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ADVANCED METHOD TO SEGMENT BRAIN MRI DATA FOR DETECTION OF DISEASE USING HISTOGRAM EQUALIZATION

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ABSTRACT: Automatic and objective image quality assessment is important for image data processing. Techniques such as digital image processing are used to magnify the medicine used to facilitate the interpretation of X-rays. The brain's Magnetic Resonance Image (MRI) is an effortless and assured test. The project's objective is to produce an image processing algorithm that can segment brain MRI information efficiently. To reduce the spread of disease and promote efficient management procedures, monitoring health and early detection of pathogen are crucial. The clinical diagnostic selection method has become the magnetic resonance imaging (MRI). However, many of the MRI parameters that allow disease detection, such as passive enhancement in comparison across a compromised blood-brain barrier, are weighted towards late-stage disease.

KEY WORDS: MRI brain image, Contrast enhancement, Histogram equalization, Medical image processing.

I. INTRODUCTION

Image processing is an extensive and demanding field and can be used in different fields such as medical images, industrial and satellite image processing. The most advanced sense in our senses is Vision; the image plays a significant role in the human's life. In medicine, digital image processing techniques are used to enhance contrast to facilitate X-ray interpretation and other bio-medical images [1]. Magnetic resonance imaging (MRI) is a safe and effortless test that generates in-depth images of the brain and brain stem using a magnetic field and radio waves. Then, using the MRI image, the treatment on brain tumors has begun, swelling and bleeding. This MRI image produce a high-resolution images and having the complete Information about the brain functionality, observe the brain maturity and abnormalities.

The method of Image Improvement is used to create an image feature for human perception. It is described as a technique of image processing so that the result is much more suitable than the initial image. Histogram Equalization is essential for enhancing the image and help to knowing about the working of the digital images. The equalization intensity level method is a dynamic range-enhanced image that tends to be highly contrasted due to the significant distribution of the histogram throughout the intensity scale. Overall, the increase intensity is due to the reality that in the histogram of the equalized picture the average intensity level is better than the original. Its role is to raise the intensity dynamic range in an image.

Enhancement is changing the image to correct the effect of the observer. Pre-processing methods can be used to pass image conditioning, i.e. Image improvement. Image Enhancement techniques are used to produce the excellence of human perception's image or appearance. For a particular implementation, the processed image is more appropriate than the initial image. Histogram Equalization (HE) is a very popular technique for improving image contrast. Most of the method is used due to its simplicity and slightly better image quality. Magnetic resonance imaging (MRI) is a safe and simple test that generates comprehensive image of the brain and brain stem using a magnetic field and radio waves. For patients with claustrophobia, MRI machines have better openings and support. Brain MRI may be useful in estimating issues such as persistent headaches, dizziness, weakness, and blurry vision or seizures, and may help to detect some chronic nervous system diseases such as multiple sclerosis [2].

As a part of the medical imaging field, image processing techniques, image improvement technique is widely used, particularly Magnetic Resonance Imaging (MRI), test that uses attractive field and radio pulses to capture body images is called Magnetic Resonance Imaging, especially for the brain or cerebrum. In the medical sector, the imaging technique of MRI is used to produce very excellent quality images of the components of the human body. MRI is used for many reasons, including the diagnosis of brain tumors, various illnesses, and spinal infections; to visualize shoulder wounds, bone tumors, and strokes.

The MRI images clearly show the damaged tissues and these pictures are stored on a computer for reference preparation and support. With a particular end objective of obviously seeing the MRI images, a contrast material is sometimes also used and acknowledges blood stream, tumors, and inflamed tissue regions. Specialists are provided the varied results of enhanced images to give a correct diagnosis with excellent results.

II. RELATED WORK

Now a day even the smallest model of any phone has digital camera and now a day's mobile phones have been widely used in everyday life to take pictures. Since mobile phones have limited hardware ability for digital photography, the use of software instruments to improve the quality of the picture acquired is highly needed to post-process pictures. The contrast enhancement and brightness conservation are two primary focus areas for researchers in the consumer field of electronics products. Image enhancement enhances image appearance with low luminance and enhances with detailed image. Image enhancement techniques are commonly divided into two categories: transform domain and spatial domain. First category includes the technique that operates on the frequency transformation of an image, whereas techniques such as improving the contrast, in second category work directly on the pixel level of the image.

Histogram equalization (HE) is commonly used for contrast enhancement in a variety of applications due to its simple function, ease of use and effectiveness. Examples include medical image processing and radar signal processing. The concept behind Histogram Equalization (HE) is to flatten the probability distribution and extend the dynamic range of gray levels, enhancing the overall contrast of the image [3-4].

