International Journal of Technical Innovation in Modern Engineering & Science (IJTIMES)
Impact Factor: 5.22 (SJIF-2017), e-ISSN: 2455-2585
Volume 5, Issue 08, August-2019

Digital Image Enhancement Using Hybridization of Wavelet De-noising & User Customizable Image Enhancement with TSV Constraine Blur

Subhash Chand Saini[1], Gori Shankar Sharma[2], Dr.Bharat Bhushan Jain[3]

[1]*Research Scholar,Deptt. of ECE, Jaipur Engineering College, Kukas, Jaipur*
[2]*Assistant Professor, Deptt. of ECE ,Jaipur Engineering College, Kukas, Jaipur*
[3]*Principal, Jaipur Engineering College, Kukas, Jaipur*

Abstract: **Digital image processing is gaining wide spread popularity in the last decade & is set to become the driving technology in future automation & robotics application in conjunction with artificial intelligence. One of the primary challenges of digital image processing are the quality of input images & various finds of noise sources being present disturb the image quality & may render image processing algorithms partially in accurate or totally unusable depend upon the type of algorithm used & noise induced. Thus it is imperation to device a noval method to counter man uniform & heavy noise from input image. This work present a unique method of hybridization of wavelet based de-noising with various variable user customization. Another challenge of faced by de-noising algorithms numerous iteration without significant improvement after a number of threshold iterations this causes a lot of computational power to be wasted the method presented provides method to control maximum iteration using total variation constrain & maximum number of iterations permissible the algorithm stops whichever of the two accurse earlies. User adjustable parameter is available for image enhancement & various types of noise filters in conjunction with wavelet de-noising & TSV constrained motion blur removal.**

Keywords:

I. INTRODUCTION

Steganography is a technique that hides viewer information to establish invisible communication. The steganography system consists of packaged media in which secret information is embedded. The embedding process creates a hidden medium by replacing the information with data in a hidden message. To hide hidden information, steganography provides a great opportunity for someone to know the existence of hidden messages, so they cannot access the original message. Steganography is the art of hiding messages in a cover without leaving a significant trajectory on the original message. Cryptography is the art and science of security by encoding messages to make them unreadable. Cryptography involves two basic functions, encryption and decryption. Encryption is the process of converting ordinary data (readable raw data files) to encrypted (non-readable data). Decryption is the process of the encryption process, we retrieve the original plain text from the encoded text. Cryptography is basically used to hide the original data into a coded data so that unauthorized access can be prevented. To encrypt the data various cryptographic algorithms such as DES, 3DES, Blowfish, AES, etc. are used. But Blowfish is strongest and fastest in data processing and storing compare to other algorithms.

II. OBJECTIVES OF STUDY

[1.] Design and Development of a GUI Based Image De-noising system using Wavelet & Image Processing Toolbox.
[2.] Adaptation of the Proposed System to De-noise various types of Image Noises such as Salt & Pepper Noise, Gaussian Noises or other forms of combined noise.
[3.] Proposal of implementations of the above specified technologies in video De-noising using advanced Wavelet Processing & Machine learning for enhancement using Frame/Scene History.
[4.] Use of additional technologies for removal of other forms of Image Noise originating due to Weather Such as Rain or Fog.
[5.] Hybridization of Wavelet processing with Bio Inspired Algorithms such as Bacteria Foraging or PSO(Particle Swarm Optimization) to achieve significant improvement in PSNR & SSIM Values as compared to previous works.
[6.] Optional Integration of Background Separation Technique(s) to enhance the ROI (Region of Interest) of Image using additional re-construction techniques, to preserve image details in heavy noise conditions.
[7.] Provision of an integrated Image Enhancement GUI interface to cater to various forms of Image De-nosing operations in conjunction with various image enhancement operations such as Contrast Enhancement or Histogram Equalization.

III. EXISTING TECHNIQUES

The Artificially degraded images and the LL images are used to validate the proposed method. Experimental results show that the proposed method can efficiently suppress the heavy noise and improve the PSNR and SSIM. [1]

