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Finger Nail Plate Classification for Transient Biometric Identification

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ABSTRACT

Transient biometrics using finger nail plate is a new for biometric identification and verification. According to traditional research biometric system concentrates on biometric characteristics which are constant i.e. for a long time or permanent. Transient means "short time" (not permanent). Texture features extracted with the help of LBP (Local Binary Pattern) and scale invariant feature transform(SIFT) from finger nail plate and after all the features classified with the help of the neural network. Previous work is done using fusion work of LBP, Adaboost, brisk and PCA. Proposed methodology uses finger nail plate image data set from the website TBND group. The work is carried out using finger nail images in Matlab environment.

Keywords: Texture Feature Extraction, Neural Network, LBP, Matching, Preprocessing, SIFT.

I. INTRODUCTION

Image processing plays an important role in feature extraction that convert an image into digital form by performing some operations on it for extracting knowledgeable information from it. The biological meaning of the biometric word is life – measurements. In this physical characteristic of a person that can be checked on an automated basis which is used for security purposes and access control applications. Transient biometric can be used in real world application for identification and security motives. For this texture features extracted from the finger nail plate. Transient biometric is a new concept and it's for short time and also database will change with in the two or three months' interval. Biometrics is the automated identification of individuals based on their physical characteristics. There is no need to remember any passwords or cards using the transient biometric system and there is less risk of misuse or forgotten the data. Biometrics systems work by recording and comparing biometric characteristics. when an individual first uses a biometric system, their identifying features are enrolled as a reference for future comparison.

II. METHODS AND MATERIAL

Literature Review

This section represents the literature survey done on the various texture feature extraction, matching, classification techniques. The literature review represents the work done by the various researchers and scholars in this direction which serves as an introduction to research further on various steps of improving highways security. [1] R. V. Hogg discussed rectangular histogram and position-invariant nonlinear-histogram equalization technique for shape feature extraction. [2] D. N. Graham considered various algorithms to extracted boundary regions from image. [6] B. Verma et.al. introduced feature extraction and classification techniques Auto Associative Neural Network (AANN) and Multi-Layer Perceptron (MLP). [14] Leutenegger decomposed signature based descriptor on color image into three monochromatic images and detected Key point. [10] Ryszard S. Choras applied classification on those images which are not selected and normalization remove the size of the image and histogram processing used for color processing. [11] Namita Aggarwal **et.al.** proposed first order statistics and second order statistics to identify texture. [13] C. Rathgeb extracted texture, color, shape

of leaf by using color, texture and shape techniques and classify leaf by adapted naïve Bayesian. [17], [20] deployed feature extraction techniques for transient biometric identification.

Proposed Methodology

The transient biometric solution presented in this work is a direct approach to the verification and identification tasks. Feature Extraction, Matching and Classification are done using Neural Network against a database of previously collected. Following Fig: 2.1 shows the methodology of proposed work. In the proposed work has five sections. First section is reading of input image of finger nail plate from database. These images are RGB and .jpg images. The next section is the preprocessing of image. in this images are converted into gray scale and after that find the region of interest with the help of grid method then remove salt and pepper noise through median filter. Median filter is used to remove the unwanted portion of image. Texture features extracted using LBP (Local Binary pattern) from preprocessed images. In the last sift and neural network used for the purpose of matching and classification of finger nail images for transient biometric identification. Neural network is advance technique in digital image processing for texture classification and feature extraction.

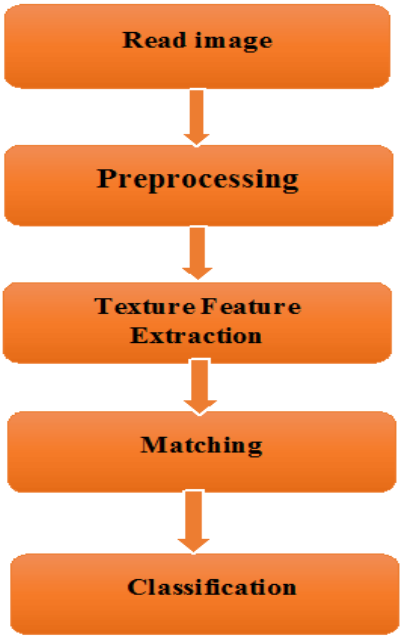

Figure 1. Methodology

III. RESULTS AND DISCUSSION

Proposed method is tested on various types of finger nail plate images with different orientations and magnitudes of the texture. Identified transient biometric identification problem modules are developed using MATLAB R2016a, which runs in the environment window 10. The database images are collected from the TBND visual group website. These images are of the right index finger nail of different persons. Fig 3.1 shows database images which are used for texture feature extraction. The data set consists of three sets. The first subset D01 consists of images acquired on the first acquisition day. The second subset D02 is composed of images acquired one day later. The third subset D30 was acquired 1month after.

