Denoising medical image using Efficient Fussion filter

P.Kanjana Devi[1],
PhD Research scholar, NGM College, pollachi
Dr.M.Rathamani[2],
Associate Professor, MCA Dept, NGM College, Pollachi

ABSTRACT:
Digital images play vital role in medical image processing. The quality of the images affected by different noises such as distortion and blurring. There are all affect the accuracy of the prediction. So it can be denoised by various filtering algorithms. These algorithms help to improve the quality of the digital image and increase the SNR (Signal-to-Noise Ratio) value. In this paper, a statistical filter has been proposed named as Fusion filters, a modified version of Median filter and kalman filter by sorting the luma component values, then median value has been assigned to the processing pixel value in a sliding window (4x4). Also, Median filter, Mean filter, Kalman filter and proposed had taken for the comparative study. PSNR and MSE metrics are compared to examine the performance and the quality of the image. The result shows that the proposed filter increases the PSNR (Peak Signal to Noise ratio) and reduces MSE (Mean Square Error) metric values and produces good results.

Keywords— Median filter, Mean filter, Kalman filter, image noises Finger Nail image denosing

Introduction

In the health care the human nails play a vital role to identify different disease in human body. Nail color is only the way to identify the presence of the disease in human. Changes in the color of the nail will help to predict the diseases. The general nail colors are pink indicate healthy body, half pink and half white color represents kidney diseases and yellow color represents the liver infections. Depending on the shape, texture and color of the nail can decide about disorders and any nutritional imbalances. Diagnosis of many diseases in health care area can be calculated by monitoring color of the human nail. In disease diagnosis system doctors watch the nails of patient to get support. An automated system is used to analyze the nail disease prediction. Because human eye having limitation in resolution and little quantity of color difference in few pixels in nail may not be highlighted to eyes of human that may proceed to wrong result [9]. To improve the accuracy of the prediction preprocessing is important to remove the noise. This paper introduced a new filter mechanism to remove the noise.

Existing system

In existing system is analyzing the various methods of data mining techniques to predict the nail disease from 2013 to till current year. It used to analyzing the various data mining techniques used to predict the human nail disease such as C4.5, color detection, Haar Transforms Matrix, K-means segmentation techniques, neural network back propagation algorithm, RGB component analysis and Noval Bicluster method. C4.5 algorithm is used to make the decision then the 65% of result are matched with data set.

Haar Transforms Matrix used to predict the GAR. K-means segmentation techniques used to to identify shape of a nail. Neural network back propagation algorithm produced 90%-95% efficiency of disease prediction. Noval Bicluster method used to predict the healthy conditions of human. The table 1 discuss the techniques in existing system.

Table 1. Different Data Mining techniques of Nail Disease Prediction

Sno	Author & Year	Data mining Techniques	observations
1	Indi Trupti (2016)[5]	C4.5 algorithm color detection algorithm	65% results are correctly matched with training data set.
2	Sneha Gandhat (2016)[12]	Haar Transforms Matrix	calculate GAR (Genuine acceptance ratio) and produced result.
3	Vipra Sharma (2015)[14]	Image Segmentation algorithm	nail color and texture and compare these values with the predefined values
4	Saranya (2017)[11]	K-means segmentation techniques	to identify shape of a nail
5	Vipra Sharma (2015).[15]	Segmentation	Analysis of color and texture
6	Nityash Bajpai (2015)	neural network back propagation algorithm .	90%-95% efficiency of disease prediction system
7	Hardik Pandit (2013)[3]	RGB component analysis	the identification of stage of a disease
8	Anuradha Thakare (2017)[1]	Noval Bicluster method	Predict the health conditions of human

Proposed Method

Reducing impulse noise is a very important activity in image processing. To remove the noise and improve the quality of color images a nonlinear Fusion Filter is proposed in this research. This filter is designed by using the combination of kalman filter and median filter. Instead of taking average to nearby pixel it takes standard deviation. It removes the impulse noise very well without alter the image features, edges and color information. This new method does not establish blurring and moving effects even in high density noise. The standard similarity measure peak signal to noise ratio (PSNR) and computation time have been used to evaluate the performance of proposed hybrid filter.

