Image Enhancement Techniques for Liver Ultasound Images

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Abstract— Liver is the most important organ of a human body. To human body the function of liver is very important, so as to maintain body healthy. Liver generates different digestive materials which is helpful in digestion. The liver functions may be disturbed due to high variety of circumstances. Due to alcohol consumption, hyper acidity and many other factors, liver damages. There are many abnormalities in liver including liver enlargement, fatty liver, chronic liver failure, formation of cancerous cells, swelling etc.

Ultrasound imaging is the most popular and accurate techniques for the investigation of major of the abdominal diseases. Abdominal ultrasonic consists of Gall Bladder, Liver, and Kidney for the analysis. Out of these organs, kidney and liver are very smaller organs. So their ultrasonic investigation could be a critical issue. Another challenge in ultrasonic imaging is the presence of speckle noise.

So it is required to work out for an image enhancement technique for liver ultrasonic images. This paper introduces different techniques for the image enhancement of ultrasonic images for liver analysis. The results obtained from these techniques are presented and compared to get conclusion.

Keywords—Liver, Ultrasound, Median filtering, histogram

I. INTRODUCTION

This Liver plays an important role in the functioning of human body. Abnormalities in the functioning of liver can lead to severe adverse effects on the human body. So it is important to detect those abnormalities. In medical field liver abnormalities can be detected by medical imaging techniques. Although some problems could be detected by using blood and urine examinations. The common techniques of imaging are Ultra-Sound (US), Magnetic Resource Imaging (MRI) and Computed Tomography (CT)[1]

II. GENERALIZED METHODOLOGY

The generalized methodology for the detection of various abnormalities liver is explained below.

Abdominal images are taken from medical imaging techniques such as ultrasound. On the basis of which the predication about disease and its severity are to be worked out.

Pre-processing can adopt different techniques such as histogram equalization, contrast adjustments, noise removal by median filtering. Segmentation is done afterwards. It is the process of getting the image in the required form so that it can be processed easily. After segmentation, it is necessary to decide the ROI of the image, depending upon the disease to be predicted. Once region of interest is obtained, different features are extracted from the ultrasound kidney image. Different algorithms are adopted for extracting the features such as DCT, Wavelets, Gabor Filtering, SVD calculations and many more. Depending on the different parameters of feature extraction, the disease can be detected.

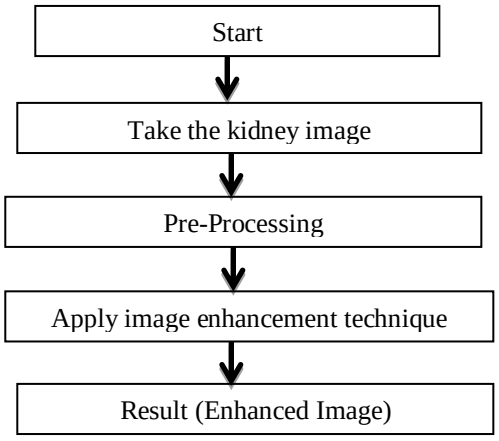


Figure 1 Flow Diagram for Image Enhancement

III. DIFFERENT METHODS FOR IMAGE ENHANCEMENT

First the abdominal image consisting of a kidney is taken. It is converted to desired dimensions and converted to desired form such as colour to gray and afterwards converted from image to double type for the analysis.

After this process, the image enhancement technique is applied and result image is used for further analysis. Following techniques are used for this purpose.

i) Histogram Equalization, ii) Image Negative, iii) Thresholding, iv) Log transformation, v) Gamma Correction, vi) Contrast Stretching vii) Gray Level Slicing viii) Bit Plane Slicing, ix) Smoothing Linear Filtering x) Median Filtering and Lapalcian Filtering

