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"Integrating Iris and Fingerprint Traits for Personal Authentication using Artificial Neural Network"

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Abstract— In recent years, biometric based security systems chieved more attention due to continuous terrorism threats around the world. However, a security system comprised of a single form of biometric information cannot fulfil user's expectations and may suffer from noisy sensor data, intra and inter class variations and continuous spoof attacks.

To overcome some of these problems, multimodal biometric aims at increasing the reliability of biometric systems through utilizing more than one biometric in decision-making process. In order to take full advantage of the multimodal approaches, an effective fusion scheme is necessary for combining information from various sources. I present a new methodology based on fusion at the feature level, which is a relatively new approach compared to others, to combine multimodal biometric information from two biometric identifiers (Iris and Fingerprint).The proposed system is for multimodal database comprising of 21 samples. The performance of the system is tested on a database prepared to find accuracy, false acceptance rate and false rejection rate .

Keywords— *Biometric, Artificial Neural Network, Security, Spoofing Attack, Wavelet, Gabor,False Rejection Rate,Falese Acceptance Rate, Genuine Accept Rate* .

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I. INTRODUCTION

Now-a-days, biometric recognition is a common and reliable way to authenticate any human being based on his physiological or behavioural biometrics."Biometrics" means "life measurement. One of the applications which most people associate with biometrics is security and authentication. However, biometric identification has eventually a much broader relevance as computer interface becomes more natural. It is an automated method of recognizing a person based on a physiological or behavioural characteristic. Among the features measured are; face fingerprints, hand geometry, handwriting, iris, retinal, vein, voice etc. .In particular, biometric authentication systems generally suffer from enrolment problems due to non-universal biometric traits, susceptibility to biometric spoofing or insufficient accuracy caused by noisy data acquisition in certain environments.

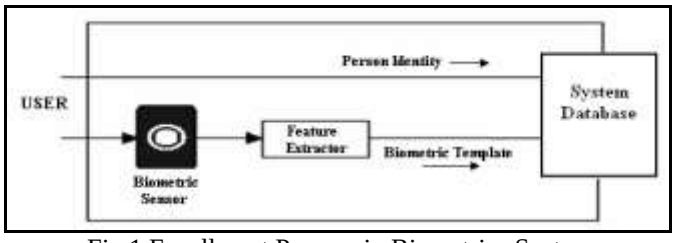

Fig 1 Enrollment Process in Biometrics System

This paper proposes an efficient multimodal biometric identification method which involving two biometric traits namely fingerprint and iris. Combining the fingerprint and iris at feature level enhances the sturdiness of the individual authentication. Multimodal biometric system is developed through combination of fingerprint and iris recognition.

2 . Comparison of Various Biometric

In this work an Iris Identification system and fingerprint Identification system are combined as these modalities are widely accepted and natural to produce. There are also some other parameters which are very important during the analysis of a biometric trait. These are:

Reducibility: The captured data should be capable of being reduced to a file, which is easy to handle.

Reliability and Tamper-resistance: The attribute should be impractical to mask or manipulate. The process should ensure high reliability and reproducibility.

Privacy: The process should not violate the privacy of the person.

Comparable: Should be able to reduce the attribute to a state that makes it digitally comparable to others. The less probabilistic the matching involved, the more authoritative the identification

Inimitable: The attribute must be irreproducible by other means. The less reproducible the attribute, the more likely it will be reliable.

Biometrics	Universal	Unique	Permanence	Collectable	Performance	Acceptability	Potential to fraud
Face	High	Low	Medium	High	Low	Low	Low
Fingerprint	Medium	High	High	Medium	High	Medium	Low
Iris	High	High	High	Medium	High	Low	Low
Signature	Low	Low	Low	High	Low	High	High
Voice	Medium	Low	Low	Medium	Low	High	High
vein	Medium	Medium	Medium	Medium	Medium	Medium	Low
Hand Geometry	Medium	Medium	Medium	High	Medium	Medium	Medium

Fig 2 Choice of Modality

2.1 Level of Fusion

Multi biometric system can be integrated in several different levels as described below .