The following steps are performed in the proposed method:

1. Acquire the original image,
2. Convert the image from RGB to Gray,
3. Apply the histogram equalization method on original image,
4. Apply the fusion filter
5. Display the resultant enhanced image.

RESULTS AND DISCUSSION

The proposed fussion filter technique implemented using MATLAB 15.0. The performance of proposed filter is analyzed and compared with other filter. The calculation of quality of medical image improvement is complex. To evaluate and examine quality of enhanced medical there is no unique algorithm. So this paper introduced new fussion filter to subtraction of noise from nail images. This method is simple and easy to implement shown in figures 2 and 3.

The Root Mean Square Error (RMSE) and Peak Signal-to-Noise Ratio (PSNR) are used to evaluate the enhancement of medical images

$$MSE = \frac{1}{M*N}\sum_{J,K}(f(j,k) - g(j,k))^2 \quad (1)$$

$$PSNR = 20\log_{10}\frac{255}{RMSE} \quad (2)$$

$$RMSE = \sqrt{MSE} \quad (3)$$

The performance of the filters was tested over the five images . The Median filter and proposed filter works well on images despoiled by Salt and pepper noise. From the literature, that Mean and Kalman filters are suitable to remove speckle noise and additive noises. But it does not suitable to remove salt and pepper noise. The results shows that the proposed filter removes salt and pepper noise efficiently than Median filter. The STD, MSE and PSNR [10] had measured. Here, the experimental results are presented for five images in figures. The comparison of the metrics had shown in the table and the graph.

