Personal Authentication Using Human Fingernail

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Abstract- Biometric characteristics from the dorsal view of hand which is believed to be distinct from other such as nail, knuckle and hand geometry can be picked up by using touch less acquisition system. Nail biometric is such a one biometrics on which limited researches have been made and can be picked up by using touch less acquisition methods. As a unique characteristics for private authentication, the appropriate proficiency and execution that can be gained from finger nail plates. This paper propose a finger nail recognition system based on GN(GLCM and NN). For feature extraction GLCM is used and for recognition Neural Network is used.

Keyword- Finger Nail Recognition, Biometric Authentication, Finger Nail Plate, Feature Extraction, GLCM, Neural Network.

I. INTRODUCTION

Recently, automatic biometric authentication has come up with the new-age solutions to our society's ever increasing demand of better security provisions. Traditional ways of maintaining security using manual record-keeping (like photo/identity card verification, signature verification) are no longer feasible with an increase in the world populace and the rise of globalization. Like most other tasks, identity confirmation processes have also been assign to computers. Distinct digital signatures are now being given to people by matching digitally acquired biometric templates against the pre-stored templates in large biometric databases.

There needs highly secured identification and personal verification systems since effective security control level in the world of electronic and internet commerce has been increased. So far, there is still no biometric trait able to satisfy the requirements of the real deployment in security applications completely. Hence, we need to develop recognition algorithms that can vigorously handle the high degree of variableness introduced due to this unconstrained and unsupervised image capture. Here in this paper, we are trying to put forth new biometric authentication method by obtaining low-resolution images of nail plate surface which is outermost part of the nail unit. We proposed a very convenient and effective method of recognition process by using Neural Network. The characteristics of nail plates such as contour and texture from index fingers are represented by the appearance and shape based feature description.

II. RELATED WORK

In the field of nail biometric authentication, only a few types of research have been done and the significant works has been explained in this section.

In [10] paper Kumuda N S, Dinesh M S proposed segmented approach of fingernail patterns and distinguish them as distinct nail parts as fingernail plate with distal free edge and lunula of nail plate. Lunula remains unchanged in structure, whereas the distal nail edge extends and changes its structure after certain period of time. For fingernail segmentation, an algorithm is designed that automatically separates unchanging region of fingernail plate from free distal edge of nail structure. Proposed method consist of two steps. In first stage, color image is turned into gray scale and using adaptive histogram equalization, contrast enhancement is applied. In second stage, segmentation is done using watershed method that uses maxima and minima properties of marker controlled watershed principles. Confusion matrix has been constructed where evaluation has been done with ground truth in order to verify the results of the algorithm. Furthermore, both segmentation methods is considered for excellence metrics estimation. Comparably, correctness for fingernail plate between the watershed and the ground truth results into 84.0% of accuracy. Therefore fingernail segmentation results are optimistic, supporting its use for biometric application.

In [5] Ajay Kumar, Senior Member, IEEE, and Ch. Ravikanth proposed a new approach using fingerback surface imaging for personal authentication. The fingerback surface images from each user are normalized to minimize the rotational variations, translation, and scale in the knuckle images. Using subspace methods the appearance-based features are extracted from the segmented knuckles and a comparative study is set forth. Simultaneously from the palm-side hand images, the palm print and fingerprint features can be extracted and combined to achieve better performance. The proposed authentication scheme performance depends highly on the accuracy of knuckle segmentation from the presented hands. Hence, further performance enhancement can be achieved with the improvement of a more precise knuckle segmentation, which can also be achieved by utilizing user pegs during imaging from some trade off in user comfort.

Ushir Kishori Narhar and Ram B. Joshi [6] investigated, a scheme by using persuasive cued click points, along with security analysis and applicability, which presents a fused estimation of the graphical password design and carrying out together with the biometric authentication using finger nail plate surface. The texture and contour properties of nail plates from Index, Middle and Ring finger are characterized by the appearance and shape based feature descriptors. They have implemented this by using classifier based fusion of matching scores by utilizing support vector machine and decision tree and a technique of score level rules for fusion.

The result comparison of ring finger nail plate surface is done for both ICA and wavelet the features. Amongst them ICA operate on better performance (80%) than wavelet features (75%).

III. PROPOSED TECHNIQUE

Biometric characteristics from the dorsal view of hand which is believed to be distinct from other such as nail, knuckle and hand geometry can be picked up by using touch less acquisition system. Nail biometric is such a one biometrics on which limited researches have been made and can be picked up by using touch less acquisition methods [7]. The nail investigation reveal that the gap between the grooves of the nail bed remains unchanged throughout the life, only the nail plate is reproduced as new cells are generated. Leaving the extended grown nail plate the nail bed remains consistent over all the lifespan of an individual. Entire nail plate can be utilized as a transient biometric but cannot be used for authentication because of the grown nail plates. The nail bed pattern and length remains unalterable [3]. This is used as a basic to form a biometric authentication system using nails.

Methodology is as follows:

Step 1:- Input the image from dataset.

Step 2:- In this stepchecking if image is rgb range or gray range in a loop. Than extract out the color bands from the original image into 3 separate 2D arrays, one for each color component.

Step 3:- Computing histogram for red, green and blue color band and plotting all 3 histograms in one plot.

Step 4:- Converting the image into binary using imbinarize and calculating threshold**.**

Step 5:- In this step image conversion is done i.e. convert the image intogray scale by rgb2gray command. This command changes RGB images to grayscale by eliminating the hue and saturation information while retaining the luminance.

Step 6:- Perform segmentation using K-Means segmentation algorithm.

