Multimodal Face and Finger Vein Biometric Recognition using ULBP and Repeated Line Tracking

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Abstract- Multimodal biometrics are systems that are capable of using more than one physiological or behavioral characteristic for enrollment, verification or identification. For biometric identification to be ultra secure and provide above average accuracy, more than one type must be used. Here a new multimodal biometric recognition system is proposed based on face biometrics and finger vein pattern recognition .The face image feature extraction is performed using uniform local binary pattern extraction. The finger vein pattern extraction is performed using repeated tracking of dark lines in the images. Initially the enrollment is verified using face recognition only. If it fails to provide matching score above minimum threshold value the enrollment is verified for authentication using finger vein biometric technique and face recognition fusion score .A single fusion score for both face and finger vein pattern is found and on the basis of scores obtained the recognition is achieved.

Keywords – Multimodal biometrics, ULBP, repeated line tracking, fusion score

I. INTRODUCTION

A biometric system provides automatic recognition of an individual based on some sort of unique features or characteristics possessed by an individual. In recent years biometric identity cards and passports have been issued in some countries based on face ,iris or finger print recognition. Although there are still some concerns about using biometrics in mass consumer applications due to information protection issues but the system will prove highly beneficial for access control applications such as database access and computer login .Compared to passwords ,biometric technologies offer more secure and comfortable accessibility and have dealt with problems such as password hacking.

II. PROPOSED APPROACH

The aim of multi-biometrics is to improve the quality of recognition over an individual method by combining results of multiple features, sensors or algorithms. In multimodal biometrics choosing of a right modality is a challenging task in recognizing a person. Here two biometric modalities namely the finger vein and face will be chosen to develop a technique for multimodal biometric recognition using score level fusion.The proposed multimodal recognition will be done using four important steps. The steps include preprocessing, feature extraction from face image, matching with first biometric and matching with second biometric using score level fusion.