In the suggested methodology repression of the impact of speckle noise by the US images in accomplished. In this structure combination of divergent filters is utilized for enhancing the US image quality which contains diagnosis significance. Firstly US image which is despoiled through speckle noise; is covered the three filters viz.[2]
In this paper different denoising techniques are discussed. It can be concluded that for salt and pepper noise, the median filter is optimal compared to mean filter and LMS adaptive filter. It produces the maximum SNR for the output image compared to the linear filters considered. Thus to summarize Bayes Invariant thresholding technique has best performance, Sure Shrink is better whereas Visu Shrink is comparatively poor in performance. [3]
Simple STLS is the process of finding the least difference between the square value of each pixel in the image with the square of its 8-neighbor pixels. This filter scan entire image to make this difference at optimum value. The suggested filter tested with different type of noise and different density of noise, the results were promised [4]
In this paper, we propose and study a unified framework which can both infer the neighbourhood filters and estimate the range variance. With the neighbourhood noise model, we show that the Yaroslavsky, bilateral, and MNLM filters can be derived by joint MAP and ML optimization. We also present an EM+ algorithm for parameter estimation via fitting the observable CSM. The experimental results on color image de-noising show the effectiveness. [5]
Image noise is usually unwanted, variation in brightness or color information is considered as a noise. The noise that is present in the image can degrade its quality. So in this thesis a new technique is proposed for the removal of the noise .the optimization technique is used for the filtration of the image so that the noise us removed. So this method is considered to be better and more efficient for removing the noise from the image than the previously used methods. [6].
We have focused on several methods of image denoising in nonlinear domain, although the linear methods are simple, effective and easy to implement but they are limited with high noise densities and complex noise models. Nonlinear methods have been the state of art denoising methods. The methods differ from each other on the type of noise used. All types of noise for example impulse, Gaussian white noise and speckle have been kept under considerations with their associated denoising methods.[7].
During image acquisition and transmission, noise is seen in images. This is characterised by noise model. So study of noise model is very important part in image processing. On the other hand, Image denoising is necessary action in image processing operation. Without the prior knowledge of noise model we cannot elaborate and perform denoising actions. [8]
In this paper, an analysis of denoising techniques like filters and wavelet methods has been carried out. Filtering is done by Mean and Median Filter. And three different wavelet thresholding techniques have been discussed i.e. Universal Thresholding, Bayes Shrink and Visu Shrink. The results conclude that Bayes shrinkage method has high PSNR at different noise variance and low MSE. Also the comparison of Wavelet thresholding methods at different decomposition level has been discussed. [9]
The comparative study of various denoising techniques for digital images shows that wavelet filters outperforms the other standard spatial domain filters. Although all the spatial filters perform well on digital images but they have some constraints regarding resolution degradation. These filters operate by smoothing over a fixed window and it produces artifacts around the object and sometimes causes over smoothing thus causing blurring of image. Wavelet transform is best suited for performance because of its properties like sparsity, multi resolution and multi scale nature. Thresholding techniques used with discrete wavelet are simplest to implement. [10]
Performance analysis of denoising algorithms is measured by peak signal-to-noise ratio (PSNR), mean square error (M.S.E) as well as in terms of visual quality of the images. Different densities of noise is added to test image for the evaluation of PSNR Many techniques assume the noise model to be Gaussian, but this assumption may not always remain true because of the different nature of various noises present in the image. Generally noise with different variance values is added in the natural images to test the performance of the algorithm. [11]
A large number of linear and non linear filtering algorithms have been developed to reduce noise from corrupted images to enhance image quality. The most common type of noise is the white or Gaussian noise where its power is uniformly distributed over the spectral and spatial spaces and its mean is zero. Linear filtering is an efficient technique to deal with additive noise while non-linear filters are efficient to deal with the multiplicative and function based noise. [12]

IV. METHODOLOGY

4.1 Image Enhancement

Picture upgrade is the way toward changing advanced pictures with the goal that the outcomes are more reasonable for show or further picture investigation. For instance, you can remove noise, sharpen, or brighten an image, making it easier to identify key features.

4.1.1 Image Contrast Enhancement

Contrast adjustment remaps picture intensity value to the full show scope of the information sort. A picture with great differentiation has sharp contrasts between high contrast.
To show, the picture on the left has poor complexity, with power esteems constrained to the centre part of the range. The picture on the privilege has higher complexity, with force esteems that fill the whole power extend [0, 255]. In the high complexity picture, features look brighter and shadows look darker as shown in fig 4.1.