HE utilizes the cumulative density function (cdf) of the image to map the gray levels of the original image to the enhanced image. For most consumer electronic applications such as TV, cameras, etc., HE is not suitable because it tends to change the mean image brightness to the center point of the gray level range, which in turn produces irritating impact of intensity saturation and artifacts. Different techniques to solve the above-mentioned shortcomings have been suggested in the literature. But improvement is still needed more attention for low illumination images.

In this paper, a new illumination-based image contrast enhancement method called as Sub-Image Histogram Equalization (ISIHE) is proposed, which is highly efficient for low illumination gray scale images and maintains entropy along with the control of enhancement rate. The authors think that not only will the suggested ISIHE technique achieve the objective of maximizing entropy, but it will also provide managed enhancement. The authors also think and suggested that a better image enhancement approach for low-illuminated images.

HE is one of the known techniques of improving images contrast according to the spatial distribution of an image. The literature offers a broad range of HE-based image enhancement methods. This chapter provides an insight into the researchers work on HE-based image contrast improvement. The first method called Brightness Preserving Bi histogram (BBHE) was suggested by Kim. It maintains the mean image brightness, while improving contrast. BBHE divides the histogram into two parts based on the input's mean brightness and equalizes the two histograms independently.

Wongsritong proposed another method, Multi Peak Histogram Equalization with Brightness Preserving (MPHEBP), in 1998. The image input histogram is smoothed and divided in this method, depending on the local maxima. It enhances the picture brightness mechanism while improving contrast. Authors stated that the production of MPHEBP is better than BBHE [5] in terms of keeping mean brightness.

Sim suggest another method comparable to RMSHE. This algorithm is called Recursive Sub-Image Histogram Equalization (RSIHE) and conducts histogram division based on average brightness value instead of mean brightness. Finding the optimal value of the iteration factor is a major challenge for producing important enhancement results in both RMSHE and RSIHE methods. Wadud introduced a method of Dynamic Histogram Equalization (DHE), established in the original histogram to eliminate the dominance of larger histogram components over decreased ones.

Ooi proposed the Bi-Histogram Equalization Plateau Limit (BHEPL) method. This method is essentially the BBHE fusion and clipped solutions to the equalization of histograms. BHEPL decomposes the input picture into two sub-images using the mean image brightness followed by sub-histogram clipping using the plateau limit as the mean of the amount of intensity that occurs. The BHEPL method avoids unnecessary enhancement and image amplification of excessive noise. Ooi proposed a similar approach that categorizes the original histogram into four sub-histograms based on the input of median image.

This method is based on the clipping of histograms and is called Quadrants Dynamic Histogram (QDHE) equalization. The resulting sub-histograms are sliced according to the mean input image intensity before a new dynamic range is assigned to each sub-histogram and are equalized individually. QDHE is the most robust way to get data about the low-contrast image. Liang et al. proposed Double Plateaus Histogram Equalization (DPHE) to enhance the infrared image. In this method, threshold values up and down could be calculated by searching for local maximum values and predicting a minimum gray interval.

III. LITERATURE SURVEY

The image segmentation technique was suggested by Havel Muhammad and David, et al. This technique of segmentation finds a contour that splits the image into images that are non-overlapping. This method of segmentation refers to homogeneous images of intensity. The benefit of this method is without any extra term, it is automatically proceeds in the right direction. This algorithm works on various regions of disjunction. The computational cost of solving the estimated PDEs is very high and the contour C is not known it is difficult to minimize the function.

D.Selvaraj and R. Dhanasekaran suggested a new approach to brain MRI segmentation. This method is based on thresholding based on intensity to obtain ordinary brain tissue limits such as CSF, GM, and WM. This strategy consists of two pre-processing phases and the other is segmentation. Skull removal is the first phase of pre-processing brain tissue segmentation. In the second step, we apply the polynomial orthogonal transformation to the image stripped from the skull and segment the CSF from the image of the brain MRI.

For GM and WM segmentation, the skull stripped picture is first smoothed by applying Gaussian convolution filter and then calculating the smoothed image's x, y gradients. Using these gradient values, the edges in the picture were labeled and then binarization and morphological operators were performed to remove the noise from the picture. This technique is easiest and fastest, but the issue is that medical images are pre-processed and pre-registered.

The expansion of the Mumford Shah function was suggested by Andy Tsai and Anthony Yezzi et al. This method covers the issue of missing data owing to the Infrared Sensor's saturated intensity and defective \pixels. This algorithm fills the gaps with the assistance of the previous smoothness constraint. This technique conducts images with missing information segmentation, denoising and interpolation. Several methods in this article have made our algorithm quick, effective and handle significant image features like triple point and various intersections.

Lee suggested a computer tomography (CT) brain image segmentation technique. This method is divided into two types pre-processing and segmentation components. Pre-processing: First of all, in pre-processing, we improve the contrast of the original image. The next step is to extract the context and skull of the image and remove the region of the intracranial.