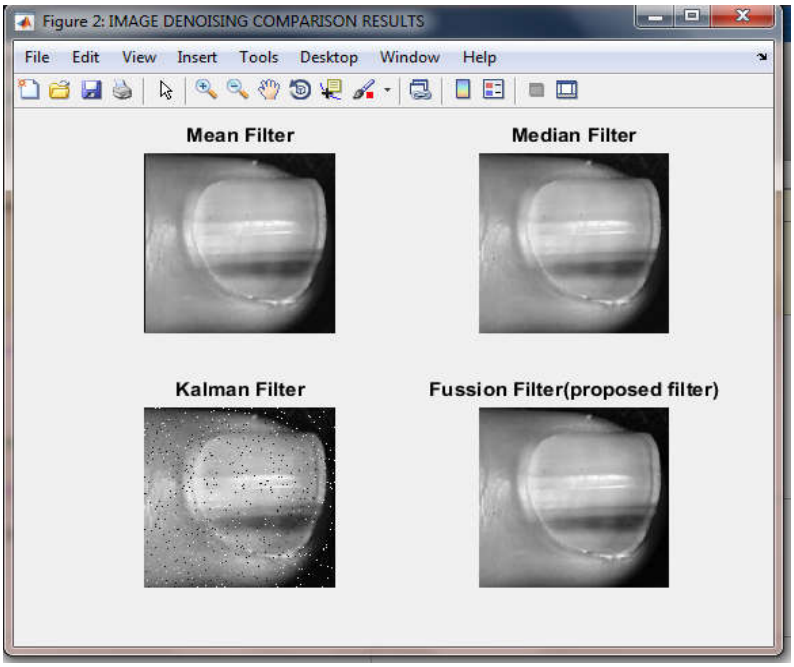


TABLE-1: Comparison of PSNR values

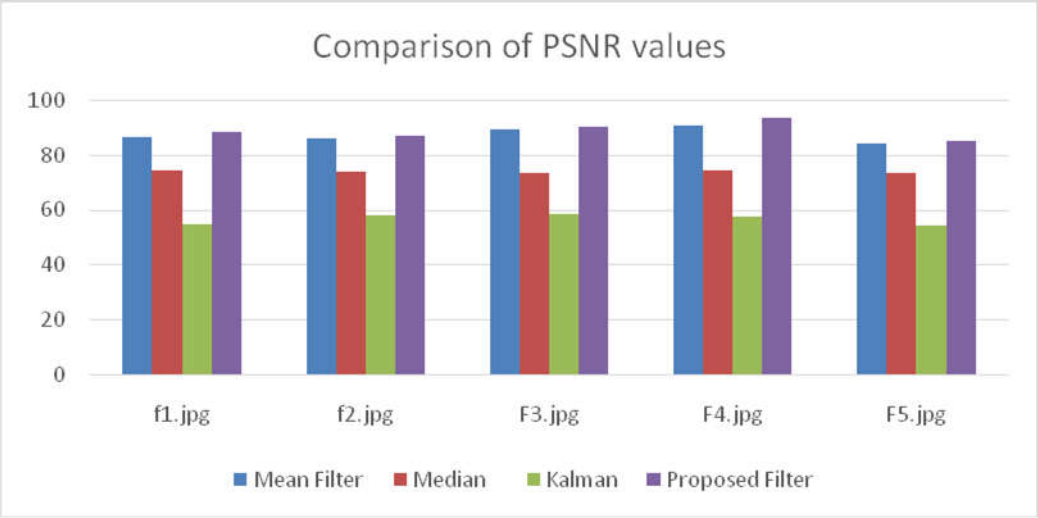
Image	Mean Filter	Median Filter	Kalman Filter	Fussion Filter
f1.jpg	85.5441	75.1218	55.7220	**88.2564**
f2.jpg	85.0812	74.8182	56.6722	**87.1347**
F3.jpg	86.2183	74.5346	58.4231	**90.2570**
F4.jpg	87.3567	73.2821	57.0981	**93.6284**
F5.jpg	84.0785	73.5713	55.0235	**85.1402**

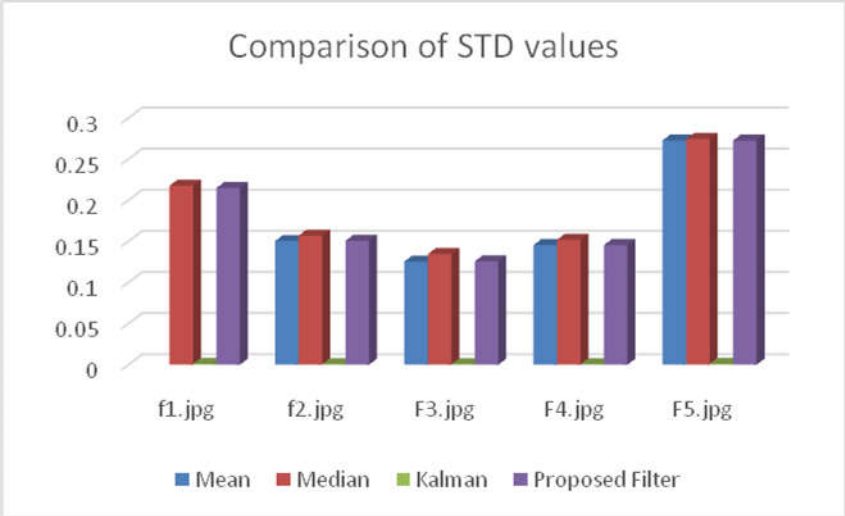
TABLE-2: Comparison of MSE values

Image	Mean Filter	Median Filter	Kalman Filter	Fussion Filter
f1.jpg	0.0001	0.0025	0.2208	**0.0001**
f2.jpg	0.0002	0.0028	0.1090	**0.0001**
F3.jpg	0.0001	0.0029	0.0945	**0.0001**
F4.jpg	0.0001	0.0025	0.1193	**0.0000**

TABLE-3: Comparison of STD values

Image	Mean Filter	Median Filter	Kalman Filter	Fussion Filter
f1.jpg	0.2511	0.2717	0.0009	**0.2561**
f2.jpg	0.1655	0.1751	0.0006	**0.1608**
F3.jpg	0.1525	0.1643	0.0005	**0.1573**
F4.jpg	0.1546	0.1723	0.0006	**0.1645**
F5.jpg	0.2279	0.2547	0.0011	**0.2827**





V. CONCLUSION

In this paper, the type of noises and filters have explained. The proposed filter is experimented and compared with Mean,Median and Kalman filters. The results are shown in figures. The PSNR, MSE and STD (Standard Deviation) values had considered for study, which is shown in tables. The low value of MSE indicates the better enhancement approach but the high PSNR value indicates the better ones. The proposed method yields better results than other filters.