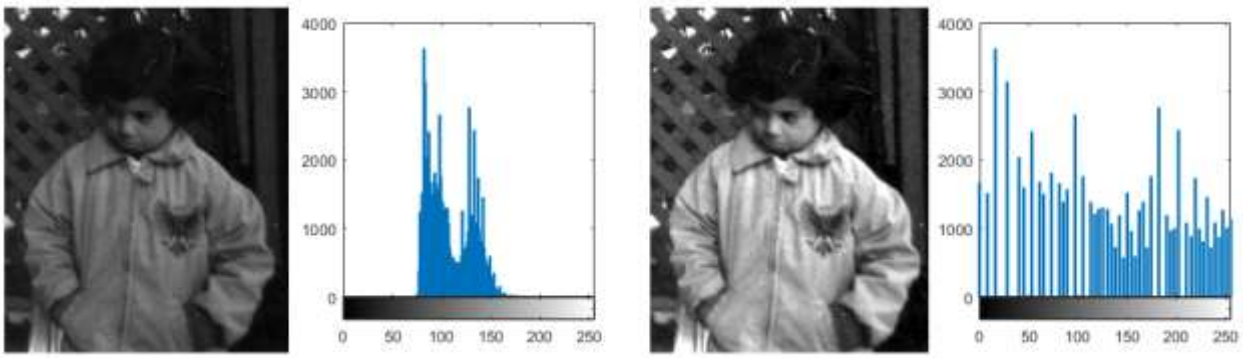


Fig.4.1: contrast adjustment

4.1.2 Flow chart of Image Contrast Enhancement

Flow chart as shown in fig 4.2,1st start the main code then load Image in Fimg and get value of luminous Intensity then Size = size of [Fimg,3] then a condition will be checked that is size = = 1 is this is not true the go to Next condition that is size = = 3 If size = = 1 is true then Fimg = Imadjust then next condition is size = = 3 If this is true then convert Fimg from RGB to LAB color space & store in shadow lab then maximum luminasity is equal to Intensity then shadow imadjust = shadow lab then convert shadow Imadjust from LAB color space to RGBD store in Fimg then Algorithm will be stop .

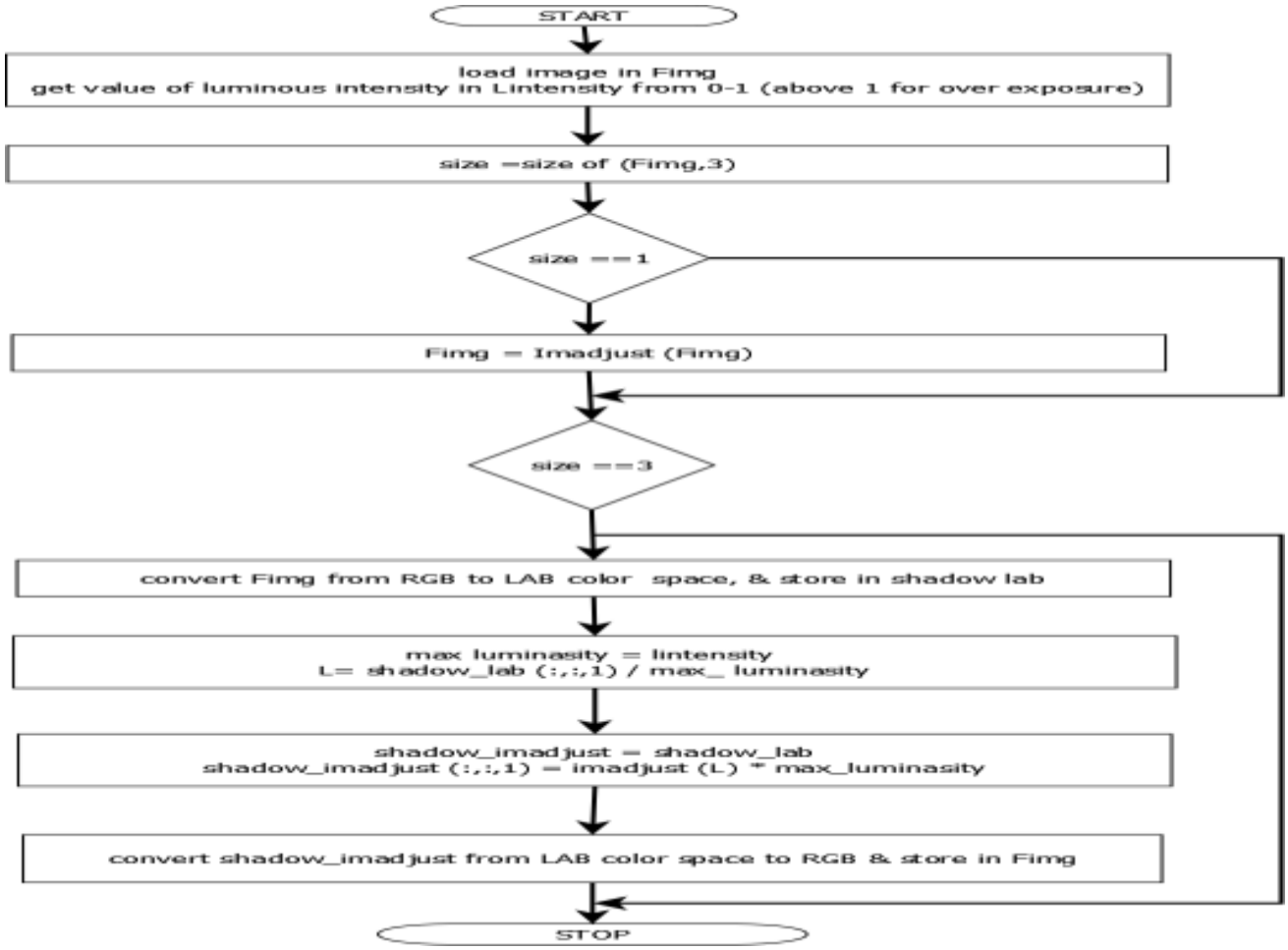


Fig.4.2: Flow chart of image contrast enhancement

4.2 Flow chart of Adaptive Histogram

Flow chart as shown in fig 4.3,1st start the main code then load Image in Fimg and get value of luminous Intensity then Size = size of [Fimg,3] then a condition will be checked that is size = = 1 is this is not true the go to Next condition that is size = = 3 If size = = 1 is true then Fimg = Imadjust then next condition is size = = 3 If this is true then convert Fimg from RGB to LAB color space & store in shadow lab then maximum luminasity is equal to Intensity then shadow imadjust = shadow lab then convert shadow Histogram from LAB color space to RGB & store in Fimg then Algonithm will be stop .

