Image Processing Techniques for Brain Tumor Detection

Ankita Mane[1], Revati Girgaonkar[2], Milind Rane[3]

Vishwakarma Institute of Technology Pune, India

Guide, Vishwakarma Institute of Technology Pune, India

Abstract: *MRI Imaging play main role in brain tumor for analysis, and treatment planning. It's useful to doctor for identifying the previous steps of brain tumor. Brain tumor detections are using MRI images is a difficult task, because the complicated structure of the brain. Brain tumor is an aberrant growth of cell of brain. For various soft tissues of human body the MRI image offer better difference concern. MRI Image provides good results than CT, Ultrasound, and X-ray. The preprocessing and post processing and methods like; (Filtering, contrast enhancement, Edge detection), post processing techniques like; (Histogram, Threshold, Segmentation, Morphological operation) these various technique through image processing (IP) is done. In MATLAB there is tools present for detection of brain tumor images (MRI-Images) are discussed.*

Keywords: Brain Tumor (BT), MRI-Images, CT, IP, x ray

1. Introduction

Human body is made up of different type of cells. The highly specialized and sensitive organ is brain in human body. Brain tumor is adverse disease for human being. The brain tumor is made up by unexpected growth of tissue in the brain or around the brain.

By benign or malignant type the brain tumor can be detected. The benign being non-cancerous and malignant is cancerous. Primary and secondary tumor benign tumor is less risky than malignant. The malignant tumor it spread rapidly entering other tissues of the brain therefore, worsening condition patients are loosed. Due to complex structure of brain the brain

Tumor detection is very difficult problem. Because of diverse shape, size, location and appearance of tumor the brain tumor examine becomes quite difficult.In beginning stag it can't find the correct measurement of tumor because of it the brain tumor detection becomes very hard. But once it gets analyzed the brain tumor it gives to start the proper treatment and it may be curable. Hence, the treatments depend on tumor like; chemotherapy, radiotherapy and surgery.

Diagnose the noninvasive possibilities in which medical image is very useful. The noninvasive approach like; MRI, CT scan, Ultrasound, SPECT, PET and X-ray are the different type of medical imaging technology. In the field of medical diagnosis systems (MDS), Magnetic resonance Imaging (MRI), gives the better output slightly than Computed Tomography (CT), due to Magnetic resonance Imaging provides higher contrast between different soft tissues of human body. To determine the radio frequency pulses and to produces the detailed pictures of organs, soft tissues, bone and other internal structures of human body the MRI-scan is a powerful magnetic fields component. The MRI-Technique is most powerful for brain tumor detection. Through MRI images the brain tumor detection can be done. Medical image processing to improve the quality of images

the image processing and image enhancement tools used. For highlighting the features of MRI images the contrast adjustment and threshold techniques are used. For classification and detecting the tumor of brain The Edge detection, Histogram, Segmentation and Morphological operations play a vital role.

Like; preprocessing, feature extraction, segmentation, post-processing, etc. the various steps of MR imaging. These are used for finding the tumor area of MRI-images. The figure-1 shows basic structure of feature extraction through digital image processing.
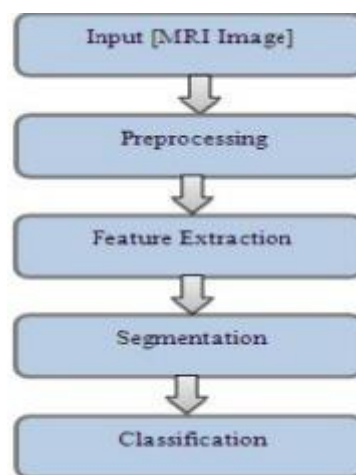

Figure 1: Block diagram of feature extraction through Digital Image processing

2. Literature Review

To find brain tumor, stroke and other Kinds of abnormalities in human brain using MR Images the Many of the researchers proposed many methods, and algorithms.

Manoj K Kowar and SourabhYadav et al, 2012 his paper "Brain Tumor Detection and Segmentation Using Histogram Thresholding", they presents the novel techniques for the

detection of tumor in brain using segmentation, histogram and thresholding.

Rajesh C. Patil and Dr. A. S. Bhalchandra et al, in his paper "Brain Tumor Extraction

From MRI Images Using MATLAB", they focused on Meyer's flooding Watershed algorithm for segmentation and also presents the morphological operation.