References

[1]. Anuradha Thakare , Shubhangi Meshram, H.M. Baradkar, "An Automated Medical Support System For Detecting Human Health Conditions Based On Noval Bicluster Method", I J C T A, Vol.- 10, Issue- 8, Pp. 223-228, 2017.

[2]. Darshana A., Dr. Jharna Majumdar, Shilpa Ankalaki, "Segmentation Method For Automatic Leaf Disease Detection", International Journal Of Innovative Research In Computer And Communication Engineering, Vol. 3, Issue 7, Pp. 7271-7282, July 2015.

[3]. Hardik Pandit, Dr. Dipti Shah , "The Model Of Nail Color Analysis – An Application Of Digital Image Processing", International Journal Of Advanced Research In Computer Science And Software Engineering, Volume 3, Issue 5, May 2013.

[4]. Hardik Pandit, Dr. D M Shah, "The Model For Extracting A Portion Of A Given Image Using Color Processing",International Journal Of Engineering Research & Technology (Ijert) ,Vol. 1 Issue 10, Pp. 1-5, December- 2012.

[5]. Indi Trupti, Yogesh A. Gunge, "Early Stage Disease Diagnosis System Using Human Nail Image Processing", I.J. Information Technology And Computer Science, Vol. 7, Pp.30-35 , 05-07-2016.

[6]. Indrakumar S S, Dr. M S Shashidhara, "Study On Eye Troubles Using Palm Print And ImageProcessing Technique", International Journal Of Recent Trends In Engineering & Research (Ijrter),Volume 02, Issue 05, Pp. 198-201, May –2016.

[7]. Jimita Baghel, Prashant Jain, "K-Means Segmentation Method For Automatic Leaf Disease Detection", Int. Journal Of Engineering Research And Application, Vol. 6, Issue 3, (Part -5) Pp.83- 86, March 2016.

[8]. Noriaki Fujishima, Kiyoshi Hoshino, "Fingernail Detection Method From Hand Images Including Palm", Iapr International Conference On Machine Vision Applications, Pp. 117-120, May 20-23, 2013.

[9]. Pandit Hardik and Dipti Shah: "The Model of nail color analysis – An application of Digital Image Processing", International Journal of Advanced Research in Computer Science and Software Engineering (IJARCSSE), ISSN: 2277 128X Volume 3, Issue 5, May 2013.

[10]. Prediction System For Various Health ConditionsBy Analysing Human Palms And Nails Using Image Matching Technique", International Journal Of Scientific & Engineering Research, Volume 6, Issue 10, October-2015.

[11]. Saranya,Dr.A.Ranichitra,"Image Segmentation Techniques To Detect Nail Abnormalities",International Journal Of Computer Technology & Applications, Vol.-8, Issue- 4, Pp.522-527, 2017.

[12] Sneha Gandhat, A. D. Thakare, Swati Avhad, Nityash Bajpai, Rohit Alawadhi, " Study And Analysis Of Nail Images Of Patients", International Journal Of Computer Applications, Volume 143 – No.13, June 2016

***[13]** Sujatha R, Y Sravan Kumar, Garine Uma Akhil, "Leaf Disease Detection Using Image Processing", Journal Of Chemical And Pharmaceutical Sciences, Volume 10 Issue 1, Pp.670-672, January - March 2017 .*

[14]Vipra Sharma, Aparajit Shrivastava, "System For Disease Detection By Analyzing Fingernails Color And Texture",International Journal Of Advanced Engineering Research And Science (Ijaers), Vol-2, Issue-10, Oct-2015.

[15] Vipra Sharma , Manoj Ramaiya, "Nail Color And Texture Analysis For Disease Detection" , International Journal Of Bio-Science And Bio-Technology, Pp.351-358, Vol.7, Issue – 5, 2015,6.

[16]Vishwaratana Nigam, Divakar Yadav, "A Novel Approach For Hand Analysis Using Imageprocessing Techniques", International Journal Of Computer Science And Information Security,Vol. Xxx, No. Xxx, 2010.