- Sensor level
- Feature level
- Match score level
- Rank level
- Decision level

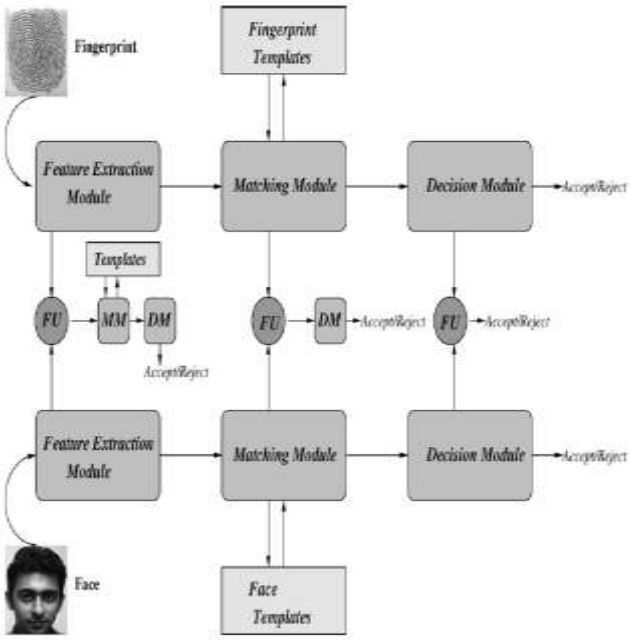

Fig 3 Level of fusion

There are numbers of fusion techniques for any particular information. Choosing appropriate fusion techniques for any specific information depends on the necessity of the application and the performance of the fusion techniques Experimented by previous research. In their research, categorized the fusion methods into two broad categories - fusion before matching and fusion after matching, considering the possible fusion elements (type of biometric information). Fusion before matching category contains sensor level fusion and feature level fusion, while fusion after matching contains match score level fusion, rank level fusion and decision level fusion.

3. DESIGN & IMPLEMENTATION

1. Firstly, we load the Sample of Fingerprints and Iris of Twenty different people's in the Database. Figure 4 shows the sample of fingerprint and Figure 5 shows the sample of Iris.

Figure 4. loaded the sample of fingerprint

Fig 5 loaded the sample of iris

2. So the features are extracted from fingerprints and iris sample.Figure 6 show the feature of fingerprint and figure 7 show the feature of iris.

Fig 6 fingerprint feature

Fig 7 Iris feature

3. Fusion of Extracted features using wavelet Fusion method. Figure 8 shows fusion of individual person and Figure 9 shows fusion of all the fingerprints and iris present in the data base.

4.

Fig 8 Fused feature of finger print and iris

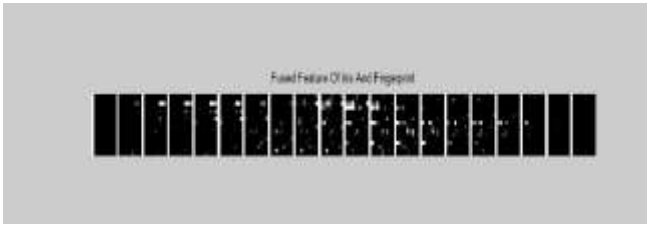

Fig 9 Fused feature of fingerprints and iris

5. Train Neural network using Cascaded feed forward Back propagation Algorithm and simulate the result. Figure shows training with trainlm and Figure 10 shows input and target whereas Figure 11 shows input and simulated result.
6.

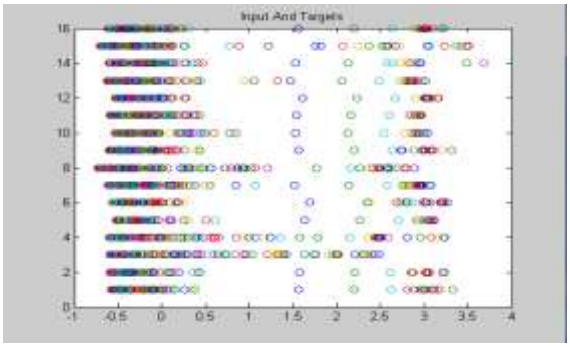

Fig 10 Input and target

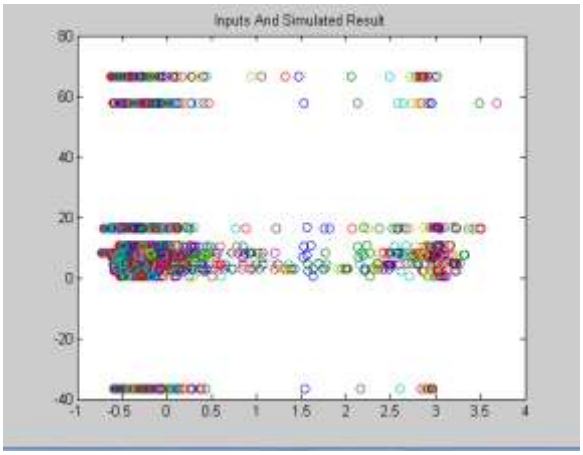

Fig 11 shows input and simulated result.

7. Load the sample of fingerprints and iris for testing purpose. Figure 12 shows the sample of fingerprints and iris for testing purpose.
8.

