

Design and Implementation of Hybrid Filtering Algorithm for CT Images

Dr.Hemalatha K.L.¹, Jahnvi Singh ², Supriya G M ³

Professor, Department of Information Science Engineering, SKIT, Bengaluru, Karnataka , India¹

U.G. Student, Department of Information Science Engineering, SKIT, Bengaluru, Karnataka, India²

U.G. Student, Department of Information Science Engineering, SKIT, Bengaluru, Karnataka, India³

ABSTRACT: The goal of image filtering algorithm is to remove the noise from the CT images in such way that the original image is noise free. Computed Tomography (CT) is non-invasive medical test, especially used in a diagnostic procedure. To get accurate CT images for further diagnosis process as they tend to suffer from noises like salt and pepper noise, speckle noise, Gaussian Noise and Impulse noise which are either present in images during capturing or injected during transmission. For the removal of these noises there are many Image filtering algorithm. In this paper, improved median filtering algorithm and Wiener algorithm are used in order to acquire denoised CT images for medical purpose. Each algorithm has its own significant effects or removal of certain noises. The resultant images quality is measured by PSNR (Peak Signal Noise Ratio) and SNR (Signal to Noise Ratio) values.

KEYWORDS: Computer Tomography, Wiener Filtering Algorithm, Improved Median Filtering Algorithm, Noise.

I. INTRODUCTION

Medical images play an important role in diagnosis of a disease. It is one of the applications of Image Segmentation. Image processing is a form of signal processing for which the input image which is corrupted from noises, the output image of image processing is free from noise. In medical image processing, de-noising of images plays an important role to obtain precise and accurate images for the further diagnosis process. Medical image processing is a technique and process of creating visual representation of the interior of the body. To make the Qualitative analysis spatial information is considered which is of 3 dimensional images. There are many different types of noises present in images; Noise is a random variation of brightness or color information in images. Noises like speckle noise- that inherently exist and degrades the quality of the image, salt and pepper noise caused by sudden disturbance of the image signal. To remove these noise from images, filtering algorithm are used. Filtering algorithm for image is a technique for modifying and enhancing an Image. In this paper, an improved median filter and Wiener filter algorithm for the images Wiener Filter algorithm is mainly used for medical images noise spots and uneven Brightness. Improved median filter on edges and corner of the image.

II. RELATED WORK

Derivative of stick (DOS) filter are used by researchers to detect fissures for lung anatomy as shown in Berend .C. Stoel et.al [1] worked on Pulmonary fissure detection in CT images which includes fissure enhancement and a post-processing pipeline for successive segmentation. The quality results of this method was proved by ocular evaluation and verification on anomalous and pathological instances.

Systematic two phase iterative method are used for removal of random-valued impulse noise as shown in Jainjun Zhang et.al[2] worked on efficient method for removing random valued impulse noise which involves two significant stages where first stage states the use of flexible center-weighted median filter to recognize pixels which are disrupted by noise and the second stage uses resultant of first stage for restoration, using efficient median filter method.

Challenges for image compression, target identification and computer vision analysis which consumes maximum computation time has been overcome which is shown in Yunzhi Jiang et.al[3] proposed paper on a co-operative honey-

bee mating based algorithm (CHBMA) for image segmentation. CHBMA, based on honey bee mating algorithm (HBMA) subsequently strengthens the search capability of the algorithm. Considerable demonstration have shown that CHBMA can deliver additional productive solution that can be applied in varies complex image processing methods. Some Genetic algorithm are used in the most commonly required task for a radiologist for further processing of images is proposed as shown in Michael. D. Noseworthy et.al[4] presented paper on optimizing the level set algorithm for detecting object edges in MR and CT images to access varies value for finding an optimal set of specification that features the level set method and acquiring precise boundaries of organs spontaneously.

III.PROPOSED SYSTEM

This section describes the process of medical image processing, including the medical image, Image denoising and Image Enhancement.

- a) **Acquire Input Image:** In this step we collect the data set form hospitals and read it using MATLAB software.
- b) **Image Denoising:** In this section, Weinerfiltering algorithm is applied followed by improved median filter for the removal of noise for medical image processing. Image Denoising means removing of unwanted noise in order to store original image.Medical image processing is the technique of editing or reconstructing of original image.
 1. **Weiner Filter Algorithm:**
Weiner Filter algorithm is mainly used to remove the uneven brightness from the image and noise spots which are present in image.
 2. **Improved Median Filter Algorithm:**
Median Filtering is a non-linear operation often used in image processing to reduce the "Salt and Pepper Noise". Salt and Pepper Noise is a form of noise sometimes seen on images. This noise can be caused by sudden disturbance in the image signal
- c) **Image Enhancement:**
After image denoising, the image is blurred even after effective filtering algorithm is applied. In order to make the images moreclear, image enhancement process is applied.

