Abstract:
The accuracy of the Finger-Knuckle-Print image recognition system based on the given input image. In this work, the different methods are used to improve the input image such as Dynamic Histogram Equalization (DHE) and Adaptive Histogram Equalization (AHE) methods were suggested. The captured FKP image quality based on the image contrast it may be combined with some unwanted noise. We have found the quality FKP images that which improved by the method of AHE which is measured the good contrast enhancement filtering technique. The performance of the studied work was evaluated by the parameters of Mean Square Error (MSE) and Peak Signal to Noise Ratio (PSNR). When the PSNR Values reaches above 60 dp is a significant metrics of the performance refining the efficiency of that algorithm. The MSE value reflect that the AHE suggestively improves the best quality of FKP images by improving the contrast with AHE, at the same time reduce the noise.

Keywords: Finger-Knuckle-Print, enhancement, Dynamic Histogram Equalization, Adaptive Histogram Equalization.

I. INTRODUCTION

Contrast enhancement is a significant field in image preprocessing for two important area such as human, computer vision. Generally, the image preprocessing techniques were used for medical image processing for diagnosing diseases and as a preprocessing step in various biometric based recognition systems, and various multimedia processing applications [1]. The Histogram Equalization (HE) is a very simple and popular method for image contrast enhancement. Because of its simplicity further comparatively better than the performance compared with other methods and almost all kind of images. The process of HE by remapping the gray levels of given image and based on the probability distribution of the grey level input image. The HE method classified into two kinds; such as is global and local HE methods. The process of Global Histogram Equalization (GHE) uses the overall input image for transformation. However, the global method is fit for the enhancement process, at the same time it is not support for adapt with the local brightness structures of the input image. Sometimes the gray level image pixels become very high frequencies. In this stage, the GHE remaps the gray levels in such a way the contrast extending becomes restricted in specific dominating gray levels consuming larger ss for extra small ones. The local histogram Equalization (LHE) can become clear. In this method a small window that slides through each and every pixels of the input image consecutively and only the block of pixels fall in the window are occupied into account for HE and before gray level mapping. The enhancement is achieved only for the middle pixel of the window. Generally, LHE needs high computational cost and occasionally causes over-enhancement in certain portion of the image. Commonly, the biometric based person authentication system is an important technique in recent research areas especially recognition system specially designed for security purposes. The security related area together with various physiological characteristics such as fingerprint, iris, eye-retina, Palm-print and Finger-Knuckle-Print [2, 3 and 9]. In this work, we use FKP image for image enhancement. In this study, we planned to compare the AHE and DHE techniques used to apply the FKP image for contrast enhancement. Those methods provide the better performance compared with other kinds of HE because of its simplicity and complexity. Various researchers have already studied the following Equalization such as HE, AHE, DHE, BPDFHE, CLAHE to appear the capability of the methods to provide the better performance of the biometric authentication system to identify the correct person [4, 5]. The organization of this paper is, in Section II Overview of the HE techniques. In section III Presence the performance evaluation, Results and discussion; Section IV we conclude our work. V References

II. OVERVIEW OF THE HISTOGRAM EQUALIZATION TECHNIQUES

A. Dynamic Histogram Equalization (DHE)
The Dynamic Histogram Equalization (DHE) technique takes control over the effect of traditional Histogram equalization so that it performs the enhancement of an image without making any loss of details in input image. It employs a partitioning operation over the input histogram to chop it into some sub histograms so that they have no dominating component in them. image histogram mechanisms and causes substantial contrast to Then each sub histogram is allotted a dynamic gray level (GL) which further can be mapped by Histogram equalization [7]. This is done by distributing total available dynamic range of gray levels among the sub-histograms based on their dynamic range in input image and cumulative distribution (CDF) of histogram values. This allotment of stretching range of contrast prevents small features of the input image from being dominated and washed out, and ensures a moderate contrast enhancement of each portion of the whole image. At last, for each sub-histogram a separate transformation function is calculated based on the traditional HE method and gray levels of input image are mapped to the output image accordingly, the whole technique can be divided in three parts partitioning the histogram, allocating GL ranges for each sub histogram and applying Histogram equalization.
on each of them. A better overall contrast enhancement is
gained by DHE with controlled dynamic range of gray levels
and eliminating the possibility of the low histogram
components being compressed that may cause some part of the
image to have washed out appearance. The functional block
diagram of the DHE is shown in Figure.1.