IV. RESULTS

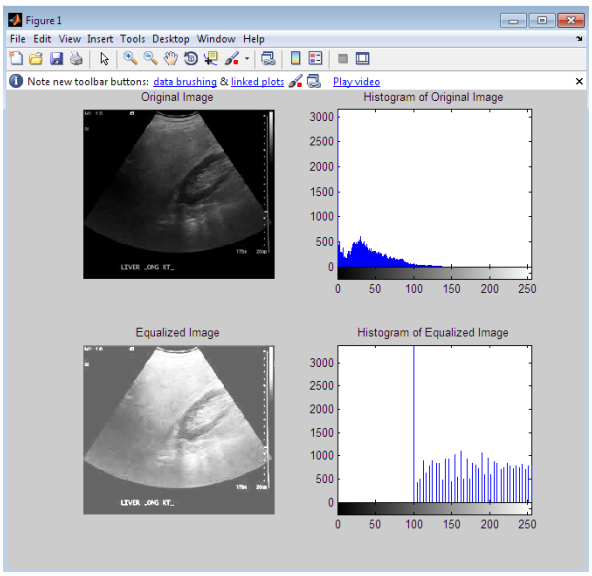
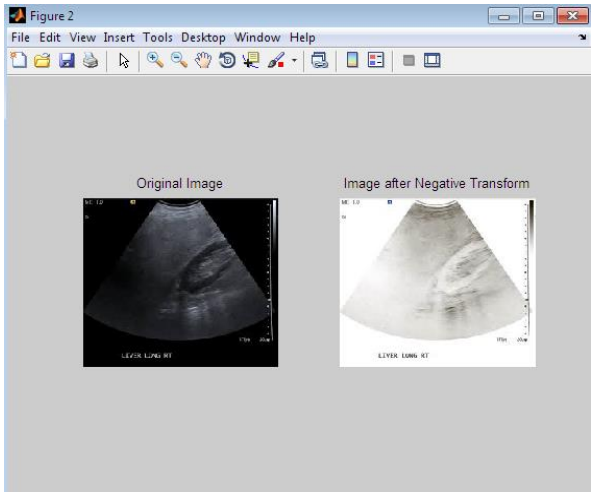