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Departments of Computer Science & Information Science Engineering, Sri Krishna Institute of Technology, Bangalore, India

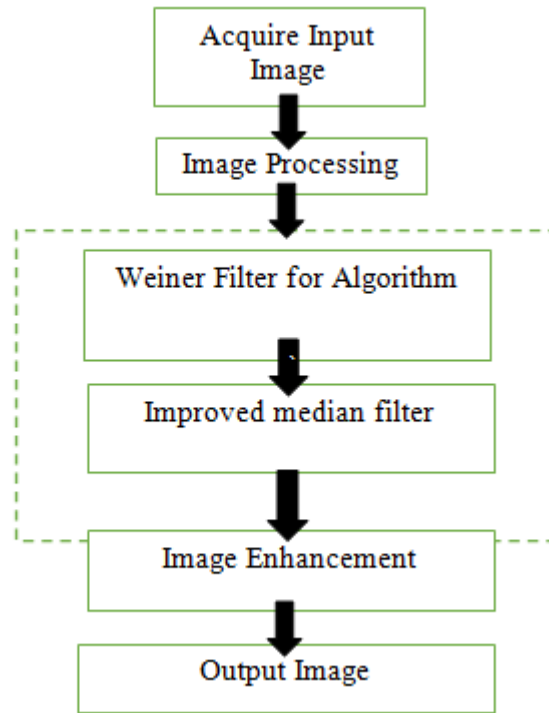
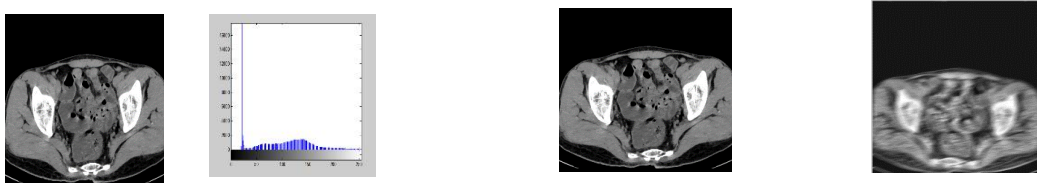


Fig.3.1: BLOCK DIAGRAM FOR CT IMAGE PROCESSING

IV. RESULTS



The implementation of various de-noising algorithms with different filters has been carried out using MATLABV.

Fig. 4.1: Image processing (a) Original shape (b) Image histogram (c) Modified Wiener filtering (d) Improved median filtering

Here, the images considered are kidney stone images affected by noises like speckle Noise, Gaussian Noise and salt and pepper noise. Many medical images is been taken for the experiment of the noise and its removal. There images have been processed in the MATLAB by adding different noises to the images. Different noise filtering algorithm is used to remove the noise.

The Wiener filter used in this to eliminate the speckle noise, then, the improved median filter in the research and development for the environment noise filtering and to protect the image edge, decreasing the computational time and improving the efficiency.

13th-14th March 2018

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	PSNR			SNR		
	Weiner	Median	Proposed	Weiner	Median	Proposed
1	18.8392	19.8658	23.6057	9.9832	11.0098	14.7497
2	18.8966	19.9903	23.6514	9.8883	10.9820	14.6431
3	18.5516	19.8549	23.1035	9.4001	10.7034	13.9520

V.CONCLUSION

In this work, many medical images for experiment for noise removal are taken. Salt and Pepper noise, speckle noise and Gaussian noise have been added to the images and also removed these noises from the medical images by applying weiner filter and improved median filter continually. The result are examined and compared with original image, these are examined through the PSNR and SNR values if these images. PSNR and SNR values obtained is comparatively better when compared to weiner and medical images separately.

REFERENCES

- [1] CY. Xiao, B.C. Stoel, M. E. Bakker, Y.Y. Peng, J. Stolk, M. Staring, "Pulmonary Fissure Detection in CT Images Using a Derivative of Stick Filter". IEEE Transactions On Medical Imaging, Vol.35, no.6, June 2016.
- [2] Jianjun Zhang, "An Efficient Median Filter Based Method for Removing Random-Valued Impulse Noise", Digital Signal Processing, pp:1010-1018, 2010.
- [3] Y.Z. Jiang, W.Ch. Yeh, Z.F. Hao, Z.L. Yang, "A Cooperative Honey Bee Mating Algorithm And Its Application In Multi-Threshold Image Segmentation". Information Science, pp: 171-183, 2016.
- [4] M. Heydarian, M.D. Noseworthy, et al., "Optimizing The Level Set Algorithm For Detecting Object Edges In MR And CT Images". IEEE Transactions On Nuclear Science, Vol.56, no.1, February 2009.
- [5] Ch.F. Jeffrey Kuo, Y.Sh. Leu, R. Kuo, et al., "Three-Dimensional Reconstruction Of Trachea Using Computed Tomography Imaging As Therapy For Tracheal Stenosis In Infants". Computer Methods and Programs in Biomedicine, pp:177-187, 2016.
- [6] Mu-Hsien Hsieh*, Fan-Chieh Cheng, et al., "Fast and Efficient Median Filter For Removing 1-99% Levels Of Salt-and-Pepper Noise in Images". Engineering Applications of Artificial Intelligence, pp:1333-1338, 2016.
- [7] M. Aminzadeh, T. Kurfess, "Automatic Thresholding For Defection By Background Histogram Mode Extents". Journal of Manufacturing Systems, pp:83-92, 2015.
- [8] H. Gao, C.M. Pun, S. Kwong, "An Efficient Image Segmentation Method Based On a Hybrid Particle Swarm Algorithm with Learning Strategy". Information Sciences, pp: 500-521, 2016.
- [9] C.M. Li, C.Y. Kao, C.G. John, Z.H. Ding, "Minimization Of Region-Scalable Fitting Energy for Image Segmentation". IEEE Transactions On Image Processing, Vol.17, no.10, October 2008.
- [10] N. Hunger, I. Bricault, P. Cinquin, C. Fouard, "Design and Validation of CT- and MRI-Guided Robot for Percutaneous Needle procedures". IEEE Transactions On Robotics, Vol.32, no.4, August 2016.