Reduce the partial volume impact on the intracranial boundary by using the canny algorithm and disconnect the ordinary region after removing the edge from the abnormal region and enhance the contrast of the abnormal region. For the removing of the salt and pepper noise, it can be can use the median filter. Segmentation: This chapter introduces the methods of segmentation applied to the improved abnormal picture. There are many methods of segmentation such as Otsu threshold, K-means, Expectation Maximization (EM) technique, and Fuzzy c-means (FCM) with autonomous population-diameter (PDI).

The best way to segment CT head images is to use the FCM with PDI method. Compared to the FCM with PDI, the results after the EM segmentation is very loud. The FCM accurately balances the contribution of small and large clusters with PDI. Chunming Li et.al suggested a formulation method based on region-based variation rate. The entire picture is segmented by this algorithm. It overcomes the issue of homogeneity intensity. In this method we first identify the energy function of Region Scalable Fitting (RSF) and then two fitting functions f1 and f2 perform localization. This algorithm can segment objects that are inhomogeneous. The descent technique of gradient is used for minimizing the functional energy.

IV. PROPOSED SYSTEM

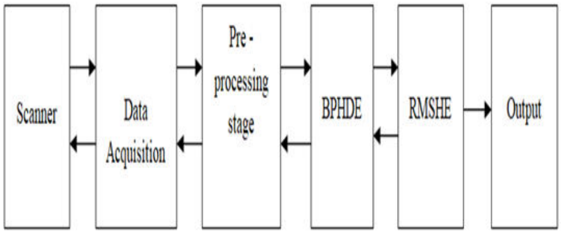

Fig. 1: PROPOSED SYSTEM

The above figure (1) demonstrates the proposed system's architecture. Data acquisition system pre-processing phase, BPHDE, RMSHE is used in this system scanner. In the method of Brightness Preserving Dynamic Histogram Equalization (BPDHE), the original image is decomposed into different sub-images. Then the dynamic histogram equalization is applied to each sub-image and finally the sub-images are paired. This method smoothes input histograms using a one-dimensional Gaussian filter. It is suggested that image decomposition be performed recursively in the Recursive Mean-Separate Histogram Equalization (RMSHE) method instead of decomposing the image only once.

a. DATA ACQUISITION

Clustering pixels into prominent picture region is the goal of image acquisition. In order to provide data such as anatomical structure and identify the region of interest, i.e. locating the tumor, lesion and other abnormalities, the acquisition of gray level data is used. The suggestion method depends on the anatomical structure data of the healthy components and compares it with the infected components. This starts by assigning a reference picture of a standard candidate brain scan picture to the anatomical structure of the healthy components.

b. PRE-PROCESSING STAGE

Magnetic Resonance Image (MRI) enhanced to detecting the suspicious region by the using of the Pre-processing techniques. The first step of pre-processing is tracking features involves those activities that are usually crucial prior to major information review and detail extraction, and are frequently grouped as radiometric or geometric improvements. for example, film artifacts or labels, names, age and marks of the patient. Through the tracking algorithm, film artifacts are eliminated. At this point, the intensity value of the pixels starting from the primary row and the initial column is analyzed and the threshold value of the film artifacts is found. The threshold value should be noted to exceed the threshold values removing from MRI. MRI eliminates the film artifacts ' high intensity value. At some point in eliminating film artifacts, the image includes salt and pepper noise.

c. BPHDE

The image histogram is manipulated by the BPHDE technique, in such a way that the histogram peaks are not remapped, while only the gray-level values are redistributed between two consecutive peaks in the valley portions. In most cases, without severe side effects, BPDHE successfully enhances the image, while maintaining the mean brightness of the input. It is made up of five steps:

1) Map each partition into a new dynamic range.

2) Smooth the histogram with Gaussian Filter.

3) Detection of local maximum location from smoothed histograms.

4) Normalize the brightness of image.

5) Independently equalizes each partition.

d. RMSHE

In the Recursive Mean Separate Histogram Equalization (RMSHE), recursively, the mean-based histogram segmentation is performed more than once. As the segmentation of the histogram increases, the average brightness of the output image converges to the average brightness of the input image. RMSHE improves the contrast of the image and maintains the brightness of the image.

