SOCIETY FOR SCIENCE AND EDUCATION
UNITED KINGDOM

JBEMi JOURNAL OF BIOMEDICAL ENGINEERING AND MEDICAL IMAGING

ISSN: 2055-1266
VOLUME 5 ISSUE 5

Improvement of Sonographic Appearance Using HAT-TOP Methods

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ABSTRACT

Ultrasound consider of one of the most important tool in analysis of fetus development. In ultrasound images, the recognition closely adjacent tissues is very crucial process because of the noise that affected both image quality and sharpness. This study conducted to study the fetus images improvement using HAT-TOP transform as computing choice in order to increase the diagnostic accuracy in diagnosis of neonatal diseases. Many image-processing techniques were used to improve the images including Using HAT-TOP and Blind Deconvolution Algorithm. The results of the study showed HAT-TOP was best processing filter and define the fetus precisely.

Keywords: Ultrasound, image processing, MatLab, HAT-TOP technique.

1 Introduction

Ultrasound images in general are complex due to data composition, which can be described in terms of speckle information. Upon visual inspection, speckle noise consists of a relatively high grey level intensity, qualitatively ranging between hyperechoic (bright) and hypoechoic (dark) domains. In addition, ultrasound images have the advantage of being non-invasive, portable, versatile, and low cost and not requiring ionizing radiations [1-2]. The filter preserves monotonic image features that fill more than half the area of the transform window. Based on Median filter have used Topological Median filter to improve conventional Median filter [3-4]. The Topological Median filters defined are outperforming conventional Median filters with 7 x 7 or larger transform windows in reducing a noise while preserving edges. On the average, there is a minimal effect on edge strength or edge location. A conventional Median filter does outperform a Topological Median filter in the reduction of the amplitude of noise [5]. Through experiments, the variance of noise passed through a Topological Median filter was found to exceed that of a conventional Median filter by a factor of about 1.25 [6]. The best techniques for processing such images are edge magnitude and edge location. Conventional Median filters reduce the variance of noise more than Topological Median filters. An adaptive two-pass Median filter to remove impulsive noise. An image contaminated by impulsive noise is represented in a two-pass Median filtering and is processed by a Median filter twice. By analyzing the spatial distribution, i.e., the error index matrix of the impulsive noise, the adaptive two-pass Median filter looks for columns containing over-corrected pixels by the standard Median filter and replaces over-corrected pixels by their original values[7-9]. The experiment that has been done shows that the adaptive filter is able to reduce the

DOI: 10.14738/jbemi.55.5283
Publication Date: 18th October 2018
URL: http://dx.doi.org/10.14738/jbemi.55.5283

mean square (MSE) and mean absolute error (MAE) produced better results. The image is divided into different regions using neighborhood contrast intensity and employ different methods to denoise the pixels in different regions. This is not only to maintain the characteristic that the Average filter algorithm has a better denoising effect on Gaussian noise, but take into account that Median filter algorithm can better preserve the details [10]. Experiments that been done show that the proposed algorithm is practicable and competent. Wiener filters are extensively used for inverse problems. Based on Wiener filter method considered as the adaptive Wiener filtering of noisy images and image sequences. An adaptive weighted averaging approach was used to estimate the second-order statistics required by the Wiener filter. From the experiment, it shows that the result from Wiener filter has improved the peak-to-peak signal noise ratio (PSNR) by about 1dB. It has also improved the annoying boundary noise significantly [11-12]. Image segmentation is a process to partition an image into Non-overlap regions, which is an important step in the image processing area and is fundamental to the analysis and identification in image processing. Image segmentation is an important process for most of the medical image analysis tasks, which is basic for higher-level image comprehension and analysis [13]. A good segmentation will benefit clinicians and patients as it provides important information for surgical planning, early disease detection and 3D visualization .In order to solve the problems of medical image segmentation, many practical methods have been advanced in this field. These include watershed segmentation, shareholding method, region-growing method, fuzzy cluster method and so on. The watershed algorithm is a classical and an effective segmentation method by which one-pixel wide continuous edge can be extracted [14]. The most effective methods in complex segmentation problems are watershed segmentation. The segmented region is obtained when the algorithm uses watershed transform applied to the image. However, segmentation of noisy ultrasound image using watershed transform always leads to over-segmentation [15-16]. There are many applications whether on synthesis of the objects or computer graphic images require precise segmentation. In general, image noise should be eliminated through image pre-processing [17].

2 Materials and Methods

This study carried out to enhance the quality of ultrasound images of long bone fracture through removal of speckle noise using techniques such as Median, Average and Wiener Filtering. The median filter is a non-linear digital filtering technique; it used to remove noise from images. It is useful to reduce speckle noise and salt and pepper noise. Its edge-preserving nature makes it practical in cases where edge blurring is undesirable. Average Filter performs spatial filtering on each individual pixel in an image using the grey level values in a square or rectangular window surrounding each pixel.

Image analysis using MatLab:

Top-hat filtering.

The morphological algorithm accomplishes on the grayscale sonographs. It uses opening technique then subtracts the product from the inventive image. imtophat uses the structuring element SE, where SE is returned by strel. SE use to computing single structure rather than multiple. IM2 = imtophat(IM,NHOOD) where NHOOD is an array of 0s and 1s that specifies the size and shape of the structuring element, is the same as imptophat(IM,strel(NHOOD)). The steps of processing is shown in figure 1.

