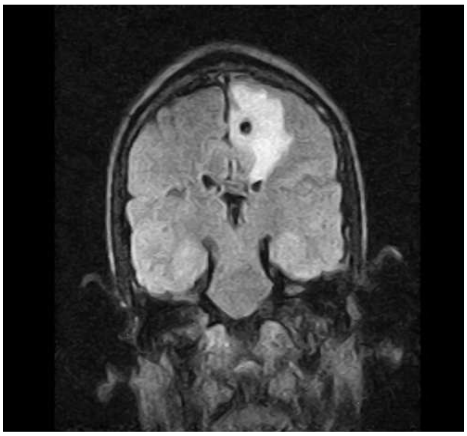

Fig 3.3 Filtered image

3.4 Thresholding

A threshold is defined, and then every pixel in an image is compared with this threshold. If the pixel lies above the threshold it will be marked as foreground, and if it is below the threshold as background. The threshold will most often be intensity or color value. Other forms of thresholding exist where the threshold is allowed to vary across the image, but thresholding is a primitive technique, and will only work for very simple segmentation tasks. For thresholding methods, it is necessary to convert an image to a binary image depending on threshold values that extract the objects from the background.

In this research Otsu thresholding has been used for thresholding of image. For thresholding first of all the pre processed image should be converted into binary image. After the conversion threshold value will be calculated. The Otsu method gives satisfactory results when the numbers of pixels in each class are close to each other.[4]

3.5 Segmentation

Segmentation is a technique to divide an image in the form of meaningful and homogeneous parts or segments. The main objective to perform segmentation is to detect the affected part of medical image.

In this research paper for segmentation Marker Controlled Watershed Algorithm is used because this approach gives you over segmented result due to noise or any other irregularities in the image. So Open CV implemented a marker-based watershed algorithm where you specify which are all valley points are to be merged and which are not. It is interactive image segmentation. In the first step label the region which is sure of being the foreground or object with one color (or intensity), label the region which is sure of being background or non-object with another color and finally the region which is not sure of anything, label it with 0. That will be marker. Then watershed algorithm will be applied. Then marker will be updated with the labels which have given, and the boundaries of objects will have a value of -1. [12]

5. CONCLUSION

If water shed algorithm is used for segmentation than it is always being able to produce a complete division of the image but the limitation of this method is over segmentation and sensitivity to false edges.FCM algorithm is highly sensitive for noisy images.

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