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SIVAKASI - 626 124, TAMIL NADU


DEPARTMENT OF COMPUTER APPLICATIONS INTERNATIONAL CONFERENCE ON SMART INNOVATIVE TECHNOLOGIES ON DATA ANALYTICS (ICSITDA '23)

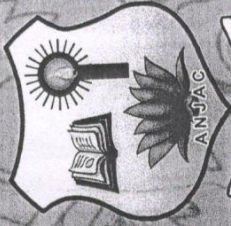
Certificate

This is certify to Dr./Mr./Mrs./Ms. A. yesu Raja, Assistant professor,
Department of C.S, Muslim Arts college has presented a paper entitled
An Efficient Sensing method of salt and pepper noise from
finger Vein using Trimmed Median Filter (TMF) in the
International Conference on "Smart Innovative Technologies on Data
Analytics" (ICSITDA '23) organized by Department of Computer Applications on 26th May,
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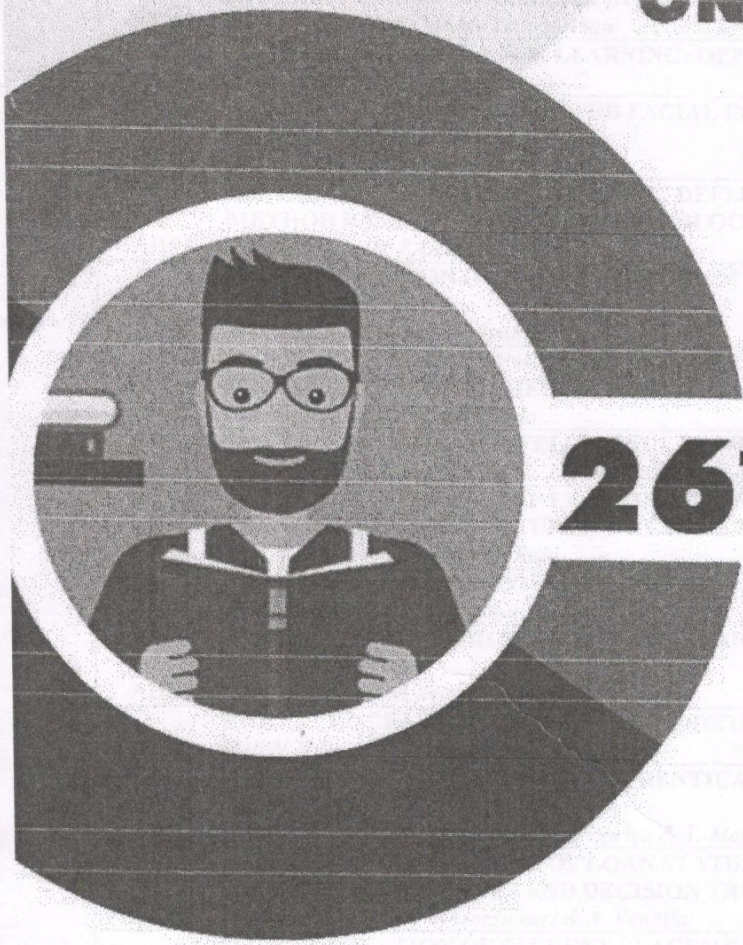
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An Efficient Denoising method of Salt and Pepper noise from finger vein using Trimmed Median Filter (TMF)

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ABSTRACT

This paper proposed Trimmed Median Filter (TMF) for removing the salt and pepper noise from the image. Due to hardware issues Salt and Pepper noise is raised. Hardware issues like camera or scanner defects. Impulse noise changes the original image pixel values. some denoising method is used removing or reducing the noise from the image. It is also known as salt and pepper noise. It presents itself as sparsely occurring white and black pixels. In the present scenario it plays a vital role in every field. Since past due decade the information processing system reached a benchmark by replacing the input data from characters to images. Hence image processing dominates every data processing system but still the images are not satisfied to obtain better accuracy. Due to the noises present in the image during image enhancement. In order to overcome the quality challenges in images. In this paper presented an experimentation with various filters such as unsymmetric filter and iterative filter for the elimination of noises. The proposed trimmed median filter (TMF) performance is measured by PSNR and MSE values.

Keywords: impulse noise, salt and pepper, noise removal, image enhancement and TMF.

I. INTRODUCTION

Image processing is a method to apply some operation on the image. It performs more enhancement and extracting the images. Images are captured by camera, scanner and some other devices. Some images have some brightness variation, electronic device issues, and the color transformation. This type of problems is called

noises. Mostly capturing devices are making this noise.