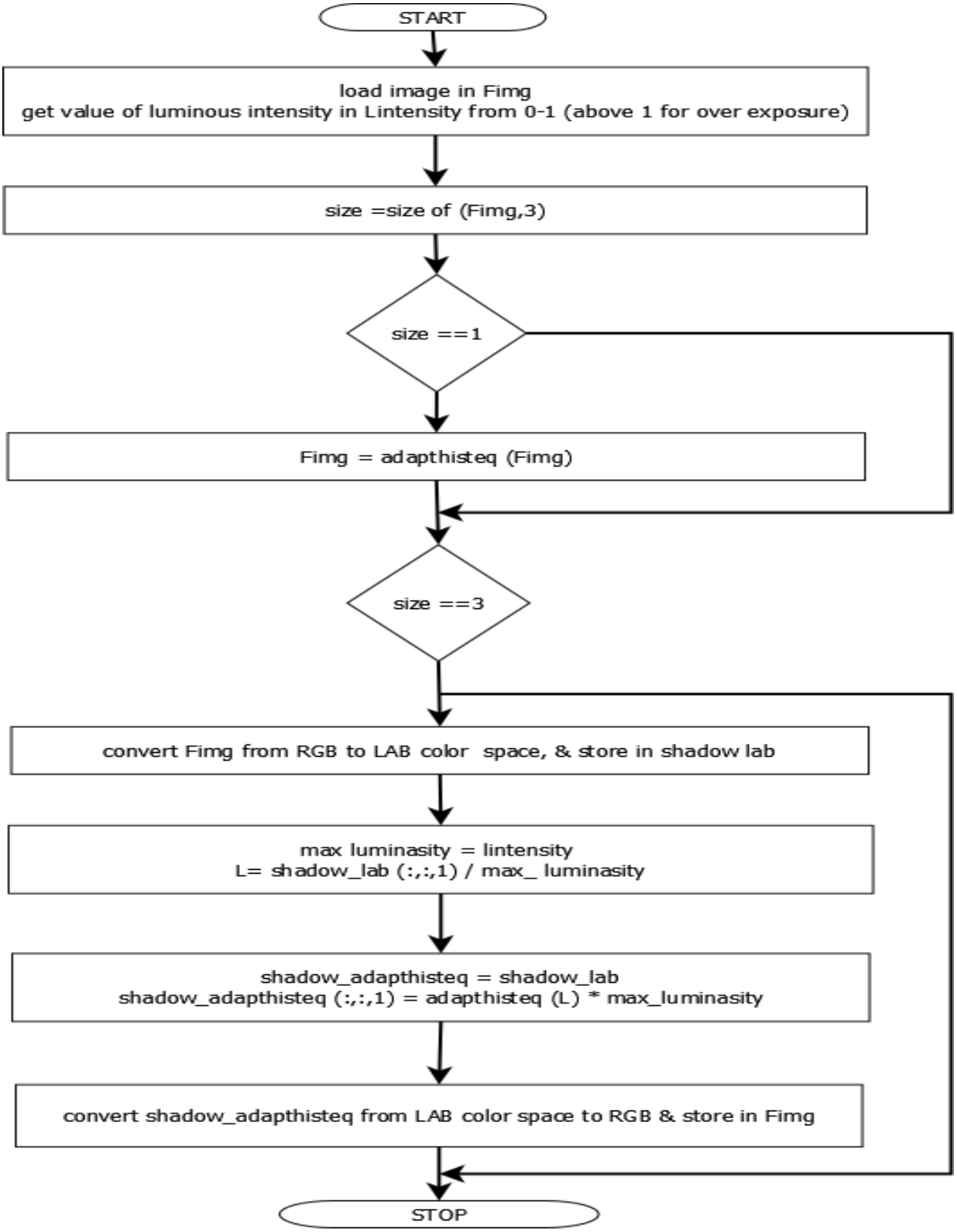


Fig4.3: Flow chart of adaptive histogram

4.3Flow chart of wiener filter

Flow chart as shown in fig 4.4, we can see 1st start the Algorithm then load Image in Fimage and get value of filter size then size is equal to size of [Fimg,3] then a condition is checked that is size = = 1 If that is not true then it directly goes to next condition If it is true then K is equal to filter 2 and then Fimg is equal to wiener 2 then a condition is checked that is size = = 3 If it is true then red channel 1 = Fimg [:,:,1] ,green channel 1 = Fimg [:, :, 2] and the blue channel 1 = Fimg [:, :, 3] then RGB Image 1 is equal to cat 3, LR 1, LG 1, LB 1, then red channel 2=RGB Image [:, :, 1], green channel 2 = RGB Image [:, :, 2] and blue channel 2 = RGB Image [:, :, 3] then LR2 = wiener 2 , LG 2 = wiener 2 and LB 2 = wiener 2 then RGB Image 2 = cab[3, LR 2, LG 2, LB 2,] then Fimg = RGB Image 2 then Algorithm will be stop.

