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Optimal NN Based Multimodal Biometric Authentication Using Palm and Finger Knuckle Images

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Abstract. The recognizable proof and authentication are finished by passwords, stick number, which is effectively broken by others. Biometrics is an effective and remarkable device in light of the useful and behavioral qualities of the individuals keeping in mind the end goal to demonstrate their authentication. One of the present patterns in biometric human recognizable proof is the improvement of new creating modalities.. For authentication four distinct modules are considered. This work diverse element as are considered to combination process highlight level combination used recognized the biometrics with help optimal Neural Network (NN), here shrouded layer and neuron optimization process Gray wolf optimization (GWO) system is utilized. From the process the trial results are contrasting with existing way to deal with demonstrate our proposed display as best for biometric authentication process.

Key words: Biometric Data, Authentication, Feature extraction, Feature level fusion and optimization**1.**

Introduction

Individual character alludes to a gathering of traits that are connected with an individual, for example, name, government managed savings number and so forth. Biometric innovation holds out the affirmation of an inconvenience free, safe method to make exceedingly exact validations of

2. Literature Review

Yarui Chen et al [7] have proposed the multimodal biometrics acknowledgment framework to have concentrated combination highlight portrayal and extraordinary acknowledgment execution. Exploratory outcomes demonstrate that the proposed multimodal biometrics acknowledgment framework has a higher testing exactness in contrast with the conventional techniques with higher proficiency and better soundness.

Lalithamani*et al*.[9] have recommended the utilization two sorts of calculation, in particular AES (Advanced Encryption Standard) and DES (Data Encryption Standard) that all are symmetric cryptographic systems. At first, highlight focuses from palm and hand veins are scrambled utilizing AES calculation. At that point, the private key produced by AES calculation is given to DES calculation for encryption. At last, the multi-modular biometric format and the mystery key are utilized to create the fuzzy vault.

Lalithamani*et al*.[10] have proposed the use a watermarking innovation to enhance the format security in biometric confirmation. As indicated by, two modalities, for example, iris and hand vein is taken to safeguard the qualities of energy and permanency. Our proposed procedure for inserting of iris information to hand vein pictures utilizing watermarking innovation to enhance format security.

3. Proposed Methodology

The innovation is for the most part utilized for authentication and get to control or for distinguishing people. Biometric authentication is that everybody is having some one of a kind example and an individual can be distinguished by his or her physical qualities. This exploration work concentrate on the biometric authentication recognition utilizing the Fingerprint, Palm prints and Knuckle print. Behind of fusions the recognition pictures and non recognition pictures are given for preparing and testing utilizing optimal Neural Network (NN). This optimal NN prepare roused dim wolf based

streamlining strategy used to enhance shrouded layer and concealed neuron of structure. In the testing stage, the test pictures are outfitted to the prepared framework with the end goal of distinguishing proof, this procedure appeared in figure 1.

This research work considered four different modules which are

- Pre processing Module
- Feature Extraction Module
- Fusion Module
- Recognition Module

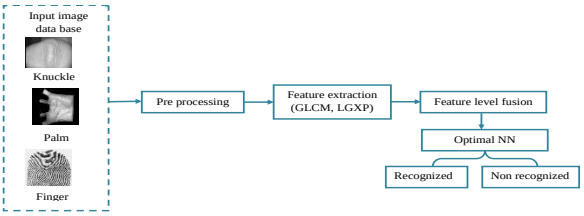


Fig 1: Schematic diagram for proposed work

3.1 Pre processing Module

The histogram equalization chronically offers ascend to the worldwide complexity of a few pictures, particularly when the practical information of the picture is symbolized by close difference values [11]. The general histogram equalization formula is

$$H(u) = round\left(\frac{cdf(u) - cdf_{\min}}{(W \times H) - cdf_{\min}} \times (G-1) \right) \quad (1)$$

Where H - value of histogram, cdf cumulative distribution function, $cdf_{\min}$ minimum non zero value of cdf , W -width, H -height and G -number of grey levels.

3.2 Feature Extraction Module

The preprocessed pictures are feature removed by method for adjusted GLCM and LGXP for finger print, knuckle print and palm print in the feature extraction segment. In the undertaking of the input picture ID and check, the feature extraction has a tremendously guided influence. A definitive rationale of the feature extraction is proportional down the original informational index by evaluating certain properties or features which are fit for distinguishing an input design from the other.