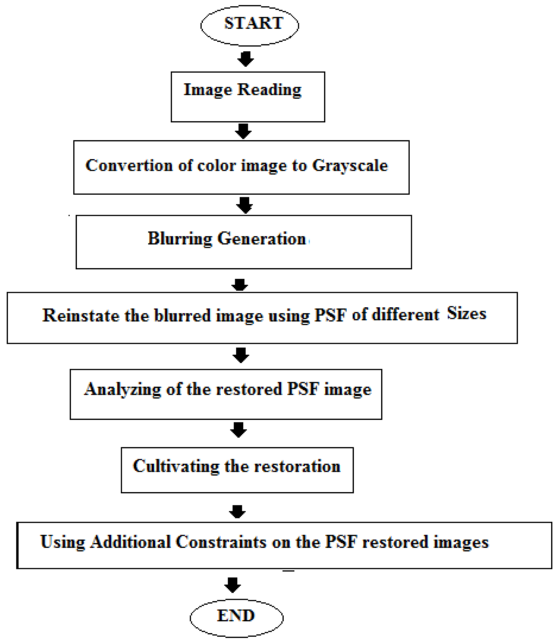

Figure 1. Top-hat filtering processing steps

The data analyzed by using MatLab program to enhance the contrast within the soft tissues, the gray levels in both enhanced and unenhanced images and noise variance.

3 Results

Ultrasound images in general are complex due to data composition, which can be described in terms of speckle information. Upon visual inspection, speckle noise consists of a relatively high grey level intensity, qualitatively ranging between hyperechoic (bright) and hypoechoic (dark) domains. In addition, ultrasound images have the advantage of being non-invasive, portable, versatile, and low cost and not requiring ionizing radiations. Therefore, those images need to be modified by using image processing program to get rid the noise, blurring and unwanted information.

Top-hat filtering

It performed morphological top-hat filtering on the grayscale or binary input image IM fig.1 and fig.2.

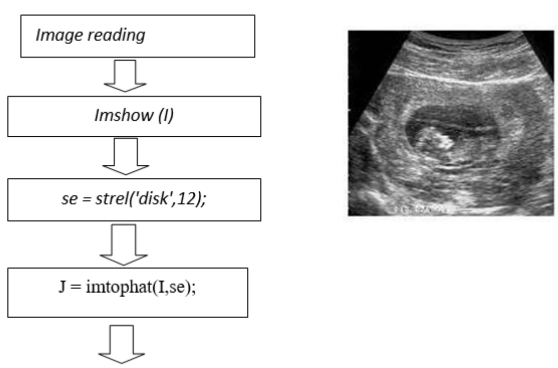

Figure 2. The Original U/S image

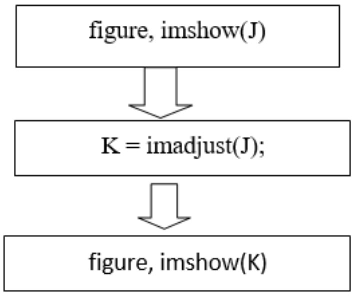

Figure 3. Top-hatted ultrasound image

Deblurring Images Using the Blind Deconvolution Algorithm

The Blind Deconvolution Algorithm:.

Step 1: Read Image

The example reads in an intensity image. The deconvblind function can handle arrays of any dimension figure 4.

Figure 4.Original U/S image

Step 2: Simulate a Blur

Figure 5. Shows blurred U/S image

Step 3: Restore the Blurred Image Using PSFs of Various Sizes

Figure 7. Shows Deblurring with Oversized PSF for U/S image

Figure 6. Shows blurred U/S image

Figure 8. Shows Deblurring with INITPSF for U/S image

Step 4: Evaluating the Restored PSF

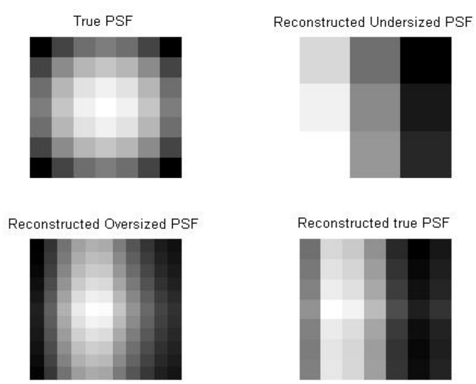

Figure 9. Shows Analyzing the Restored PSF for U/S image

Step 5: Improving the Restoration

Figure 10. Shows Improving the Restoration of U/S image

Step 6: Using Additional Constraints on the PSF Restoration

Figure 11. Shows Deblurred Image

Figure 12. Shows anonymous function Deblurred Image

4 Conclusion

Ultrasound images in general are complex due to data composition, which can be described in terms of speckle information. Upon visual inspection, speckle noise consists of a relatively high grey level intensity, qualitatively ranging between hyperechoic (bright) and hypoechoic (dark) domains. In addition, ultrasound images have the advantage of being non-invasive, portable, versatile, and low cost and not requiring ionizing radiations. Therefore, those images need to be modified by using image processing program to get rid the noise, blurring and unwanted information. This was an experimental study to study the enhancement of ultrasound image using filtering technique using image-processing technique. In addition, to evaluate contrast enhancement pattern in different ultrasound images such as grey color in order to evaluate the usage of new nonlinear approach for contrast enhancement of soft tissues in panoramic images. The main techniques of enhancement used in this study was Top-hat filtering and Blind Deconvolution Algorithm The results of this study were agreed with previous studies in blind Deconvolution algorithm and it added new approach by using both technique in U/S image processing which would increase the diagnostic value of those images. So conclusion of this research that the new method is supported that the best method to solve BSS presence by filtering the noise and background. The detection of the noise is a complex procedure, which is difficult to detect by naked eye so that image analysis should be performed by using powerful image processing.

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