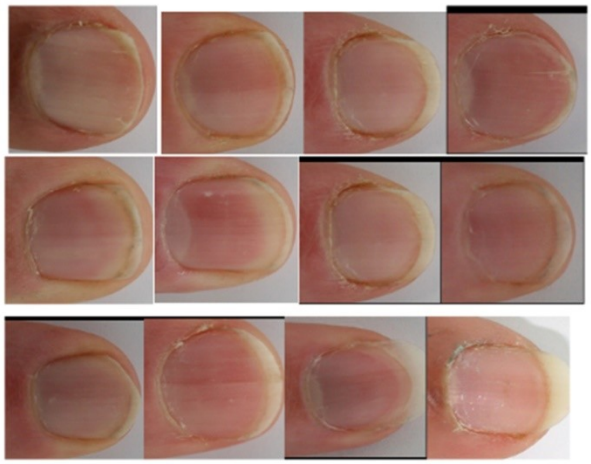

Figure 3.1. Databse images

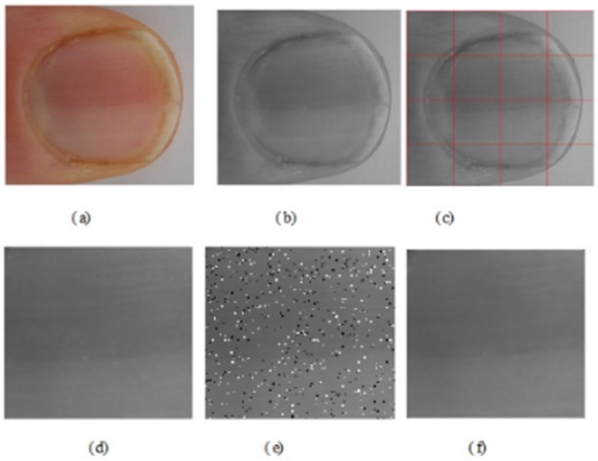

Figure 3.2. results of preprocessing

Figure 3.3. LBP output

Preprocessig is one of the most important step in feature extraction and also used to remove unwanted portions of image which are degrade the image performance. In proposed methodology there is six steps of preprocessing. These are reading of image from database images, convert into gray scle image, creating a 4x4 grid on image, crop image with the help of grid method (in this extracted only center part of finger nail image because center part gives better results than whole image of finger nail plate), added 'salt and pepper', removing noise. Fig 3.2 shows the results of preprocessing of finger nail plate images before texture feature extraction. It shows six images (a) to (f). Image (a) orignal image from database, (b) gray scale image, (c) 4x4 grid on imagefor finding region of interest, (d) cropped image using grid method, (e) added salt and peeper, (f) remove noise using median filter. Fig: 3.3 output image of LBP which is showing texture of finger nail plate. LBP develop local texture pattern which is built by thresholding neighbourhood by the gray level value of center pixel. LBP worked with eight neighbouring pixels and center pixel or value is computed as threshold value. Since correlation between pixels decreases with distance, a lot of the texture information can be obtained from local neighborhoods.