Step 7:- Feature extraction by using GLCM Algorithm.

Step 8:- Neural Network classifier is used for classification. Performing NN training followed by NN testing.

Step 9:- In this step Matching has been done.

Step 10:-Testing Accuracy of Neural Network.

A. Grey-Level Co-occurrence Matrix

The Gray Level Co-occurrence Matrix (GLCM) and related texture characteristics computations are image examination methods. An image comprises of pixels each with a specific gray level, the GLCM is a summary of a number of times various fusion of gray levels co-exist in an image section image. Texture feature determination make use of the details of the GLCM to contribute a measure of the alteration in intensity of significant pixels. Gray-level co-occurrence network (GLCM) is method that consider the spatial pixels relationship from the nail surface.

B. Neural Network

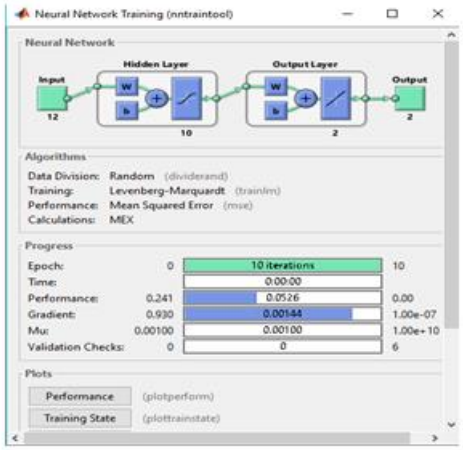
Neural networks are usually arranged in layers. This layers are constructed with number of interrelated 'nodes' which consist of an 'activation function'. 'Input layer' are used present the patterns to the network through which it communicates to one or more 'hidden layers' where the actual process carried out through a system of weighted 'connections'. Later the hidden layers then connected to an 'output layer'. Almost all ANNs contain some means of 'learning rule' which act as weight modifier i.e. it changes the weights of the connections in accordance to the input patterns that it is exhibited with. The output what we get from neuron is a function of the weighted sum of the inputs and a bias. The estimation of the outputs of all the neurons is basically the function of the entire neural network i.e. a totally acceptable calculation.

Later weighted sum of the inputs of a neuron is applied to generate the output. Most of NN's utilizes sigmoid functions. In determining its function the weights in a neural network plays important role. Training of network is performed with some sample data and adjusting the weights to highly approximate the suitable function. Epoch in NN is providing iteration to the network with an input and restoring the network's weights. On the whole number of epochs are required to train the neural network

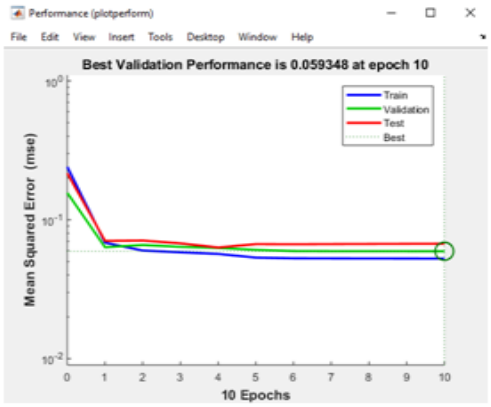
Finally entire dataset divided into independent sets i.e. training set and testing set. A group of samples used to train the neural network is training data. Testing set is a collection of samples used to test the efficiency of the neural network and to determine the error rate. If any error encountered than network than the errors optimized and training is done all over again until you get better performance. Basic idea is to iterate the training and testing process number of times.

IV. EXPEIMENTAL RESULTS

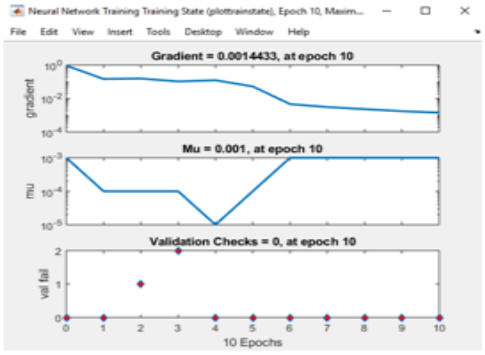
MATLAB tool is used for implementing the proposed method. The results of the proposed technique is presented in this section. Mentioned proposed technique is tested on number of different finger nail plate images with various magnitudes and orientations of the texture.



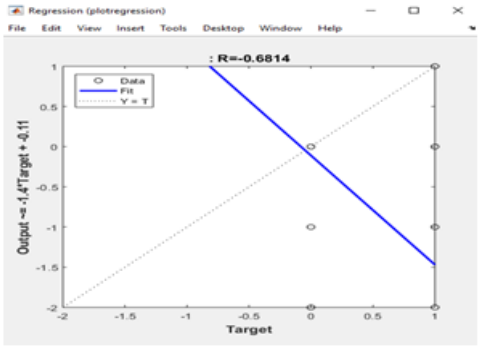
(a)



(b)



(c)



(d)

Fig 2: (a) Neural Network (b) Best Validation Performance of Neural Network at 10 Epochs (c) Gradient, Validation Checks and Learning Rate of Neural Network at 10 Epochs (d) Training Rate

V. CONCLUSION

The suggested system demonstrate a new approach of biometric identifier based finger nail surfaces. By using single finger nail surface, this system has tried to analyse the actual possibility and performance for authentication. Proposed technique uses a GN (GLCM, NN) based finger nail recognition. Different biometric methods used for fingernail identification are examined. For extracting features GLCM is used and finally by using NN training and testing identification is carried out. Implementation of technique is done in MATLAB. Analytical results proves that the mentioned method performs recognition in an effective way.

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