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Detection of Brain Tumor By Using Image Processing Techniques

Assistant Prof. Dr. Salem Saleh Ahmed Al-amri
Engineering Geology Department
Oil & Minerals Faculty ,Aden University
Aden ,Yemen
salemalamri2003@yahoo.com

***Abstract*—Detection of brain tumor is very important to diagnosis of Early prediction cancer cells in brain in this paper using image processing techniques with help of MR image to choose best method to detection of tumor.**

This paper attempts to undertake the study of brain tumor using image processing techniques by three types of filters as mean filter ,standard median filter and adaptive median filter applied in MR images and compared with one another so as is choose the best technique of detection of tumor.

Keywords—Brain Tumor ,MR Images, Image Processing.

I. INTRODUCTION

Detection of brain tumor is very important to diagnosis and Early prediction in cancer cells in the brain to this cause more studies which take in this subject like :

They are proposed new method for image smoothing based on a fourth-order Partial Differential Equation (PDE) model, the algorithm used in MRI medical image and demonstrated good noise suppression without destruction of important anatomical or functional detail, even at poor signal-to-noise ratio[1].

They are presents a de-noising method in Magnetic Resonance Images using Wave Atom Shrinkage that leads to the improvement of SNR in low and high noise level images[2].

They are applied various spatial filters on the medical images like CT, MRI, and X-ray images and after comparing the wavelet based de-noising methods, noise is removed while preserving the edges with less loss of detail. The main idea is the use of realistic distributions of the wavelet coefficients [3].

Nowadays there are several methodology for classifying MR images, which are fuzzy methods, region growing method, neural networks, knowledge[4] .

in which the multi-parameters(edge, gray & contrast)were used. This method can segment a tumor provided that the desired parameters are sat properly. They also calculated area and volume of tumor in 2D&3D MRI. The segmentation of brain tumor based on Graph-cut is done by Chen and Ruam [5].

This method, the image segmentation is considered as a graph partition problem and global criterion which measures both the total dissimilarity among the different groups and the total similarity inside them. The results obtained by this method are encouraging An Improved Image segmentation algorithm based on Normalized Cut is recently proposed Qiu-Bo Xi in 2010.[6].

By using computer aided drawing software. Segmentation of basic brain MR regions supports in visualization to identify various diseases, morphological and volume estimation, tissue classification and etc. Various methods of segmentation are edge based, thresholding, watershed and region growing etc., which are distinguished on the basis of their application and modality using which image is acquired[7].

Magnetic Resonance Imaging (MRI) is a multi-sequence medical imaging technique with which stacks of images are acquired with different tissue contrasts. Each sequence, namely, T1-weighted,T2-weighted, Proton Density (PD), Fluid-Attenuated Inversion Recovery (FLAIR), etc., highlights specific properties of tissues and pathologies, but none of them can provide completely decisive and reliable information. In MR images, lesions usually appear quite different in texture from normal tissues. Texture features provide an important in the perception and discrimination of a tumor. Image classification is one of the typical computer applications widely used in the medical field[8].

They art introduced into brain tumor segmentation. Trained classifiers estimate the probability for each voxel in the testing volume, judging whether the voxel belongs to the target or the background. The threshold of the probability map is calculated to obtain the segmentation result or provide for post-

processing. These techniques make it possible for high-dimensional features to be utilized in order to achieve a better discriminatory power for tumors compared with sole dependence on intensity information [9].

Brain images in MRI scan can be normal or abnormal. The normal brain is characterized by having gray matter (GM), white matter (WM) and cerebrospinal fluid (CSF) tissues. The abnormal brain usually contains active tumor, necrosis and edema in addition to normal brain tissues. Necrosis is a dead cell located inside an active tumor, while edema is located near active tumor borders. Edemas, which results from local disruption of blood brain barrier, often overlap with normal tissues and it is always difficult to distinguish from the other tissues [10].

This method MR images were preprocessed, using standardizing, non-brain removal and enhancement and an improved fuzzy clustering algorithm was then applied to segment the brain MRI into different tissues. To complete the diagnosis fuzzy logic based genetic programming (GP) procedure was developed to search for classification rules. Classification results for three types of tumors on different MR images for different pathologies, indicated that the technique is promising[11].

The median filter was once the most popular nonlinear filter for removing noise, because of its good de-noising power[12].

II. IMAGES PROCESSIG TECHNIQUES

When take MRI may be corrupted by some noise which call reimaging MRI but this re-imaging is very costly.