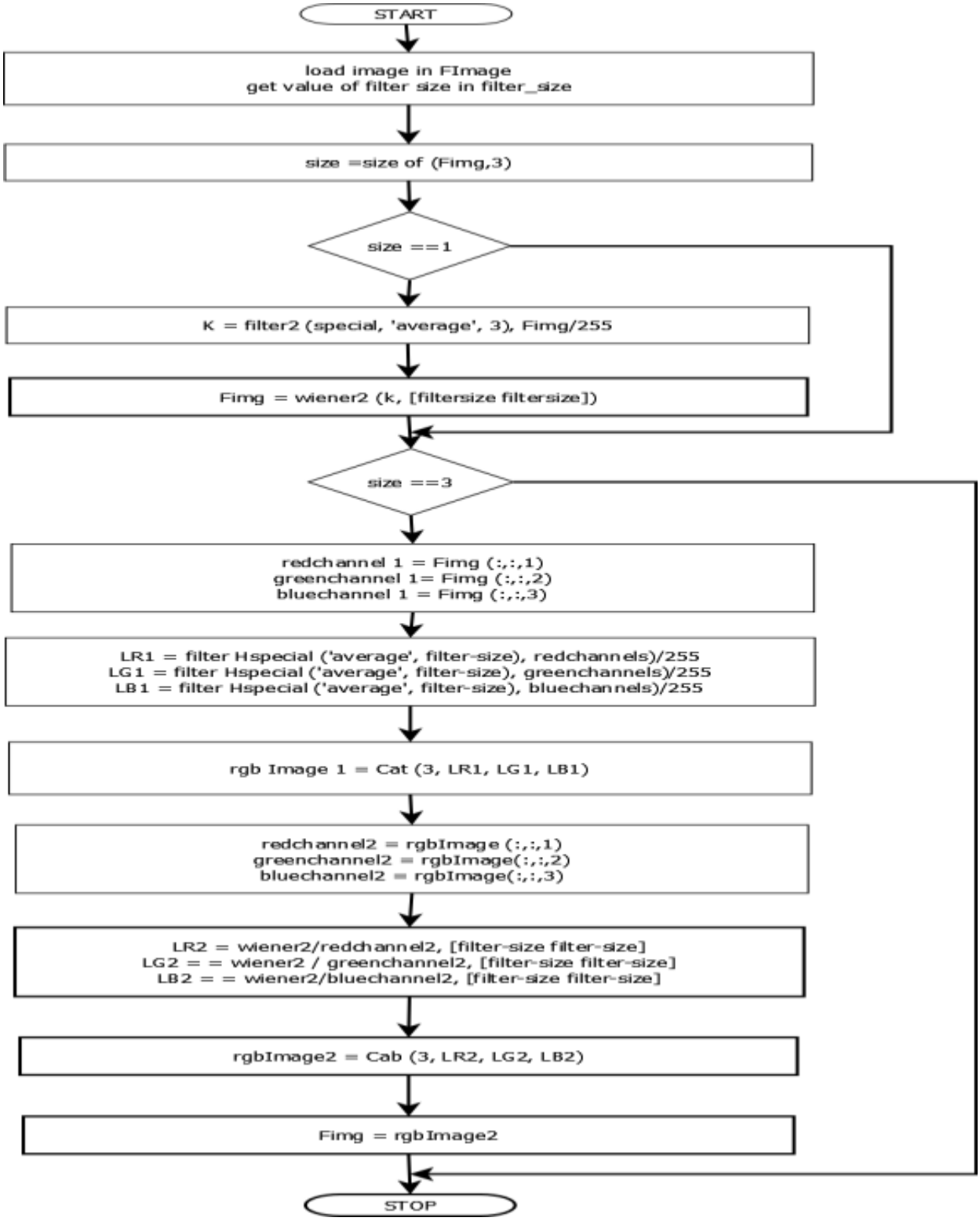


Fig.4.4: Flow chart of wiener filter

4.4 Flow chart of median filter

Flow chart as shown in fig 4.5, we can see 1st start the Algorithm then load Image in Fimage and get value of filter size then size is equal to size of [Fimg,3] then a condition is checked that is size = = 1 If that is not true then it directly goes to next condition If it is true then K is equal to filter 2 and then Fimg is equal to medfit 2 then a condition is checked that is size = = 3 If it is true then red channel 1 = Fimg [:,:,1] ,green channel 1 = Fimg [:, :, 2] and the blue channel 1 = Fimg [:, :, 3] then RGB Image 1 is equal to cat 3, LR 1, LG 1, LB 1, then red channel 2=RGB Image [:, :, 1], green channel 2 = RGB Image [:, :, 2] and blue channel 2 = RGB Image [:, :, 3] then LR2 = medfit 2 , LG 2 = medfit 2 and LB 2 = medfit 2 then RGB Image 2 = cab[3, LR 2, LG 2, LB 2,] then Fimg = RGB Image 2 then Algorithm will be stop.