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V. RESULTS

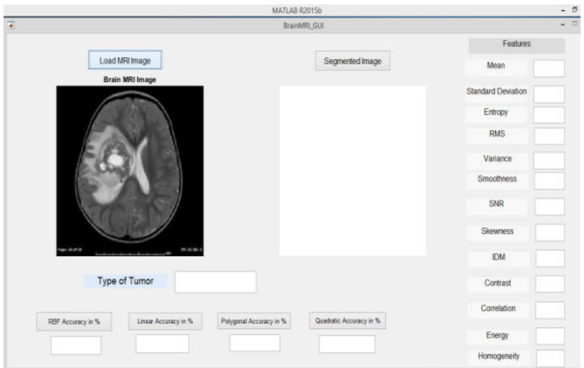

Fig.2: INPUT IMAGE

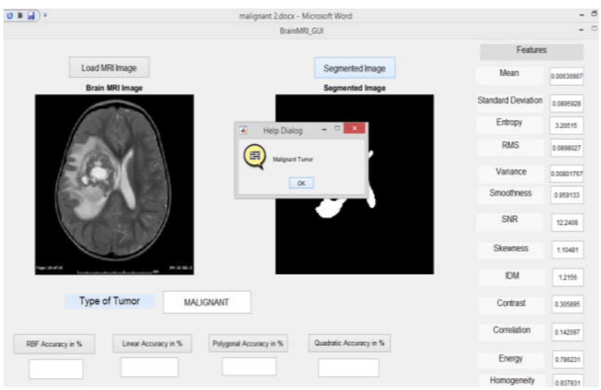

Fig.3: MALIGNANT TUMOR

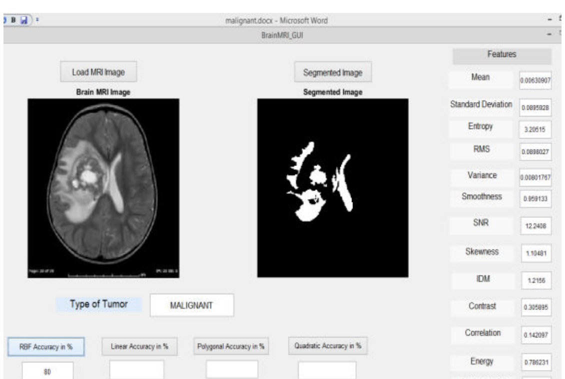

Fig.4: RBF ACCURACY IN PERCENTAGES

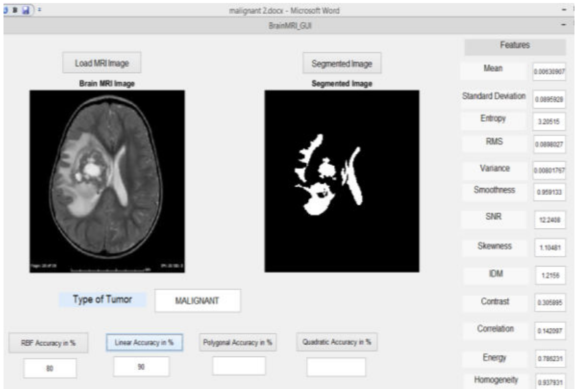

Fig.5: LINEAR ACCURACY IN PERCENTAGES

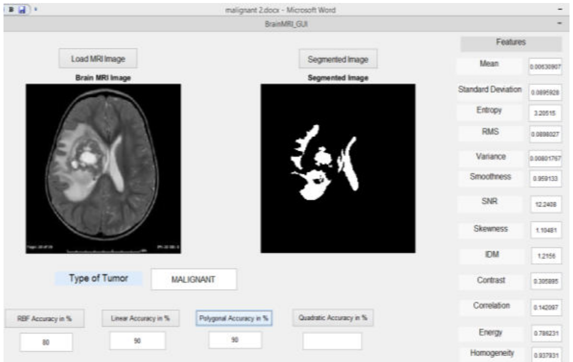

Fig.6: .POLYGONAL ACCURACY IN PERCENTAGES

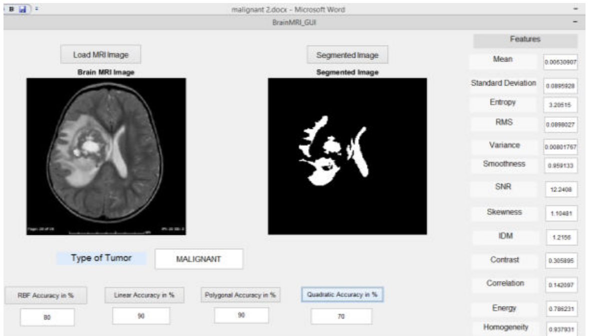

Fig. 7: QUADRATIC ACCURACY IN PERCENTAGES

VI. CONCLUSION

In this paper the robust and simple classifications of MRI scans are proposed. This system detects the motion-corrupted images in large-scale data bases. Proposed algorithm produces the best enhancement of image contrast producing good enhancement of image contrast. In the initial stage of the work preprocessing is done to remove noises. The experimental result shows that the suggested method offers greater precision in classification than other volumetric methods. From the view of this work, other classification techniques are scheduled, but also various MRI modalities in the classification structure developed.

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