3.2.1 Grey Level Co occurrence Matrix (GLCM)

Preprocessed pictures are highlight extricated by method for adjusted GLCM and LGXP for unique finger impression, knuckle print and palm print in the element extraction part. In the assignment of the info picture

The set of Grey Level Co-Occurring Probabilities (GLCP) is defined below:

$$S_{ij} = \frac{P_{ij}}{\sum_{i,j=0}^{L-1} P_{ij}} \quad (2)$$

Where P_{ij} represents the frequency of occurrence between two grey levels, L -Number of quantized grey levels, i and j for a given displacement vector for the specified window size.

3.2.2 Local Gabor XOR Pattern (LGXP)

The phase some portion of Gabor took after by LBP gives LGXP. In LGXP, descriptor phases are quantized into the various reaches. The quantity of phase extents is produced in order to devise the examples element to the deviations of Gabor phase, and subsequently can't be greatly raised. Every single phase esteem is quantized with the assistance of the quantization strategy. Along these lines, the LGXP administrator is adequately used to the quantized phases of the focal pixel and each of its neighbors.

At the point when the LGXP technique arrives at an end, an indistinguishable esteem is accomplished and the relative undertaking gets rehashed for every last piece. Ensuing to the component extraction method, the elements are outfitted to the combination procedure [13].

3.3 Feature Level Fusion Process

In the feature level fusion, the removed features from the unique mark, palm print and knuckle print pictures are nourished as the contributions for the feature level fusion. In this feature level fusion least, medium and most extreme standardization process is performed in unique mark, palm print and knuckle print pictures, then the link procedure is happened and combined the features of three pictures.

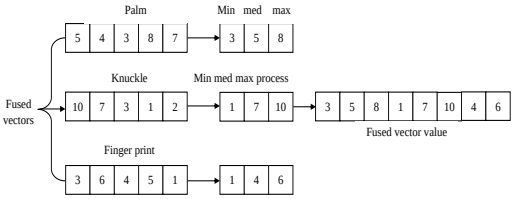


Fig 2 Feature Level fusion process

In figure 2 the feature level fusion process is appeared previously. The feature vectors are watched for each knuckle print picture, palm print picture and unique mark picture. In the wake of gathering vectors least, middle, and most extreme vectors has been happened in the following stride behind this procedure connection technique is performed and the vectors are melded toward the finish of process. This model is utilized as a part of feature level fusion strategy.

3.4 Recognition Module

Biometric acknowledgment prepare ideal NN module is considered, to validate three various types of pictures this work improve shrouded layer and neuron of the structure Gray Wolf optimization (GWO) procedure utilized.

3.4 .1 Artificial Neural Network (ANN) with optimization Module

In the novel procedure, the picked components are related to the assistance of the artificial neural network. The neural networks are sensibly sorted out in layers, made out of various interlinked "hubs" having an 'actuation work'. The

examples are outfitted to the network by method for the 'information layer', which conveys to at least one 'hidden layers' the place the genuine handling is done by method for an arrangement of weighted 'associations'. The hidden layers are next connected to an 'output layer'. Presently the picked include qualities are offered as the contribution for neural networks [14].

3.5 Optimization

The dark wolves enough edge a Canidae's piece family and are regarded as the pinnacle predators demonstrating their position at the sustenance's evolved way of life. They routinely demonstrate a slant to make due as a gathering [15]. Steps involved in GWO

Step 1: Initialize the solution $c_i = (1,.....n)$ and Initialize $a, A, and \quad C$

Step 2: Find the fitness of the initial solution

Step 3:Separate the solution based on the fitness

s_α = the first best search solution

s_β = the second best search solution

s_δ = the third best search solution

Step 4: Update the position of the current search solution

Step 5: Calculate the fitness of the new search solution

Step 6: Store the best solution so far attained
Iteration=Iteration+1

Step 7: Stop after the optimal solution is attained.

4. Result and Discussion

The proposed perceived technique is actualized in MATLAB 2015a stage with the system course of action is i5 processors with 4GB RAM. Here three diverse arrangement of pictures are gathered from web examination the execution alongside the current procedures.

4.1 Database Description

This research work the database is collected from CASIA database; this considers palm, knuckle, and finger print 200 images. All the three pictures are 8 bit dim level JPEG records by our self-created palm print acknowledgment gadget. Among the 200 pictures 180 pictures considered for preparing process and remaining 20 pictures consider for testing process. Figure 3 demonstrates the specimen database pictures.