Digital image processing deals with manipulation of digital images through a digital computer. It is a subfield of signals and systems but focus particularly on images. DIP focuses on developing a computer system that is able to perform processing on an image. The digital images are classified into three types. They are i) Binary Image ii) gray scale image iii) color image.

Noise is always presents in digital images during image acquisition, coding, transmission, and processing steps. Noise reduction techniques exist for audio and images. Noise reduction algorithms may distort the signal to some degree. Impulse noise usually corrupts images due to a defect in the device's hardware or in the camera's sensor.

Impulse noise replaces some of the pixels in the original image. They may occur during image acquisition, due to switching, sensor temperature. They may also occur due to interference in the channel and due to atmospheric disturbances during image transmission.

Preprocessing is the process to improve the quality of images. In this paper the noise removing using trimmed median filter.

II. REVIEW OF LITERATURE

The author V.P. Ananthi et al. [1] described a new fuzzy-based technique is introduced for denoising images corrupted by impulse noise. This method works based on the intuitionistic fuzzy set (IFS), in which the degree of hesitation plays an important role. The degree of hesitation of the pixels is obtained from the values of memberships of the object and the background of

the image. After minimizing the obtained hesitation function, the IFS is constructed and the noisy pixels are detected.

The author Karen Panetta et al. [2] described an approach that investigates the similarity property among sequences of pixels to establish a new reference sequence-to-sequence similarity impulse noise (RSSS) detector. In this approach, the RSSS detector locates the impulse noise, and then three different median filters remove the detected impulse noise in a cascade framework.

The author Ugur erkan et al. [3] described an iterative mean filter for image denoising. This method works based on the Iterative Mean Filter(IMF). It eliminates the salt and pepper noise. The goal of IMF is based on MF.

The author Xiaoqin Zhang et al. [4] described an Exemplar-based denoising: A unified Low Rank Recovery Framework. It works based on Low Rank Recovery (LRR). It interprets nonlocal similar patch-based denoising as a problem of low-rank recovery. The framework can handle complex noise models, such as zero-mean Gaussian noise, impulse noise, and any other noise that can be approximated by mixing these two kinds of noise..

The author min liu et al. [5] described a Weighted t-Schatten-p Norm Minimization for Real Color Image Denoising (WSNM). In this paper, to fully exploit the spatial and spectral correlation information, it present a new real color image denoising scheme using tensor Schatten-p norm (t-Schatten-p norm) minimization based on t-SVD to recover the underlying low-rank tensor.

III. METHODOLOGY

The image denoising methods reducing noise using some filtering methods. In this paper the trimmed median filter used for removing the noise. This TMF is divided into three parts. They are

- a. Detect the noise pixel
- b. Noise reduction for noisy neighbors pixels
- c. Noise reduction for non- noisy neighbors pixels

a. Detect the noise pixel

The noisy pixel is identified in this section. In this salt and pepper noise types the noisy pixel is denoted 0's or 255's. The noise image can be denoted by P.

The noise pixel can be represented as NP_{ij} . If the noisy pixel is equal to 0 means non-noisy pixel otherwise it is equal to 1 means noisy pixel.

b. Noise reduction for noisy neighbors pixels

The process of P_{ij} the image pixels have neighbors. The median filter trimmed the 3×3 pixels near P_{ij} . If the neighbors are noisy, this section to get the noise free image. If 3×3 neighbors are non- noisy the go to the next window. The noisy pixels count CNP is computed from the $s \times s$ window using

$$CNP = 0$$

$$CNP = CNP = C_{NP+1},$$

$$\text{if } W^{m,n}_{3 \times 3} = 0 \parallel W^{m,n}_{3 \times 3} = 255$$

$$CNP,$$

$$m \in [0, s-1] \quad n \in [0, s-1]$$

where, CNP - Noisy pixel count

c. Noise reduction for non- noisy neighbors pixels

The current noisy pixel which is surrounded by minimum nonnoisy pixel can be resolved or restored as noise free pixel using two different sizes of overlapped windows, such as 3×3 and 5×5 . A 3×3 size window is selected and the non-noisy pixel count CNNP is computed. If the CNNP is being in the range 3 to 8, the current noisy pixel is replaced by the median value. If this condition is not satisfied then value is assigned with the 0th element of the linearly stored non-noisy pixels of 3×3 size window and value is assigned with the 1st element from the same. Next a 5×5 window is extracted and the non-noisy pixel count CNNP is computed.