The image processing techniques is the method using to removal the noise by computer programming by less cost using some filters like:

A. Mean Filter(MF)

The Mean filter is a linear filter which uses a mask over each pixel in the signal[13]. Each of the components of the pixels which fall under the mask are averaged together to form a single pixel:

$$f(x,y) = 1/MN\Sigma(s,t) \in Sxy\ g(s,t) \quad (1)$$

where f is the restored image and g is the corrupted image.

B. Standard Median Filter(SMF)

The median filter is also the simpler technique and it removes the speckle noise from an image and also removes pulse or spike noise [13]. The Median Filter is performed by taking the magnitude of all of the vectors within a mask and sorting the magnitudes. The pixel with the median magnitude is then used to replace the pixel studied. The Operation of median filter can be expressed as:

$$f(x,y) = \text{median}(s,t) \in Sxy\{g(s,t)\} \quad (2)$$

where Sxy represents the set of coordinates in a rectangular sub image window, centered at point (x, y), and median represents the median value of the window.

C. Adaptive Median Filter(AMF)

Adaptive Median Filter(AMF) is combines both standard median filter(SMF) and mean filter(MF) to determine more accurate value of each pixels of noisy image. Adaptive Median Filter(AMF) is one of the order statistics filters that give more accurate output than other existing order statistics filter. This filter work in the two stages: The first is started when the mean filter is end and the second stage after median filter is starting to remove noise from the edge of image when the median filter unable to remove noise from edge of image.

Adaptive median filter works in two levels denotes Level A and Level B as follows:

Level A: A1 = Zmed – Zmin
A2 = Zmed – Zmax
If A1>0 AND A2<), Go to level B
Else increase the window size
If window size <=Smax repeat level A
Else output Zxy.

Level B: B1 = Zxy – Zmin
B2 = Zxy – Zmin
If B1>0 And B2<) output Zxy
Else output Zmed-

Where,

Zmin = Minimum gray level value in Sxy
Zmax = Maximum gray level value in Sxy
Zmed = Median of gray levels in Sxy
Zxy = gray level at coordinates (x,y)
Smax = Maximum allowed size of Sxy

III. MRI & NOISE

Magnetic Resonance Image (MRI) is widely used in the field of medicine. It is used for imaging soft tissues in organs brain. The common problem in Magnetic Resonance Image is speckle noise which is caused by the imaging technique used that may be based on coherent waves such as acoustic to laser imaging.

MR images corrupted also by Rician noise, which arises from complex Gaussian noise in the original frequency domain measurements.

Noise reduction by remove from a MRI corrupted by different kinds of noise while image acquisition. Some image processing techniques can be described in this paper to remove MRI noise.

IV. EXPERIMENTS & RESULTS

A. Testing Proceeding

Removal noise from MR image was implemented to detection cancer of the brain tumor using (MATLAB R2014a, 14.4a) by three image processing techniques as Mean Filter(MF), Median Filter(SMF) and Adaptive median filter(AMF) in MR image illustrated on the Fig.(1).

