A Review on Statistical Analysis of Filters on Various Noises in MRI and USG Images

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Received: 10 April 2015 Accepted: 5 May 2015 Published: 15 May 2015

Abstract

Medical imaging is widely used in detection of tumors and other diseases. In medicine, the enormous use of digital imaging, the quality of images becomes an important issue. The basic problem found in it is the introduction various kinds of noises whose removal becomes difficult. The technologies are working on civilizing the excellence and resolution of images but these forms as one of the major face to de-noise the image and recover its perception. This paper represents the complete review of various filters and their comparative analysis which can be used with statistical parameters in digital image processing. We can simulate the various statistical parameters and view their results using plots. We can have their relative study with the aid of MATLAB simulation to relieve the selection of best filter for a particular noise introduced in MRI and USG image.

Index terms— statistical parameters, noise, filters, MRI and USG image.

1 Introduction

uppression of noise efficiently in an image is a very important process. Here the detection of the noise patterns which affects the USG and MRI image and to apply the Spatial filters to remove those noises. The common noises found in these images are speckle noise, salt and pepper noise and Gaussian noise. These images come across these noises from background and through equipment [1]. The noise can be of any type, high or low leading to the degradation of the image quality. The Spatial Filters are categorized according to their performance and judged by Statistical analysis to find the best suitable Spatial Filter for a particular noise. The various statistical parameters used are MSE, NAE, NCC, max diff and PSNR [5] [6].

2 II.

3 Related Work

The various types of noises are considered in efficiency through different ways in removing noise from noisy images. The discussions of some linear and nonlinear filtering techniques are used for the process of de noising. The recently proposed statistical parameters will compare various filters used for de noising. The plots and tables used for the comparison of various statistical parameters.

Vijay **??**umar et al. (Aug, 2012) recommended a comparative analysis through MATLAB simulation is done to reduce the process of selection of statistical parameters for a precise image processing method which may be image enhancement, de noising, restoration, edge detection etc. Hence it is that planned statistical model which can be used as pre-dispensation model for digital image processing method to perk up the efficiency of composite image processing technique in the next levels [2].

Muthukrishnan. R et al. **??**Dec,2011) proposed an attempt in which the study of the performance of the most commonly used edge detection techniques are used for image segmentation and even the similarity of these techniques is carried out with an experiment through MATLAB [3].

Ravi ??umar et al. (Nov, 2012) projected that images that are been subjected to various degrees of haze, noise, solidity and distinction levels and superiority which has been calculated as well known metrics for example Mean Squared Error (MSE), Structural Similarity Index Metrics (SSIM) Peak Signal-to-Noise Ratio (PSNR), Maximum difference (MD), etc. Here comparative analysis of quality metrics has been done [5].

Pawan ??atidar (Nov,2010) expressed four different forms of noises: Gaussian noise, Salt & Pepper noise, Speckle noise and Poisson noise. Figure denoising is done for various noises using Mean filter, Median filter and Wiener filter. Additionally, the results have been compared for various noises. The performances of Wiener filter, mean and median filter after de-noising for Speckle, Poisson and Gaussian noise are compared for the above said three noises [4].

Eric ??mistad (Oct,2014) proposed that Segmentation of anatomical structures, from calculated tomography (CT), magnetic resonance imaging (MRI) and ultrasound as the key enabling technology for medical applications such as diagnostics, planning and guidance. GPUs solve large data parallel problems at higher speed than the traditional CPU which are more affordable and are energy efficient. Furthermore, using a GPU enables concurrent visualization and interactive segmentation, where user can help algorithm to achieve a satisfactory result [3].

Dina Aboul Dahab et al. ??Oct, 2012) proposed that image segmentation can be used for the removal of tumor in the brain. Different neural network models are used in this project. Probabilistic Neural Network(PNN) is modified in this project and the better version is more accurate. It also tells that how Learning Vector Quantization(LVQ) is interlinked with PNN.

4 III.

5 Gaps in Literature

After carrying out the review it was found that most of the offered literature don't focus on one the following stuff: 1. In the papers MRI images are used, we can also use USG images for the results or both. 2. As in prior papers noises used are limited, we can use various noises such as speckle, salt and paper and Gaussian noises. 3. For the removal of the noises various filters can be used and the best filters can be found. 4. Statistical parameters can be varied. We can use the known parameters and the new parameters can also be added. 5. The graphs and tables can also be plotted for the various values retained comparing the different parameters used.

IV.

6 Methodology Proposal

Step I: Noise is introduced to input MRI and USG images.

The input images used are MRI and USG images. These images are passed through various noises to make them noisy images namely: Speckle, salt and pepper and Gaussian noise.

Step 2: Filters are passed through images and de noised images are retained.

The various noisy images are passed through various filters such as: Max filter, minimum filter, median, mid point, harmonic, contra harmonic, alpha mean, alpha trimmed mean filters. The de noise images obtained through this is kept for further processing.

Step 3: The various statistical parameters are used for comparing the images obtained from various filters to find the best filter for each noise. V.

7 Future Scope and Conclusion

Noise can be removed by using linear spatial domain filters. To reduce blurring effect we can use filters like median, mean, Harmonic, contra harmonic, alpha trimmed mean, midpoint, arithmetic mean, maximum and minimum filters etc. The various statistical parametric values can be attained for each of the de noised values from filters. These parameters are further demonstrated by comparison tables and plots. Even the filters can also be further varied accordingly. The statistical parameters used are numerous and can be used for better results. Mostly in the presence of Speckle, Salt and pepper and Gaussian noise, filtering is much required in order to recover the analytical examination. In the current work various filters are used and have done the best job as far as de noising is concerned. The main contribution of the proposed work is its attempt to build a complete noise removal system for use in medical images which detects and classifies the noise in an image and removes noise from it.

8 Global Journal of C omp uter S cience and T echnology

Volume XV Issue I Version I Year ( ) [1] [2]


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Figure 1:

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