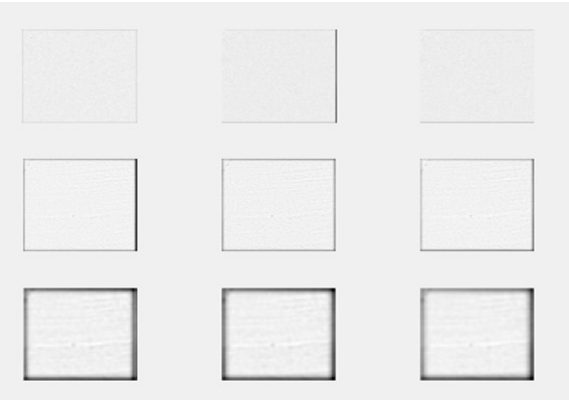

Figure: 3.4 scale space representation

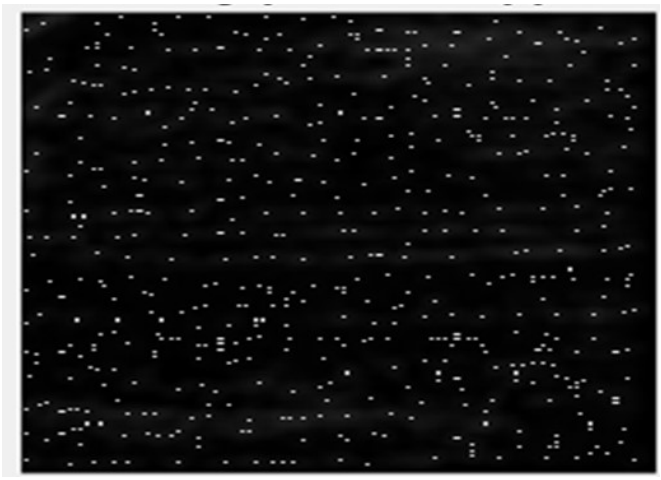

Figure: 3.5 key point localization

2.0943	1.1572	1.1859	0.5522	1.4264	1.6095	0.9722	0.2987	61.0362	5.0655
0.9956	0.9983	1.0038	2.5502	1.23	1.0756	1.0008	0.9945	59.7471	4.4861
0.5498	1.1825	0.7147	0.9326	1.0634	0.8585	0.5063	0.7545	57.1137	4.5074
1.047	0.7291	0.775	0.8253	0.8625	1.0309	1.2102	1.125	62.8463	4.1234
0.6209	1.1087	1.6999	0.7309	0.8706	0.667	1.1049	1.2688	62.1948	4.0197
0.9875	0.9991	0.9951	1.5099	1.0086	0.9999	0.7222	0.8332	57.8259	3.8868
1.8898	1.3894	1.5719	1.0967	1.8652	2.5389	1.0979	2.0336	61.475	9.4525
0.8928	1.0318	0.6291	0.6492	1.053	1.1606	0.7061	0.5729	63.7853	4.3562
0.9804	1.0067	1.2334	1.3932	0.9977	0.9235	1.0739	1.7417	60.506	8.0525
1.5433	0.6482	0.9654	1.8285	1.0382	1.1383	1.1984	1.1006	59.555	9.3306
1.1075	1.0299	1.0299	0.9804	1.295	0.8244	0.6454	1.1808	56.5883	4.7785
1.4051	1.0566	2.0201	1.0992	1.6303	0.5458	1.0056	1.4482	61.1011	4.7296
0.9975	1.8988	0.8043	0.9966	0.9506	0.4442	0.9972	0.9586	62.0624	4.6102

Figure: 3.6 Matching Features (SIFT)