Figure.1. Functional Flow Diagram of DHE

B. Adaptive Histogram Equalization (AHE)

Adaptive Histogram Equalization filter is used increase
contrast in given input image. AHE calculates various regular
histograms, of all analogous with a subdivision of the image
[6]. Therefore, the output of the each image subdivision is
reallocating the lightness values. In this method to adjust the
local contrast and get clear information of the given image. At
the same time specifically the contrast of the homogeneous
areas can be limited in order to evade amplifying the noise
which should be exist in the image. Instead of, AHE is liable
for extra amplifying in some homogeneous area of an image.

C. Parameters of the performance metrics

- Mean Square Error
  The MSE signifies the collective squared error among the
  input and output FKP images. The good image enhancement
  algorithm can be agreed if it yield lower MSE values. The
  value of MSE were calculated using the below equation (1).
  Here $e(m, n)$ is error difference between the original and the
distorted images.

$$MSE = \frac{1}{NM} \sum_{m=0}^{M-1} \sum_{n=0}^{N-1} e(m, n)^2 \quad (1)$$

- Peak Signal to Noise Ratio (PSNR)
  PSNR value is defined by the ratio among the higher power of
  signal and the power of noise. The signal and noise are
  affected the quality of image. Higher PSNR values are used to
  find the quality of the algorithm. PSNR value was calculated
  by the given equation (2).

$$PSNR = 10 \log_{10} \frac{s^2}{MSE} \quad (2)$$

III. RESULT AND DISCUSSIONS

A studied histogram equalization technique uses two
parameters such as PSNR and MSE for measuring
performance evaluation [8]. Fig 2(a) and (b) are the original
and enhanced DHE image with respectively. The outcome of
the PSNR values is shown in table 1. The value of PSNR
gives bad result in DHE. The DHE gives the lowest PSNR
value 34.89. Therefore, the Adaptive Histogram Equalization
(AHE) gives 71.71 it increases the contrast of the tested Finger
Knuckle Print (FKP) image and exposes the higher quality of
acquired image after applying AHE the ability of that method
to minimize the noise and artifacts.

(A)

(B)

Table 1. Performance comparison of PSNR

<table>
<thead>
<tr>
<th>Image</th>
<th>DHE</th>
<th>AHE</th>
</tr>
</thead>
<tbody>
<tr>
<td>001-right-middle-1</td>
<td>35.32</td>
<td>70.57</td>
</tr>
<tr>
<td>002-right-middle-1</td>
<td>34.89</td>
<td>69.72</td>
</tr>
<tr>
<td>003-right-middle-1</td>
<td>34.92</td>
<td>69.98</td>
</tr>
<tr>
<td>004-right-middle-1</td>
<td>35.91</td>
<td>71.42</td>
</tr>
<tr>
<td>005-right-middle-1</td>
<td>35.80</td>
<td>71.71</td>
</tr>
</tbody>
</table>

In table 2. AHE algorithm exposes very low MSE value.
Therefore, AHE algorithm provides the good results
compared with DHE. In other hand, DHE gives maximum
MSE value compared with AHE. Hence, Figure 2. (a) and
(b) Depicts before and after applying AHE[10]. The efficiency
of the AHE, to enhance the contrast of given input image and
better quality.

Table 2. Performance comparison of MSE

<table>
<thead>
<tr>
<th>Image</th>
<th>DHE</th>
<th>AHE</th>
</tr>
</thead>
<tbody>
<tr>
<td>001-right-middle-1</td>
<td>1249.26</td>
<td>0.19</td>
</tr>
<tr>
<td>002-right-middle-1</td>
<td>1428.31</td>
<td>0.38</td>
</tr>
<tr>
<td>003-right-middle-1</td>
<td>1528.56</td>
<td>0.21</td>
</tr>
<tr>
<td>004-right-middle-1</td>
<td>1267.90</td>
<td>0.59</td>
</tr>
<tr>
<td>005-right-middle-1</td>
<td>1671.30</td>
<td>0.70</td>
</tr>
</tbody>
</table>
IV. CONCLUSIONS

The quality of the image is playing an important role in FKP based person authentication. In order to increase the quality of the given image, various kinds of image enhancement methods are available. In this work, we studied two histogram equalization methods such as DHE and AHE in order to minimize the noise of grabbed image and increase the quality. These two methods are estimated by two performance measurements (PSNR, MSE) for that metrics we determined that the AHE provides good outcomes compared to the DHE. Accordingly, the AHE is effectively minimizing the noise and increasing the FKP image quality. Those quality images produce best accuracy in recognition.

V. ACKNOWLEDGMENT

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VI. REFERENCES


[8]. Xiangfei Kong, Kuan Li, Qingxiong Yang, Liu Wenyin and Ming-Hsuan Yang, “A New Image Quality Metric for Image Auto-Denoising”.