IV. RESULT AND ANALYSIS

In this paper two existing methods are compared to proposed method. They are described as follows

1. Unsymmetric median filter (M1)

2. Iterative Median filter (M2)
3. Proposed trimmed median filter (M3)

Datasets

In this paper plans to use one database to evaluate the performance growth of it. The names of those finger vein database is:

- Finger Vein Database (FVD-DB dataset 2022)

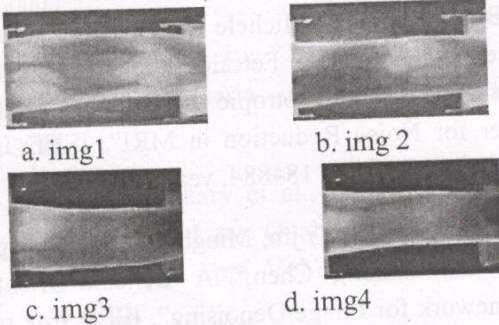


fig.1. sample images of FVD-DB dataset.

Mean Squared Error (MSE)

The MSE analysis is used to validate the performance of the existing and proposed methods in terms of similarity between the noise-free image and the input mage. The less MSE indicates a better denoising method while the higher MSE denotes the fair quality denoising method. It can be computed using Equation 1.

$$MSE = \frac{1}{h \cdot w} \sum_{p=0}^{h-1} \sum_{q=0}^{w-1} (I_p^{p,q} - I_{NFI}^{p,q})^2 \quad \dots 1$$

where MSE- Mean Square Error of input image and noise free image.

Table 4.1: MSE analysis for denoising of 90% noise

Database name	Image name	MSE (methods)		
		M1	M2	M3
FVD-DB	Img1	0.4810	0.2174	0.0764
	Img2	0.3928	0.3149	0.0603
	Img3	0.4407	0.3910	0.0846
	Img4	0.436	0.4253	0.0576

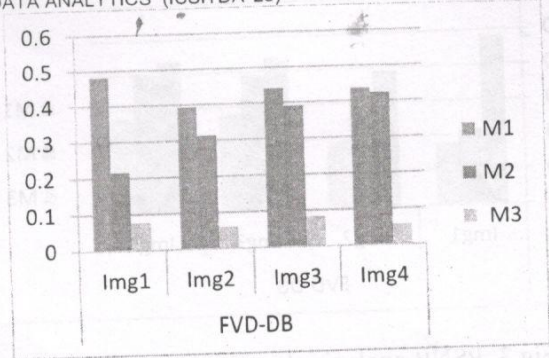


Fig.2. MSE analysis chart for 90% of noise corruption.

The Table 4.1 and Figure 2 illustrate the MSE analysis data obtained from three methods and one database. The proposed method is the candidate of least MSE provider whereas the M1 method is the fair level performance provider. The least MSE of M3 method is trimmed median filter related to image of FV-DB database. This analysis declares that the proposed M3 is the best denoising method according to MSE.

Peak Signal to Noise Ratio (PSNR)

The PSNR measure is a similarity measurement between the original input finger vein image and the restored finger vein image. It can be measured using the unit namely 'db'. It can be computed using Equation (2).

$$PSNR = 10 \log_{10}(255^2 / MSE) \quad (3.35)$$

In general, higher PSNR is the indication of best denoising and vice versa.

Table 4.2: PSNR analysis for denoising of 90% noise

Database name	Image name	PSNR(in db)		
		M1	M2	M3
FVD-DB	Img1	48.1	21.74	17.83
	Img2	39.28	31.49	19.33
	Img3	44.07	39.10	28.39
	Img4	43.57	40.23	27.54

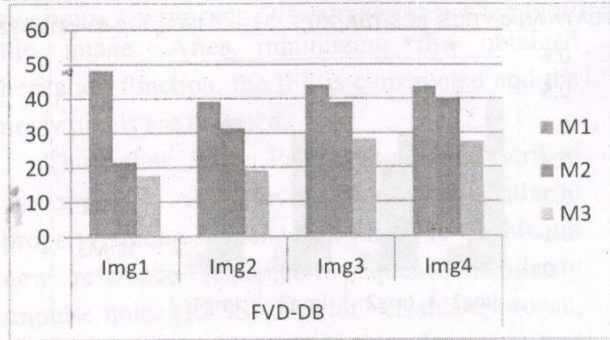


Fig.3. PSNR analysis chart for 90% of noise corruption.

