

# Certain investigations on filter performance for skin texture analysis

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**ABSTRACT:** Noises are always present in an image posing higher or lower complexity in removal and however it is necessary to remove those noises to obtain a better image. There are various types of filters available that help us to remove those noises; only when a right type of filter is used the best result could be obtained. This paper compares the performance of filters namely median, Wiener, average and sharpened filter applied for skin texture analysis by using GLCM(Gray level co-occurrence matrix) parameters. Cheek and dorsal skin images at two different angles are taken by a 8MegaPixel camera, with a resolution of 1920x2560, exposure time  $1/10^{\text{th}}$  of a second as samples for analysis.

Keywords - Skin texture analysis, GLCM, Filters

## I. INTRODUCTION

Various skin texture patterns appear on the surface of human skin. For instance, a person's palm shows different textures of blood spots, prints and wrinkles. The analysis and synthesis of these texture patterns is important for several research areas, such as computer graphics, medical imaging, and cosmetics development. In signal processing, a filter is a device or process which removes the unwanted component or feature from the signal. Filtering is a class of signal processing. Most often, this means removing some frequencies and not others in order to suppress interfering signals and reduce background noise.

## II. LITERATURE SURVEY

ShijieHao.etal[1] constructed a spatially guided map which exploits the spatial influence of the image details based on edge response of an image. Further, this map was integrated into two state of the art image filters for image detail enhancement. We know noise removal is important task in different applications such as medical which the noise free images could lead to less error detection. Azadeh Noori Hoshyar.etal [2] compared the performance of five filters - Median Filter, Adaptive Median Filter, Mean Filter, Gaussian Filter and Adaptive Wiener filter- for de-noising from Gaussian noise, Salt & Pepper noise, Poisson noise and Speckle noise. Motonori Doi etal[3] Proposed image analysis and synthesis of skin color texture by wavelet transform. The skin color texture is modeled as four texture components of base color, internal skin texture, regular surface texture and local texture. The skin color image is decomposed to the four texture components by multi-resolution analysis using wavelet transform. Sergey Abramov etal[4].

proposed Prediction of Filtering Efficiency for DCT-based Image Denoising. It is possible to estimate the MSE values of images to be processed by means of calculation rather simple statistics of DCT coefficients. Moreover, the quasi-optimal value of threshold parameter for DCT filtering methods can be easily evaluated as well. The results are presented for different additive Gaussian noise levels and a set of gray-scale test images. Ji-Hong Liu etal[5] proposed Research and Implementation for Texture of Handback Skin Quantitative Analysis based on Co-occurrence Matrix. First of all, the non-invasive method of digital imaging Technology is adopted to get the handback skin morphological data. Then, based on the algorithms of gray level co-occurrence matrix and displacement co-occurrence Matrix, morphological features of the individual hand back skins are measured. Finally, we analyse the relationship between the experimental results and skin aging for both methods. Kouhei Shimizu.etal[6] proposed a new computer-aided method for the skin lesion classification applicable to both melanocytic skin lesions (MSLs) and nonmelanocytic skin lesions (NoMSLs). They developed a new method to distinguish among melanomas, nevi, BCCs, and SKs. They calculated 828 candidate features grouped into three categories: color, sub region, and texture. They introduced two types of classification models: a layered Emre Celebi.etal[7], proposed the automated quantification of clinically significant colors in dermoscopy images.

Given a true-color dermoscopy image with  $N$  colors, we first reduce the number of colors in this image to a small number  $K$ , i.e.,  $K < N$ , using the  $K$ -means clustering algorithm incorporating a spatial term. The optimal  $K$  value for the image is estimated separately using five commonly used cluster validity criteria. Mariam A. Sheha.etal[8], presented an automated method for melanoma diagnosis applied on a set of dermoscopy images. Features extracted are based on gray level Co-occurrence matrix (GLCM) and Using

Multilayer perceptron classifier (MLP) to classify between Melanocytic Nevi and Malignant melanoma. MLP classifier was proposed with two different techniques in training and testing process.

In this work tells about the novel method of identifying the filter performance of different filters on skin texture analysis.

**III. METHODOLOGY**

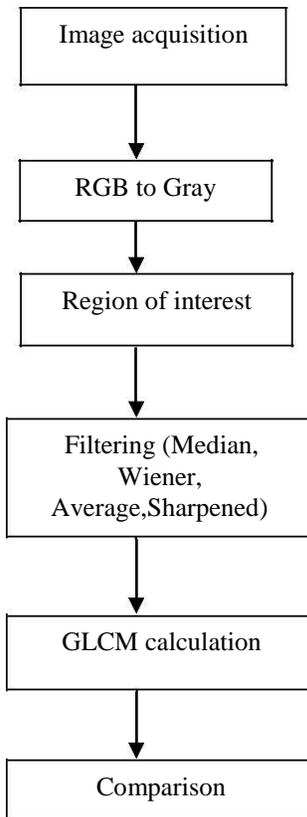


Fig1:Flow diagram

Cheek and dorsal skin images at two different angles are taken by a 8MegaPixel camera, with a resolution of 1920x2560, exposure time 1/10<sup>th</sup> of a second as samples for analysis. The images are converted to gray. The region of interest (ROI) is then selected. The ROI must have at least 600 to 800 pixels to get reliable results. Different filters like Median filter, Wiener filter, Average filter, Sharpened filter are applied to ROI of these images and the GLCM values are then calculated. The calculated GLCM values of the filtered images by different filters have been compared to analyze the performance of them.