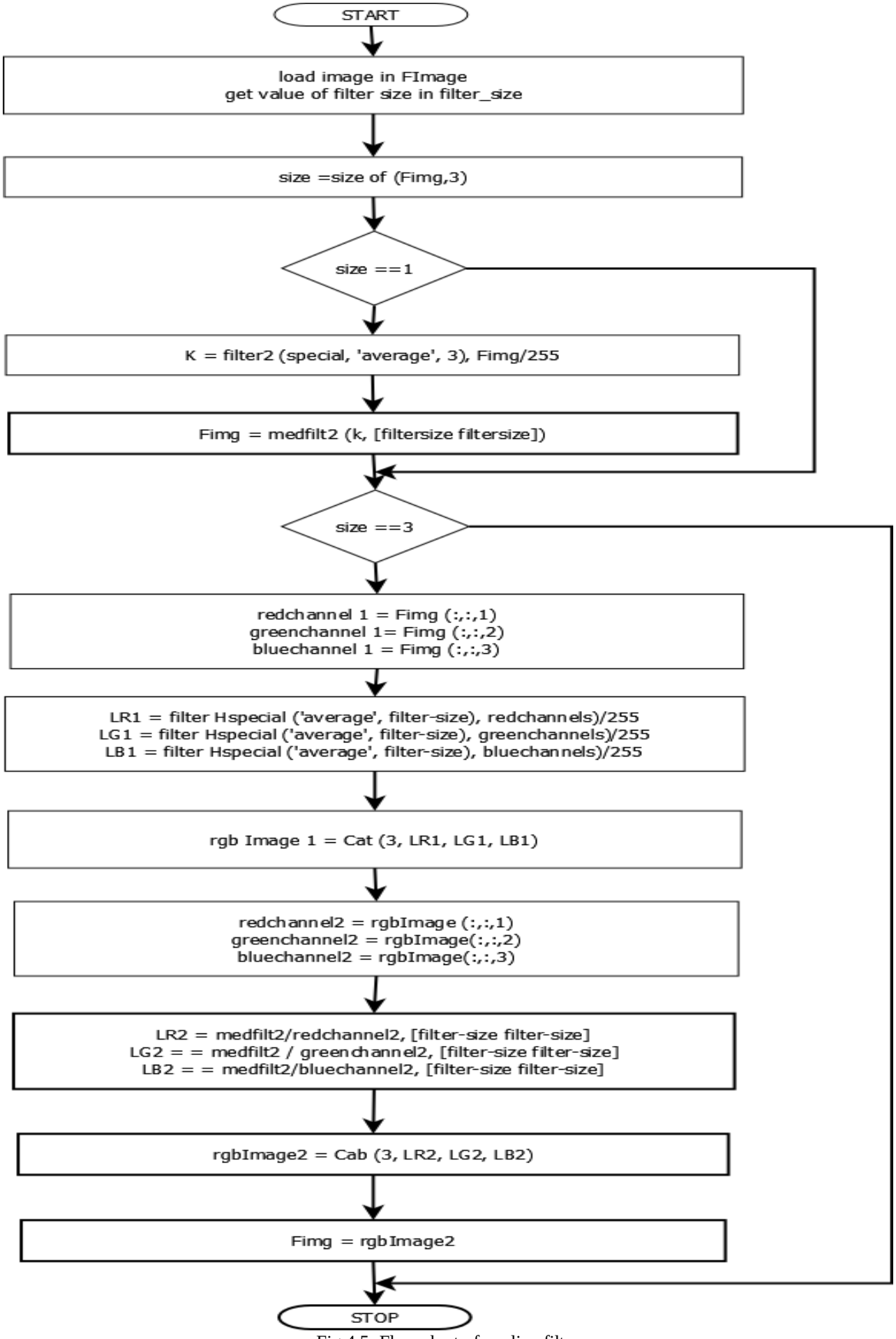


Fig.4.5: Flow chart of median filter

V. RESULTS

Image Used:
We have taken sample of images, with respective resolution 644X513, 283X178, 254X254,259X194and 246X193 and respective size(s) 32.9Kb,10.9Kb,5.89Kb, 13.1Kb, 8.41Kb, as shown in fig 5.1.