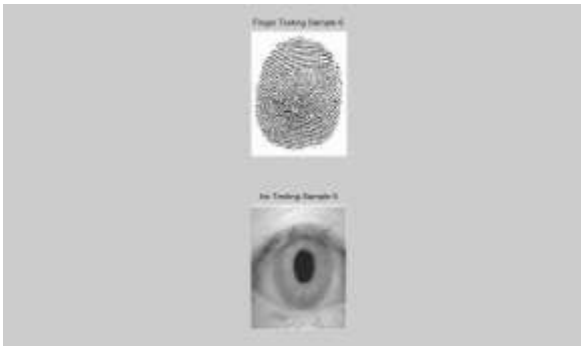

Fig. 12 Load sample of iris and fingerprints for testing purpose

4. Experiment and Rsesult

The effectiveness of our proposed multimodal biometric authentication scheme is evaluated on Fingerprint database and iris database.The experiments are conducted in MATLAB with imageprocessing Toolbox and on a machine with an Intel core 2 Duo CPU processor.

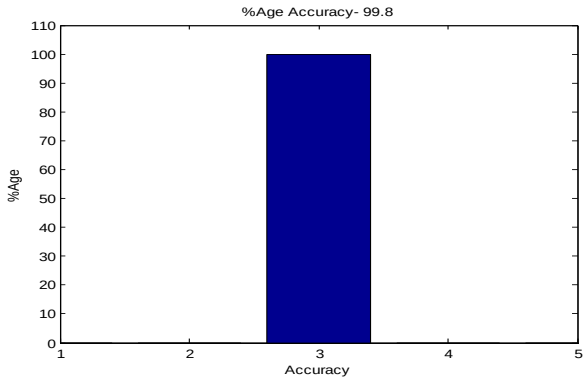

Fig 13 Accuracy of purpose algorithm

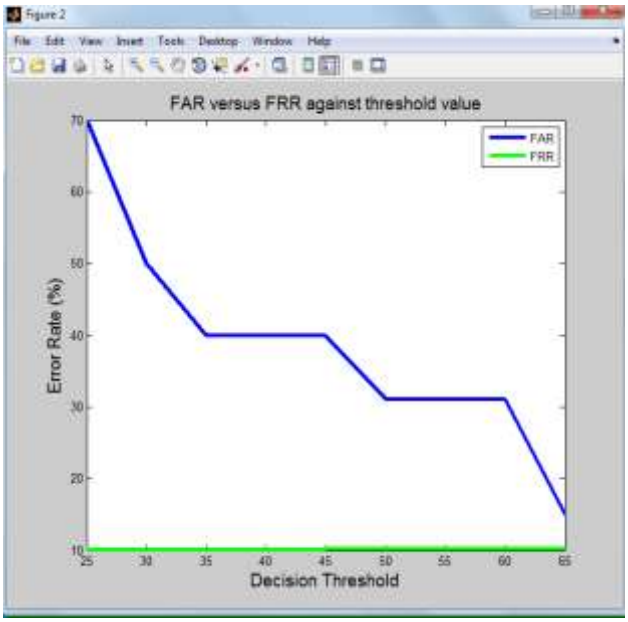

Fig 14 Figure 8.1: Graph of FAR vs FRR against threshold value

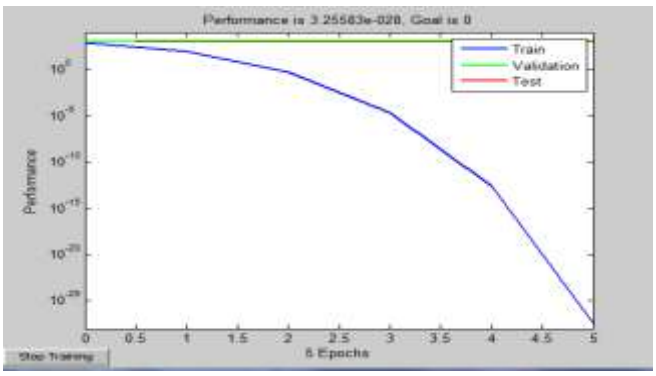

Fig 15 Train NN using Cascaded feed forward Back propagation Algorithm

5. Conclusion

The paper proposes a biometric personal authentication system using a novel combination of iris and fingerprint. For system deployment the combination is found to be useful as one needs a close up system and other needs contact. One modality is used to overcome the limitations posed by the other. The experimental results show that the accuracy of system would increase on combining the traits. The system is giving an overall accuracy of 99.8% with FAR and FRR of 0 and 1.

6. Future Research Direction

The outcomes of this research have been published and presented through important venues, such as International Journal of Biometrics, national Conference etc. and have benefited both academic and enterprise applications. There are some issues and open questions left for future research

More research can be conducted to find the optimum matching algorithms for unimodal biometrics to enhance the overall performance of the multimodal system. Dual or tri-level fusion scenarios (different fusion in different levels of the system) can be investigated to make the system faster and significantly reduce the error rate. These represent possible future direction of research in this exciting and rich field.

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