GLCM matrix has been found using the formulae using below:

$$\text{Contrast} = \sum_{(i,j)} |i - j|^2 p(i,j) \dots\dots\dots(1)$$

Where p=image, i,j=coordinates, p(i,j)=Intensity value at i,j,

$$\text{Correlation} = \sum_{i,j} \frac{(i-\mu_i)(j-\mu_j)p(i,j)}{\sigma_i\sigma_j} \dots\dots\dots(2)$$

$$\text{Energy} = \sum_{i,j} p(i,j)^2 \dots\dots\dots(3)$$

$$\text{Homogeneity} = \sum_{i,j} \frac{p(i,j)}{1+(i-j)} \dots\dots\dots(4)$$

Medianfilter:

$$y(m,n) = \text{median}\{x[i,j], (i,j) \in \mathcal{A}\} \dots\dots\dots(5)$$

where w represents a neighborhood defined by the user, centered around location [m,n] in the image

Wiener filter:

$$f_{ij} = \sum_{K=-n/2}^{(n/2)-1} \sum_{l=-n/2}^{(n/2)-1} (v_{kl} g_{i,j+k,l}) + e_{ij} \dots\dots\dots(6)$$

for I,j=1,2,3,4....n.

where v denotes the weights by which g is blurred and e denotes the noise

Average filter:

$$y[i] = \frac{1}{M} \sum_{j=0}^{M-1} x[i+j] \dots\dots\dots(7)$$

where x[] is the input signal, y[] is the output signal and M is the number of points in the average

Sharpened filter:

$$S_{ij} = x_{i,j} + F(x_{i,j}) \dots\dots\dots(8)$$

Where x<sub>i,j</sub> is the original pixel value at the co-ordinate I,j, F is the high pass filter, a is the tuning parameter

**IV. RESULTS**

Fig2:Cheek and dorsal skin images in two different angles



Table1:The GLCM values of Different filters

S. No	Position	Parameters	Filters			
			Median filter	Wiener filter	Average filter	Sharpened filter
1	Hand (angle1)	Contrast	0.1377	0.1846	0.1687	5.6582
		Correlation	0.9445	0.7743	0.7827	0.0955
		Energy	0.1885	0.3405	0.3616	0.0260
		Homogeneity	0.9315	0.9110	0.9189	0.4755
2	Cheek (angle1)	Contrast	0.1176	0.1931	0.1562	6.2551
		Correlation	0.7803	0.7743	0.8230	0.0860
		Energy	0.3095	0.3119	0.3206	0.0231
		Homogeneity	0.9121	0.9074	0.9244	0.4532
3	Hand (angle2)	Contrast	0.1193	0.1488	0.1280	3.5709
		Correlation	0.9478	0.9432	0.9435	0.3979
		Energy	0.2016	0.1852	0.2015	0.0282
		Homogeneity	0.9407	0.9262	0.9380	0.5248
4	Cheek (angle2)	Contrast	0.1302	0.2143	0.1476	8.3461
		Correlation	0.7625	0.6488	0.7666	0.0452
		Energy	0.4564	0.3500	0.4169	0.0192
		Homogeneity	0.9532	0.9025	0.9296	0.4238

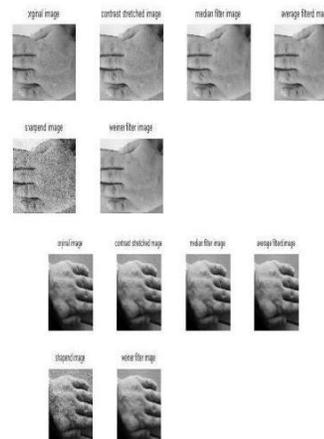


Figure 2 shows the cheek and dorsal hand skin images and figure 3 shows the filtered cheek images taken two different angles. Figure 4 shows the filtered hand images taken at two different angles. Table1 shows the GLCM(gray level Co-occurrence matrix) values of the cheek and hand skin images using different filters.