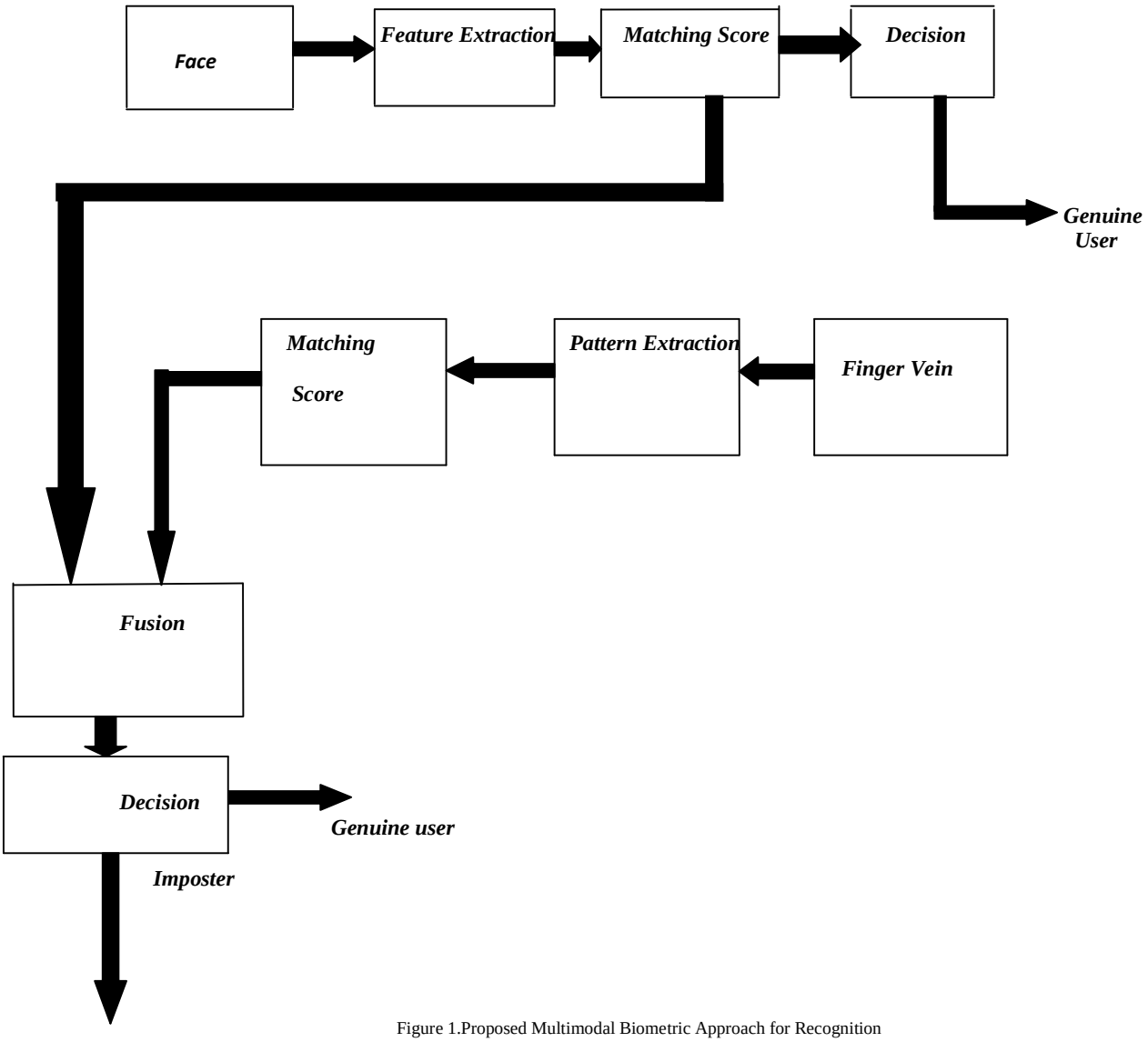

Figure 1.Proposed Multimodal Biometric Approach for Recognition

A. Preprocessing

In the preprocessing stage the preprocessing of both the face image and finger vein pattern is to be done. Among the various feature extraction techniques available Local Binary Pattern is the most commonly used feature extraction technique in face biometrics. But the extracted output feature consist of both the uniform and nonuniform pattern and it has undesirable characteristics such as high dimension ,partial correlation and unwanted noise that produces irregular distribution in texture classification. The increase in feature length will reduce the accuracy of output result. To overcome these drawbacks of LBP another method called ULBP (Uniform Local Binary Pattern) is used.

In ULBP the input grayscale image is of size nxm .For an efficient feature extraction using ULBP, the input grayscale image is segmented into pixels. In LBP a centre pixel c_p is selected and compared with 8 neighboring pixel values n_p in 3x3 window. If the value of centre pixel c_p is greater than its neighboring pixel values consider it

as binary 0, otherwise consider it as binary 1.Finally after a single circular comparison an 8 –bit binary pattern is obtained.

In order toi obtain uniform LBP the effect of change in binary pattern due to rotation has to be removed. Here the rotation invariant pattern RI is obtained

$$RI\ p,r = \min\{ROR\ (LBP_{P,R}\ i)\}$$

Where i=0,1,2 ……p-1

B. Face Image Verification

In face image verification let the obtained histogram features of the input face image be F_Q.To find the matching score between input face query image and database image T_n the Euclidian distance is being used.

$$Fn = \sqrt{\sum_{n=1}^{N} (F_{Qn} - F_{Tn})^2}$$

A certain threshold level is already being set. The matching score Fn is compared with threshold level. If the matching score is greater than threshold consider input as genuine, else request for finger vein pattern.

C. *Finger Vein Pattern Extraction-*

As temperature, illumination locus and angle vary with each collection, normalization has to be carried out to separate the vein pattern from the image background. The captured image has low contrast and contains noise, hence contrast enhancement and noise reduction are crucial in ensuring quality of image.

For robust extraction of finger vein patterns from non –uniform images our method includes repeated tracking of dark lines in the image. The number of times that each pixel has become the current tracking point is recorded in a matrix named locus space. The positions with high values in locus space have high probabilities of being the positions of veins. Hence the path of finger veins is obtained as chains of high-value positions in the locus space.

III.CONCLUSION

In this paper we have proposed a multimodal biometric method based on face and finger vein pattern extraction. As two tests data are included for authentication of a single enrollment the proposed system will prove helpful in recognition with very low False Acceptance Rates (FAR)
And False Rejection Rates (FRR).

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