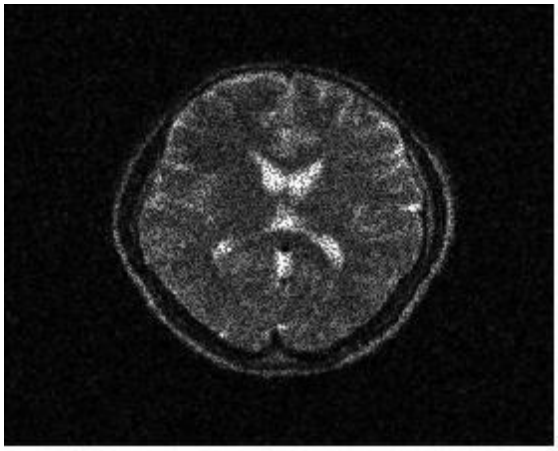

Fig.1.MR Image of brain Tumor with 70% noise

B. Simulation & Results

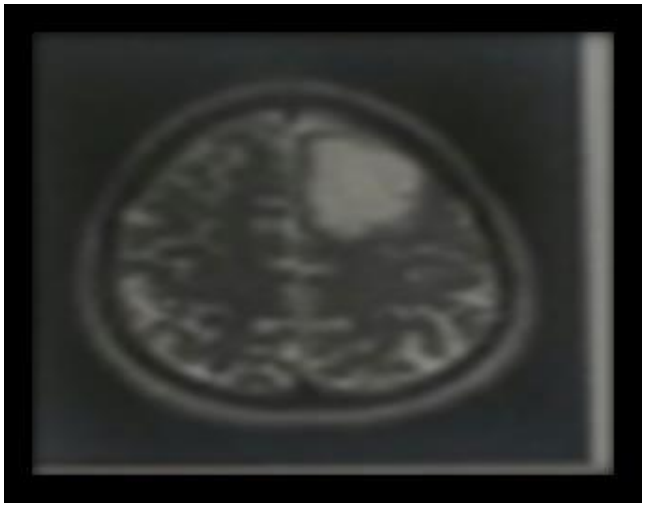

Fig.(2) Remove Noise by Using MF Method

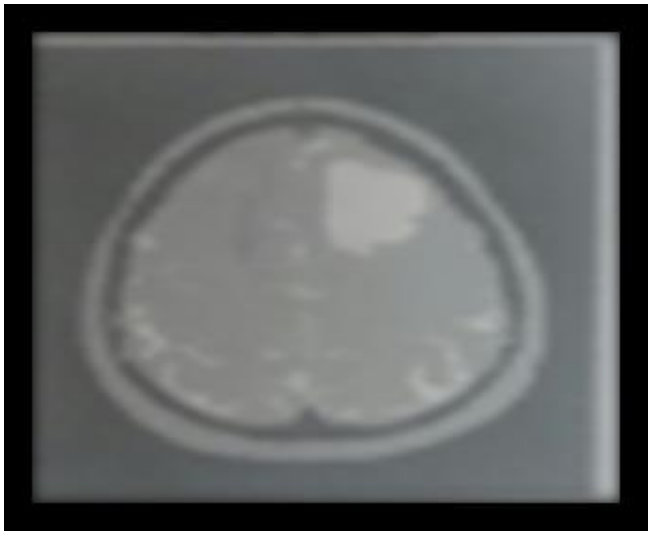

Fig.(3) Remove Noise by Using SMF Method

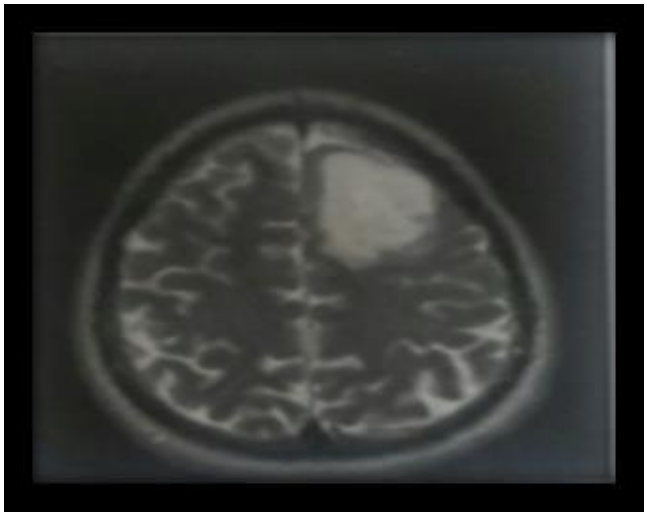

Fig.(4) Remove Noise By Using AMF Method

Table 1. Comparison results of different filtering method by using (PSNR) and (RMSE)

Image	Filtering Methods	PSNR (dB)	RMSE
MR brain image	MF	48.30	340.23
MR brain image	SMF	48.80	339.35
MR brain image	AMF	49.2	315.20

To remove the noise from magnetic resonance imaging (MRI) of brain tumor in Fig.(1) by using the three types of filters ,the results of this filters in the experiment shown in the Fig.(2),Fig.(3) and Fig.(4) which show that:

The adiabatic median filter(AMF) is best method to clean the noise to shown the cancer of tumor of brain clearly. Comparing the result of the removal noise from MRI also by using the root mean square error (RMSE) and peak signal-to-noise ratio (PSNR).

The peak signal to noise ratio (PSNR) is the ratio between the maximum possible power of a signal and

the power of corrupted noise that affects the fidelity of its representation. A higher PSNR would normally indicate that the reconstruction is of higher quality. The root mean square error (RMSE) used to evaluate the enhancement performance.
A smallest(RMSE) would normally indicate that the reconstruction is of higher quality.

VI. CONCLUSION

In this paper, the comparative studies are explained & experiments are carried out for different filters, Mean Falter(MF), Standard Median Falter(SMF) and Adiabatic Median Falter(AMF) to remove the noise from MRI brain tumor. Experimental results show that AMF method performs much better than the other filtering methods. The AMF method has been compared with MF and SMF using quantitative parameters like PSNR and RMSE which illustrated in the Fig.(2),Fig.(3)and Fig.(4) with values illustrated in the Table. (1). It has been found that AMF method performs better than all other methods .Although MF and SMF filter shows good result, but some blurring effect in the Fig.(2)and Fig.(3). The cancer brain tumor after removing noise can be showing clearly in the white spot in the right hand side of the MRI in the fig.(2),Fig.(3) and Fig.(4).

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