Fig3: Cheek skin images by different filters

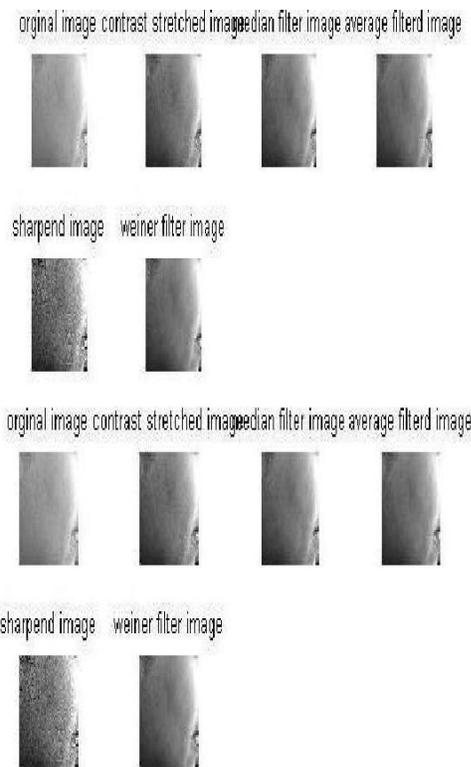


Fig4:dorsal skin images using different filters

### V. DISCUSSION

The cheek and hand samples are taken for experimentation and imaged at two different angles. A region of interest is identified in each sample and various filters are used to filter this region of interest. GLCM parameters are found for these filtered images. The results which has been tabulated in Table-1 shows the GLCM(gray level Co-occurrence matrix)values for Median, wiener, Average and sharpened filters. The GLCM values of median, wiener and average filters are not of any particular pattern but only the GLCM values of sharpened filter is of particular pattern for the skin samples taken ; i.e., for median filter the contrast value for hand and cheek at angle1 is decreasing and for angle2 it is increasing. Whereas the correlation for hand and cheek at angle1and angle2 is been decreasing. The energy for hand and cheek at angle1 is and angle2 is increasing. The homogeneity for hand and cheek at angle1 is decreasing, whereas at angle2 it is increasing. It is found that the results of median filter do not yield any particular pattern by comparing all the GLCM values at different angles. For wiener filter, the contrast for hand and cheek at both angle1 and at angle2 is increasing. The correlation for hand and cheek at angle1 is found to be the same where as at angle2 it is decreasing; the energy for hand and cheek at angle1 is decreasing and at angle2 is increasing. The homogeneity for hand and cheek at angle1and angle2 is found to be decreasing. Also wiener filter, average filter do not give any particular pattern but only sharpened filter shows a definite pattern; i.e., the contrast for hand and cheek at angle1 and angle2 is increasing. The correlation

for hand and cheek at angle1 and angle2 is decreasing. The energy for hand and cheek at angle1 and angle 2 is found decreasing. The homogeneity for hand and cheek at angle1 and at angle 2 is increasing. From the tabulated GLCM results it is found that, of all the filters considered here only sharpened filters results fall in a pattern for analyzing skin texture.

## VI. CONCLUSION

The proposed method is tested on the cheek and dorsal skin images taken at two different angles. The results obtained show that the sharpened filter performs better compared to the other filters namely Median, wiener and average filters to classify the skin textures based on GLCM values. It is found that the contrast of Hand skin is lesser than that of cheek skin where as correlation, Energy and homogeneity of Hand skin are more than that of cheek skin.

However more samples of skin from different locations are to be tested to know about the accuracy of the proposed method.

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## REFERENCES

- [1]. Shijie Hao, Daru Pan, Yanrong Guo, Richag Hong, Meng Wang, *Image detail enhancement with spatially guided filters*, *Signal Processing* 120(2016)789–796, Elsevier journal.
- [2]. Azadeh Noori Hoshyar, Adel Al-Jumailya, Afsaneh Noori Hoshyar, *Comparing the Performance of Various*

- Filters on Skin Cancer Images*, *International Conference on Robot PRIDE 2013-2014 - Medical and Rehabilitation Robotics and Instrumentation, ConfPRIDE 2013-2014*, *Procedia Computer Science* 42 ( 2014 ) 32 – 37
- [3]. Damanpreet Kaur, Prabhneet Sandhu, *Human Skin Texture Analysis using Image Processing Techniques*, *International Journal of Science and Research (IJSR)*, India Online ISSN: 2319-7064,
- [4]. Sergey Abramov, Sergey Krivenko, Alexey Roenko, Vladimir Lukin, *Prediction of Filtering Efficiency for DCT-based Image Denoising*, *2nd Mediterranean Conference on Embedded Computing, MECD - 2013*
- [5]. Jaruwat Toontham, Wirat Rattanapitak and Somkait Udomhunsakul, *Comparative Efficiency of Wavelet Filters for Multi-focus Color Image Fusion*, *2nd International Conference on Education Technology and Computer (ICETC)*, 2010.
- [6]. Ji-Hong Liu, Qian Gao and Yang Liu, *Research and Implementation for Texture of Handback Skin Quantitative Analysis based on Co-occurrence Matrix*, *International Conference on Industrial Mechatronics and Automation*, 2009.
- [7]. Rashi Goel and A. Saranjeet Singh, *Skin cancer detection using glcm matrix analysis and svm classifier*, *international journal of applied engineering and technology* issn: 2277-212x (online) an open access, online international journal available at <http://www.cibtech.org/jet.htm> vol. 5 (1) january-march 2015, pp.6-11
- [8]. Mariam A. Sheha, Mai S. Mabrouk, Amr Sharawy, *Automatic Detection of Melanoma Skin Cancer using Texture Analysis*, *International Journal of Computer Applications* (0975 – 8887), Volume 42– No.20, March 2011