Figure 2: Result of Histogram Equalization



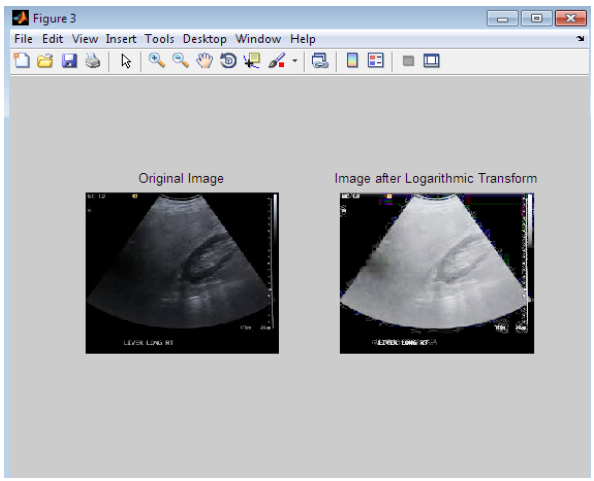


Figure 3: Result of Negative of Image

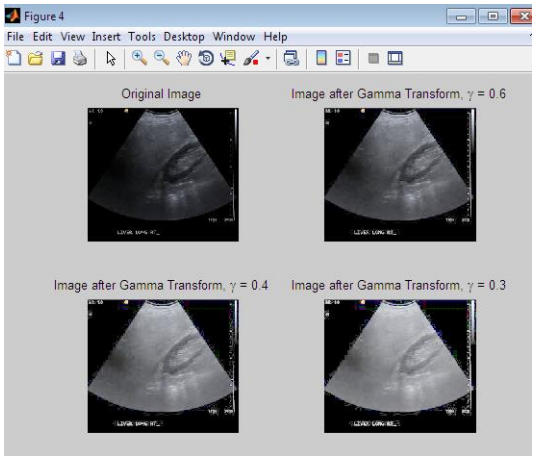


Figure 5: Result of Gamma Transformation

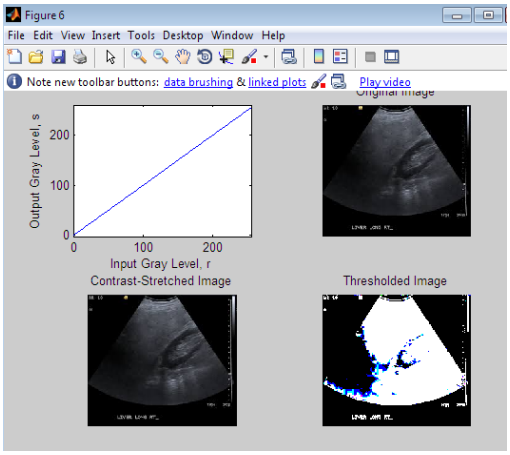


Figure 6: Result of Contrast Stretching

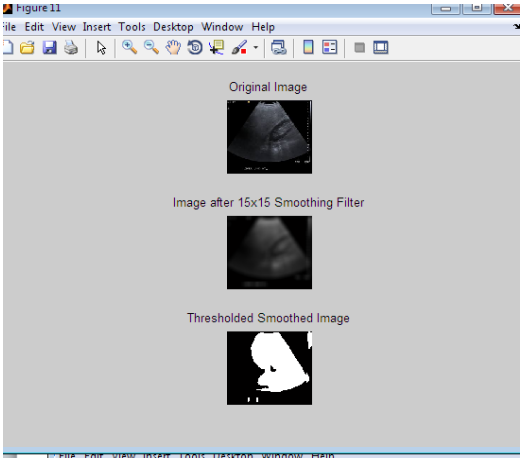


Figure 9: Result of Smoothing

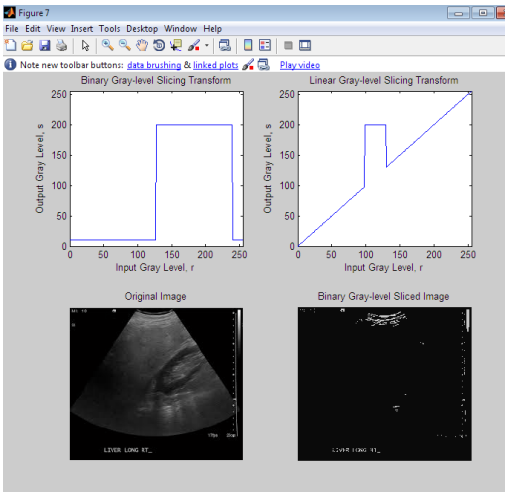


Figure 7: Result of Gray Level Slicing

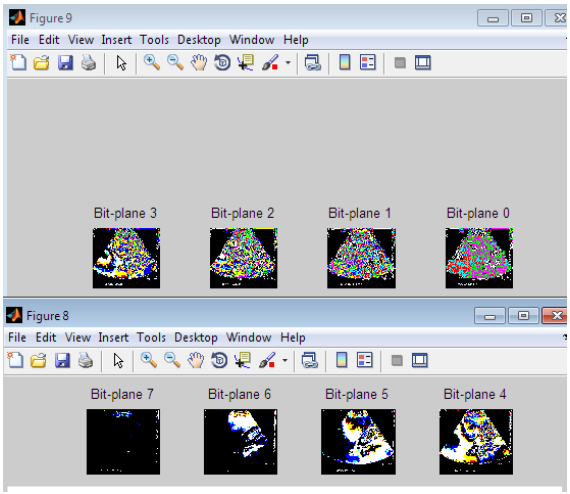


Figure 8: Result of Bit Plane Slicing

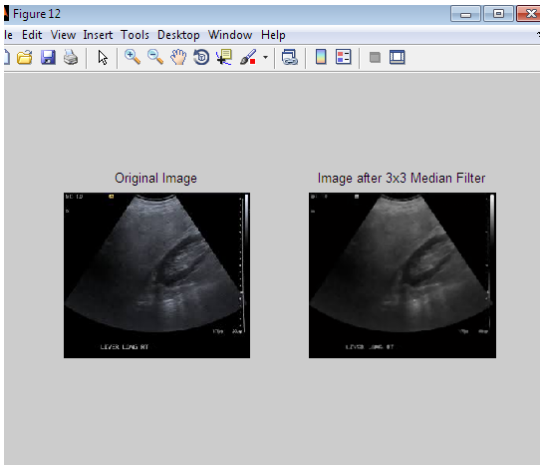


Figure 10: Result of Median Filtering

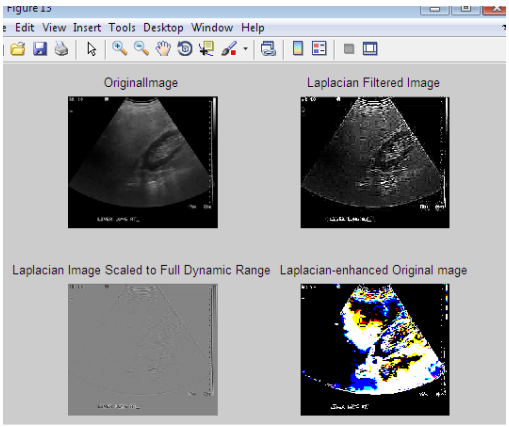


Figure 11: Result of Laplacian Flitering

V. CONCLUSION

In biomedical imaging Ultrasonic images plays a vital role for predication of different diseases related to organs such as kidney, liver, brain etc.. The main problem with ultrasonic imaging is that, for liver and kidney the images have speckle noise, as these organs are smaller in size.

Disease prediction could become a critical issue for these organs. Hence an efficient speckle noise removal technique can be employed for efficient predication and treatment. Another challenge in Liver ultrasonic images is the image segmentation and obtaining the region of interest. Different techniques are proposed for image enhancement here. Suitable technique can be used for the enhancement depending upon the disease to be predicted and region of interest.

Hence this can be concluded as Ultrasonic images can be refined by using image enhancement techniques. Different algorithms could be employed to decide the disease of kidney by using Ultrasound images. Further, PSNR and MSE can be obtained to predict the image enhancement techniques efficiencies. Also image quality equation can be applied to decide the quality of enhanced images.

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