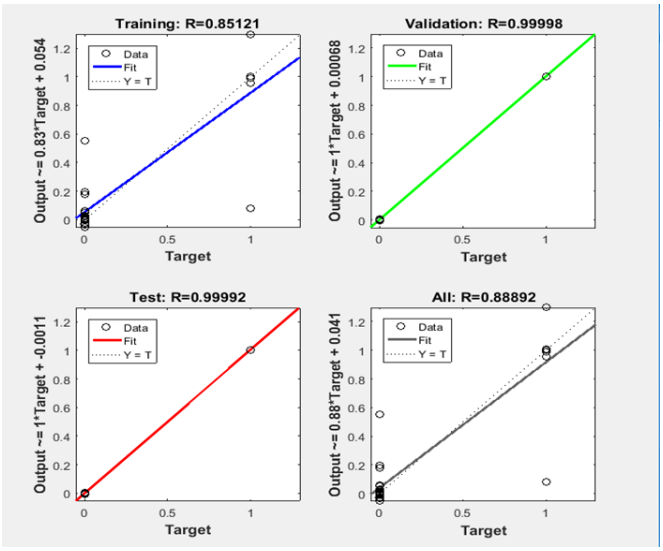

Figure: 3.7 Results using Neural Network

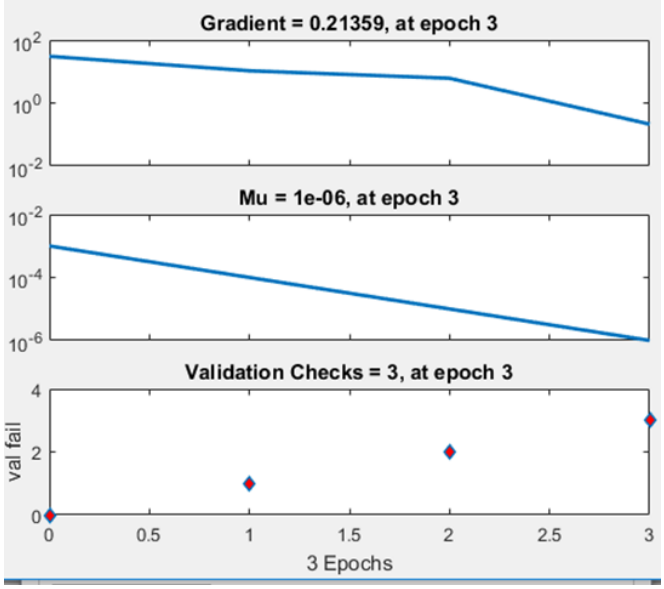

Figure: 3.8 Decent Gradient &Validation

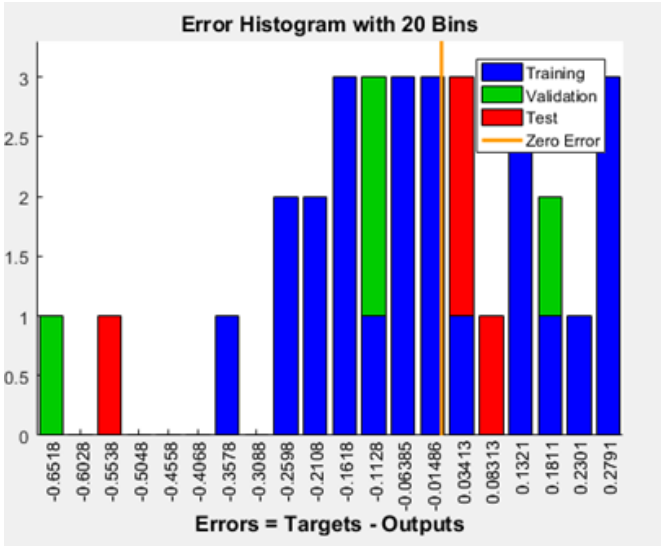

Figure: 3.9 Error Histogram

Next process (step) in proposed methodology is sift feature extraction , matching and classification using neural network method. Fig 3.4, 3.5, 3.6 showing results of sift method i.e representeed scales of image using sigma in in sift and extracted (localize) keypoints from the LBP resultant image. Sift method discard the low contrst pixels and display (localize) only high contrast pixels which have various features and then fig: 3.6 matching features using sift method. Fig: 3.7, 3.8, 3.9 are the resultant images or diagrams of neural network. It shows training state, testing state, validation state of fitting and classify MSE (mean square error) and error histogram (Fig: 3.9) showing zero errors during tesing , training, validation. Error histogram uses 20 bins to classify features.

IV. Conclusion and Future Scope

From the study conducted on finger nail plate in transient biometric. It has been concluded that the transient biometric opens the door for real world and non-critical applications for the purpose of security. Biometrics research has provided significant results in universality, distinctiveness and permanence. Acceptability is an important issue and one of the most important reason behind this is the fear of misuse or theft or loss of one's permanent biometric data or useful information. Individuals are thus unwilling and unenthusiastic to offer their biometric characteristics where possible, and the leap in usability that biometric technology offers (i.e. password- and device free access to resources), cannot be realised. This work introduces a new for identification system and direct the acceptability issue to the biometric. It reduces the risk of misuse of biometric information. It can be used for identification purpose in real world applications. In future work it can be continuing with other classification and machine learning techniques and also finger nail plate can be used for disease detection system.

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