The Table 4.2 and Figure 3 express the PSNR analysis which can reveal the performance of the proposed method in account of the denoising quality. In this analysis, 90% noise is applied on images of each database. This research involves with the highest PSNR of the proposed M3 method in account of finger vein image.. This research shows that the FV-DB database is the best supportive database to accomplish a better denoising process.

IV. CONCLUSION

This work focused on finger vein images using the trimmed median filter. It gives the better MSE and PSNR values. In future the various filters using in noise removing. It is much easier to detect the noises and removed it.

REFERENCES

- [1] V.P.Ananthil, P. Balasubramaniam and P. Raveendran, "Impulse noise detection technique based on fuzzy set", IET journals the institution of Engineering and technology, vol. 12, issue 1, pp. 12-21, year 2018.
- [2] Karen Panetta, Long Bao and Sos Aгаian, "A New Unified Impulse Noise Removal Algorithm Using a New Reference Sequence – to - Sequence Similarity Detector", IEEE Journal ,Vol. 6 , issue 1, pp. 37225 - 37236, year 2018.
- [3] Ugur Erkan, Dang Ngoc Hoang Thanh, Le Minh hieuAn and serdar Enginoglu, "An Iterative Mean Filter for Image Denoising", IEEE Access, vol 7 pp167847-167859 , year 2019.
- [4] Xiaoqin zhang, Jingjing zheng, Di wang and Li Zhao," Exemplar based denoising a unified Low Rank Recovery Framework", IEEE journal early access article, pp. 1, year 2019.
- [5] Min liu, Xinggan Zhang and Lan tang," Weighted t-Schatten-p Norm Minimization for Real Color Image Denoising", IEEE Jnl, vol.8, pp. 150350-150359, year 2020.
- [6]Bilel Kanoun, Michele Ambrosanio, Fabio Baselice, Giampaolo Ferraioli,vito Pascazio and Luis Gomez," Anisotropic Weighted KS-NLM Filter for Noise Reduction in MRI", IEEE Jnl, vol.8, pp. 184866 – 184884, year 2020.
- [7] Huaian Chen, Yi jin, Minghui Duan, Changen Zhu and Enhong Chen," A Demand-Oriented Framework for Image Denoising", IEEE Jnl, vol. 17, pp. 5369 - 5379 ,Aug2021.
- [8] Javier Gurrola-Ramos,Oscar Dalmau , And Teresa E. Alarcón," A Residual Dense U-Net Neural Network for Image Denoising", IEEE Jnl, vol.9,pp.31742 – 31754, year 2021.
- [9] Josef Strom Bartunek et al. " Adaptive Finger Print Binarization by Frequency Domain Analysis",1-4244-0785, pp.598-602,2006.
- [10] Mustafa salah Khalefa et al. " Finger Print Image Enhancement by Develop Mehtre Technique", Advanced Computing: An International Journal (ACIJ),vol 2, No.6,pp.171-182,DOI.10.5121/acij.2011.2601,2011.
- [11] Jyotika chopra and Dr.P.C.Upadhyay," Various Finger Print Enhancement and Matching Technique',International Journal of Electronic and Communication Engineering",vol.5,No.3,pp.279-289,ISSN:0974-2166,2012.
- [12] G.M.Rajaathi and R.Rangarajan," Efficient Adaptive Weiner Filter with Thresholding for better Image Enhancement", European Journal of Scientific Research, vol.69,No.1, pp.135-145, ISSN; 1450-216x,2012.
- [13] Keokanlaya sihalath et al., "Finger Prints Image Enhancement with second Derivative Gaussian Filter and Directional wavelet

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"Transform", second International Conference on
computer Engineering 9 and Applications, IEEE,
pp.112-116, 978-0-7695-3982-9, DOI 10.1109.
ICCEA. 2010. 178, 2010.

ISBN: 978-93-83191-92

[14] Jianwci Yang et al., " A Modified Gabor
Filter Design Method for Finger Print image
Enhancement ", Elseiver Science B.V, Pattern
Recognition Letter DOI:10.1016/50167-8655
(03) 00005-9.

[15] Nicolac Constantinesw " Estimators in
cryptography", Anale.seria. informatica vol.VII,
fax 2-2009.

[16] Jitendra Choudhary et al., "A New Frame
work forimproving Low Quality Finger Print
Images", Int.J.Comp. Appl. Vol.2 (60, 1859-1866,
ISSN:2229-6093.