Image-1



Image-2



Image-3



Image-4

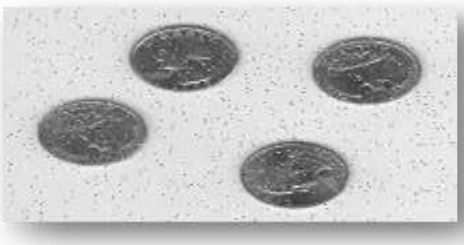


Image-5
Fig 5.1 Selected Images

Window show in fig 5.2 we perform operation on the image using different type of GUI Buttons which is show in this window. In this figure we can also see many GUI buttons which is used for different kinds of operations.



Fig 5.2 Perform Operation Using GUI

Window shown in fig 5.3we perform the output images which we used as input image with the problem. And by using the GUI buttons we can perform other kind of operation on the image.

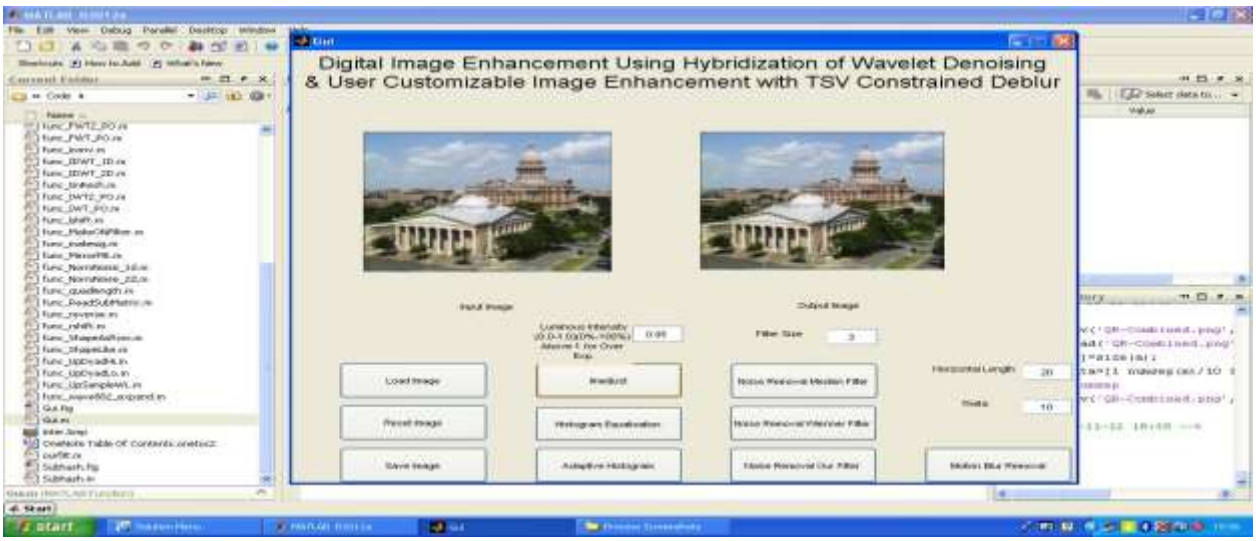


Fig 5.3 Output Image

Window show in fig 5.4 we perform different operation on the other image for solve problem. By using the GUI buttons we can also perform different kinds of operation on the image which we used.



Fig 5.4 Perform Different Operation

Window show in fig 5.5we see that how many time retraction is performed for such as parameters Relchg, Hf-Img, Obj val , Rho. And we can also see the other parameter like time taken and etc.

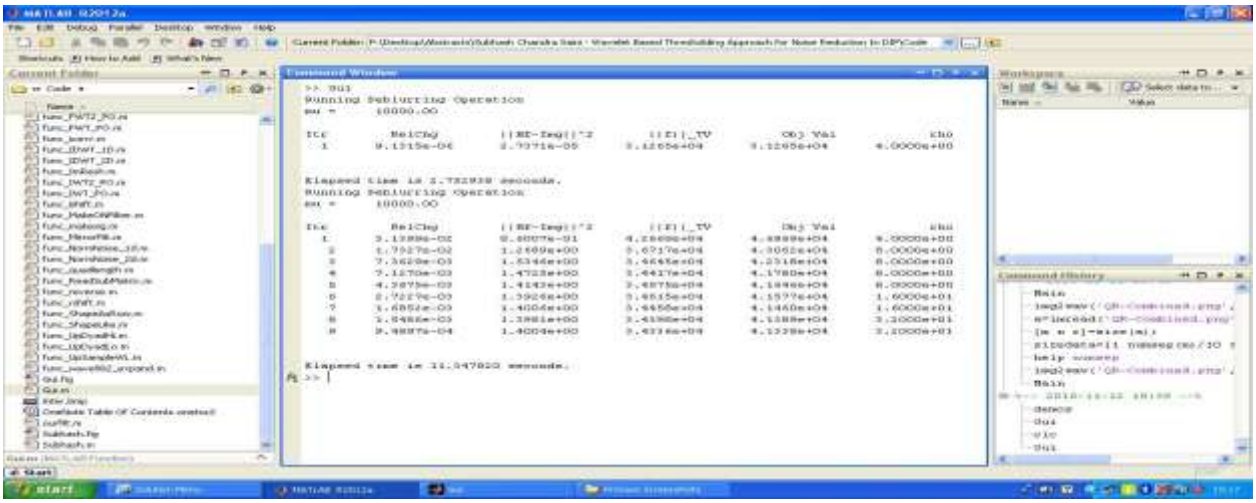


Fig 5.5 Time Retraction

Window show in fig 5.6 we can see output image of out input image after the applying the many- kind of operation and remove noise from the image by using the graphical user interface.