Many researchers has proposed many algorithms and segmentation techniques to find abnormalities in the brain using MRI images. Most of them proposed various algorithms to find the abnormality in the brain like Brain tumor.
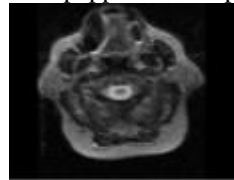
3. Image Processing Techniques

3.1 Median Filtering for Noise Removal

Used for noise removal the Median filter is a non-linear filtering technique. To remove salt and pepper noise from the converted gray scale image Median filtering is used. It changes the value of the center pixel with the median of the intensity values in the neighborhood of that pixel. In the presence of impulse noise Median filters are particularly effective. The salt and pepper noise is also called Impulse noise as because of its appearance as white and black dots covered on image.
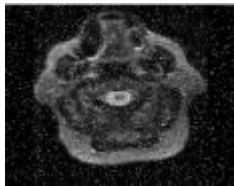
Salt and pepper NoiseApply

Median filter

3.2 Various De-noising Filters

We have studied the various filtering techniques in digital image processing that are shown in table 1.

Table 1: Various de-noising filters

Various Filters	Working Principle	Advantages	Disadvantages
Mean Filter	Based on average value of pixels	Reduces Gaussian noise. Response time is fast	Results in distorted boundaries and edges
Median Filter	Based on the median value of Pixels	Efficient for reducing salt & pepper noise, speckle noise. Boundaries and edges are Preserved	Complex and time consuming as compared to mean filter.
Wiener Filter	Based on inverse filtering in frequency domain	Efficient for removing blurring effects from images	Due to working in frequency domain, its speed is slow. Doesn't provide good results for speckle noise.
Hybrid Filter	Combination of median and wiener filter	Removes speckle noise, impulse noise and blurring effects from images	Complex and time consuming
Modified hybrid median Filter	Combination of mean and median Filter	Efficient for removing speckle, salt and pepper and Gaussian noise	Computation time is more as compared to simple median filter

3.3 Image Enhancement

In acquired image Poor contrast is one of the defects found. On the contrast of imagethe effect of that defect has great impact. When contrast is bad the contrast enhancement method plays an important role. Scaled to improve the contrast the gray level of each pixel is scaled. The visualization of the MRI images is improvedbyContrast enhancements
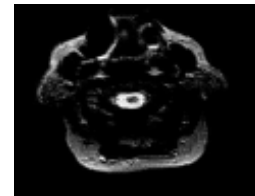
Reduced Contrast
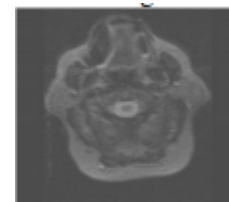
Increase contrast

3.4 Edge Detection

For finding the boundaries of objects within images Edge detection is an image processing technique is used. It works by detecting discontinuities in brightness. For image segmentation and data extraction in areas such as image processing, computer vision, and machine vision edge detection is used. Common edge detection algorithms include methods like Sable, Canny, Prewitt,Log, and Zero cross. For finding object boundaries from MRI imagesEdge detection methods are used.

Log operator

Sable operator

Canny operator

Prewitt operator

3.5 Threshold

Mage threshold is a simple, effective, way of partitioning an image into a foreground and background. This image analysis technique is a type of image segmentation that isolates objects by converting gray scale images into binary images. Image threshold is most powerful in images with high levels of contrast. Threshold technique is apply on input MRI image by switching the threshold value.

Threshold applied image

3.6 Histogram

The graphical representation of an image is known as histogram. The histogram of a digital image with gray levels in the range [0, L-1] is a discrete function. The histogram of an image mostly represents the comparative frequency of the various gray levels in the image histogram techniques apply on input MRI image.

3.7 Morphological Operation

For sharpening the regions morphological operation used as an image processing tools. Morphological image processing is a collection of non-linear operations related to the shape or morphology of features in an image. For morphological operationthe erosion and dilation methods are used.

3.8 Segmentation

Image segmentation is the action of segmenting a digital image into multiple segments.to locate objects and boundaries in image the image Segmentation is typically used. Thedifferent segmentation methods are shown in table 2

Table 2: Various Image Segmentation Techniques

Various Techniques	Advantages	Disadvantages
Active contour method	• Use active contour Models. • Preserves global line shapes efficiently.	• Should find strong image gradients to drive the contour. • Lacking accuracy with weak image boundaries and image noise.
Watersheds Method	• Based on mathematical morphology • Helps to improve the capture range	• Over segmentation
Threshold method	• Try to find edge pixels while eliminate the noise influence. • Use gradient magnitude to find the potential edge pixels	• The detected edges are consisted of discrete pixels and may be Incomplete or discontinuous. • Computationally Expensive
Seed region growing	• Correctly separate the regions that have the same properties • Determine the seed points	• It requires manual interaction to obtain seed point

4. Conclusion

For brain tumor detection MRI images are best suitable. In this study for brain tumor detection by MRI images digital Image Processing Techniques are important. In smoothing of image the preprocessing techniques include different methods like Filtering, Contrast enhancement, Edge detection are used.used to enhance the images the Post processing operations like; threshold, histogram, segmentation and morphological are used.

References

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