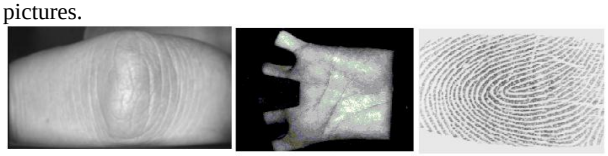


Fig 3: Sample database images

4.2 Experimental Results

Table 1: NN Structure with accuracy

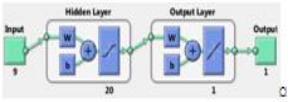
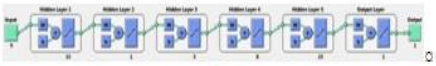
Technique	Structure	Accuracy (%)
Default		90
Optimal NN (GWO)		50

Table 1 demonstrates the default NN and optimal NN precision are depicted. Our proposed optimal structure accomplish 90% exactness and optimal hidden layers are five with various hidden neurons that is are 15 neurons in hidden layer 1, 1 neuron in hidden layer 2, 3 neurons in hidden layer 3, 8 neurons in hidden layer 4 and at last 23 neurons in hidden layer 5.

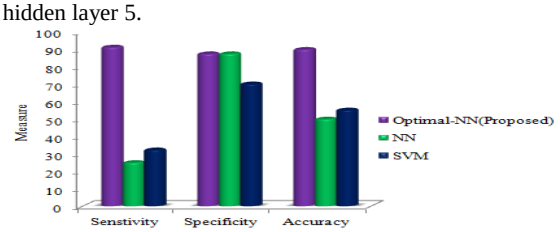


Fig 4 Comparative analysis

Figure 8 demonstrates the execution for each knuckle, palm and unique mark affectability, specificity and exactness of perceived and non perceived process. Affectability as 91.33% in our proposed approach ideal NN with help of GWO. For exactness the GWO esteem is 0.55 %, In a palm print images for affectability the proposed esteem is 25.3% then for specificity the NN esteem is 0.29 %. The recognition precision for the unique mark image accomplishes 90% exactness esteem and the palm image accomplishes 55.26% exactness esteem. At last the intertwined score an incentive from the iris and knuckle image accomplishes 85% of precision esteem.

Table 2 Feature vector value

Image	Feature vector values
Finger print	45052
Knuckle	12345
palm	54522

In our proposed technique here component level is utilized in view of these the iris and unique finger impression images are perceived. In highlight level combination. The recognition exactness for palm, knuckle and unique mark image and furthermore the melded image. Here the utilized image has high recognition exactness esteem.

Table 3 Recognized and Non Recognized image

Input image	Proposed (NN-GWO)	Default
2	2	2
2	2	1

2	2	2
1	1	2
1	1	2

1 Means: Recognized images and 2 means: Non recognized image

Table 3 shows the recognized image as the input as 2 and our proposed work achieves the default structure also. If recognized image as input means our proposed work recognized correct image and normal NN achieves the non recognized image.

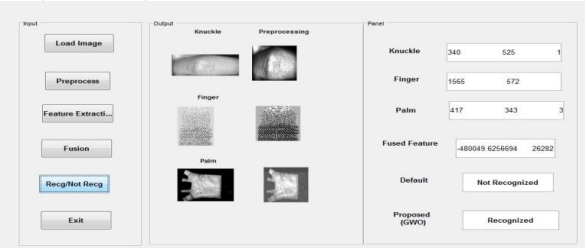


Fig 5 GUI

The Figure 5 epitomizes one arrangement of info estimations of the procedure amid the proposed technique is executed in the MATLAB programming determines on the biometric acknowledgment work. From that every one of the pictures with intertwined vector esteem alongside the execution measure.

5. Conclusion

In the segment a successful procedures are utilized for biometric authentication acknowledgment. Three different authentications are used in particular unique mark,knuckle print and palm print pictures. For these acknowledgment methods by and large four assorted modules are considered to order the acknowledgment and non acknowledgment handle. From the significant outcomes are dissecting the precision, affectability, and specificity level of optimized NN structure along the distinctive prints. The three authentication pictures are performed and the proposed combined pictures are indicated better when contrasting and other separate picture strategies. In future work, the affectability specificity and precision estimation of acknowledgment is enhanced utilizing different streamlining and arrangement procedures.

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