Fig 5.6 Output Image after Operation

Test Result

S.NO.	Image Name	Problem Identification	Operation Perform
1	Building.jpg	Contrast, colour variance, slight blur.	Imadjust- 0.95,Adaptive Histogram-0.98, Midian Filter-3,Our Filter-3
2	Cow.jpg	Poor contrast ,Noise	Imadjust- 0.90, our filter-3
3	Madem.jpg	Motion Blur	Horizontal Length-20, Theta 10
4	Noise.jpg	Poor contrast and Noise	Adaptive Histogram-0.95, Our Filter-3, Wiener Filter-3
5	Salt&Paper.jpg	Noise	Our Filter -3

Table 1: Test Result

CONCLUSIONS

As image processing is the backbone of intelligent computer assisted automation it is imperative to have a multi-future image ailment removel & correction tool that can correct real world captured image. As image capturing preservation storage retrieval scanning can introduce a variety of ailments such as poor contrast , colour variation, Noise of various types, motion induced blur appear in the captured image. This dissertation proposes & demonstrates a digital image enhancement tool with hybrid de-noising algorithm by application of custom filter in conjunction with wavelet denoising user customizable image contrast enhancement & motion blur removal using total variation constraint method. As demonstrated by the results above image enhancement operations such as imadjust, Histogram equalizer, noise removel, etc. with user select table luminous intensity noise removal filters such as noise removal median filter, wiener filter with user select filter size & motion blur removal with user selectable Horizontal length & theta Have been implemented on a single GUI which convert on color as well as grayscale image.

FUTURE SCOPES

A GUI based digital image enhancement denoising & debluring tool has been demonstrated but as digital image processing & computer vision are heavily researched avenues the system should dope with the rapid pace of adopting technology. Various enhancements are proposed for the future on of the primary one is automatic detection of image ailment & application of suitable correction using artificial intelligence other importance update may be integration of image enhancement using machine learning for reconstruction of heavily damaged portions of an image.

REFERENCES

[1.] Yan Shen, Qing Liu, Shuqin Lou, and Ya-Li Hou "Wavelet-Based Total Variation and Nonlocal Similarity Model for Image Denoising", IEEE Signal Processing Letters, vol. 24 , issue 6 ,June 2017.
[2.] Devanand Bhonsle, Vivek Kumar Chandra and G.R. Sinha "Speckle Noise Removal from Ultrasound Images Using Combined Bivariate Shrinkage and Enhanced Total Variation Techniques" International Journal of Pure and Applied Mathematics, vol. 118,no 18, 2018.
[3.] Sandeep Kaur, Navdeep Singh "Image Denoising Techniques: A Review" International Journal of Innovative Research,vol. 2, issue 6, June 2014.
[4.] Naseer R. M. AlBaka, Nidhal K. El Abbadi, Ghadeer Hakim "Image De-Noising Based on Simple Total Least Square" International Journal of Innovative Research in Computer Science,vol.4, issue 2, Feb.2016.

[5.] Chao-TsungHuang "Bayesian Inference for Neighborhood Filters with Application in Denosing"IEEE Transactions on Image Processing, vol. 24, no.11, 2015.
[6.] Kalpana, Harjinder Singh "To study the Image Denoising Techniques", International Research Journal of Engineering and Technology (IRJET), vol.2, issue 8, 2015.
[7.] I. Irum*, M. A. Shahid, M. Sharif and M. Raza "A Review of Image Denoising Methods" Journal of Engineering Science and Technology 2015.
[8.] Ajay Kumar Boyat and Brijendra Kumar Joshi "Noise Models in Digital Image Processing" International Journal (SIPIJ) vol.6, No.2 April 2015.
[9.] Anutam and Rajni "Performance Analysis of Image Denoising with Wavelet Thresholding Methods for Different Levels of Decomposition"The International Journal of Multimedia & Its Applications (IJMA) Vol.6, No.3, June 2014.
[10.] Jyotsna Patil, Sunita Jadhav "A Comparative Study of Image Denoising Techniques" International Journal of Innovative Research in Science, Engineering and Technology,Vol. 2, Issue 3, March 2013.
[11.] Vikas Gupta, Dr. Vijayshree Chaurasia, Dr. Madhu Shandilya "Image Denoising Techniques" IJSRD - International Journal for Scientific Research & Development Vol. 5, 2018.
[12.] Vandana Roy, ShailjaShukla "Spatial and Transform Domain Filtering Method for Image De-noising: A Review" .Modern Education and Computer Science, 2013.