An Unifiedmultimodal Biometric Recognition Framework

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***Abstract*-- Multibiometrics is the combination of one or more biometrics (e.g., Fingerprint, Iris, and Face). Researchers are focusing on how to provide security to system, the template which was generated from the biometric need to be protected. The problems of unimodal biometrics are solved by multi biometrics. The main objective is to provide a security to the biometric template by generating a secure sketch by making use of multi biometric cryptosystem and which is stored in a database. Once the biometric template is stolen it becomes a serious issue for the security of the system and also for user privacy. The drawbacks of existing system include accuracy of bio-metric need to be improved and the noises in the biometrics also need to be reduced. The proposed work to enhance the security using multi biometric cryptosystem in distributed system applications like e-commerce transactions, e-banking and ATM. A practically viable multi-biometric recognition system should not only stable, robust and accurate but should also adhere to real-time processing speed and memory constraints. This study proposes cascaded classifier-based framework for use in biometric recognition systems.**

Index Terms — Images scan, Segmentation and Normaisation, ROI calculation, Matching and authentication.

1. INTRODUCTION

The performance of a cascaded classifier-based biometric recognition system willnot keep increasing additional classifier stages. A point will be reached when the performance will not increase anymore. This point can be called the saturation point. The addition of more classifier stages beyond the saturation point will result in the increase of error rates and the reduction in accuracy. The saturation point would differ for different systems and will be depended upon the types of modalities being used, the size of the test and implementation databases and the type and number of classification stages being used. By using our proposed method a single modality cascaded approach. Sun et al. claim to improve the accuracy by about 10%, which is comparable to the improvement provided by our proposed system, but their average time cost increases by 2% over the processing time of the unimodal system, where as our proposed system reduces processing time significantly even for the worst case scenarios. Biometrics refers to metrics related to human characteristics. Biometrics authentication in computer science as a form of identification and access control. It is to identify individuals in groups that are under surveillance. Biometric identifiers are distinctive, measurable characteristics to label and describe individuals. Biometric identifiers categorized as physiological versus behavioral characteristics. Physiological characteristics related to the shape of the body include, but are not limited to fingerprint, palm veins,finger vein, face recognition, DNA, palm print, iris recognition, retina and scent. Behavioral characteristics are related to the pattern of behavior of person, including but not limited to typing rhythm, voice.

Security and the authentication of individuals is necessary for many different areas of our lives, with most people having to authenticate their identity on a daily basis; examples include ATMs, secure access to buildings, and international travel. Biometric identification provides a valid alternative to traditional authentication mechanisms such as ID cards and passwords, whilst overcoming many shortfalls of these methods; it is possible to identify an individual based on "who they are" rather than "what they possess" or "what they remember".

2. RELATED WORK

Multimodal biometric systems use multiple sensors or biometrics to overcome the limitations of unimodal biometric systems. For example iris recognition systems can be compromised by aging irides and finger scanning systems by worn-out or cut fingerprints. While

unimodal biometric systems limited by the integrity of their identifier, unlikely that several unimodal systems will suffer from identical limitations.

2.1 Image Restoration

Is the process of taking an image with some known, estimated degradation, restoring it to its original appearance. Image restoration used in the field of photography or publishing where an image was somehow degraded but needs to be improved before it can be printed.

Fig 1.1 Image with distortion

Fig 1.2 Restored image

2.2 Image Enhancement

Involves taking an image and improving visually by taking advantages of human Visual System responses.The simplest enhancement techniques is to simply stretch the contrast of an image. Enhancement methods tend to be problem specific. For instance, method that uses enhance satellite images may not suitable for enhancing medical images, enhancement and restoration similar in aim, to make image look better. They differ in approach the problem. Restoration methods attempt to model the distortion to the image and reverse the degradation, where enhancement methods use knowledge of the human visual systems responses.

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2.4 ROI

Fig4.1 ROI of the finger-vein image

The alignment module includes the following steps, the part between the two joints of finger-vein image is segmented based on the peak values of the horizontal projection of the image, a Canny operator with locally adaptive threshold is used to get the single pixel edge of the finger, the midpoints in finger edge are determined by edge tracing so that the midline can be obtained, the image rotated to adjust the midline of the finger horizontally and the ROI of finger-vein image is segmented according to the midline

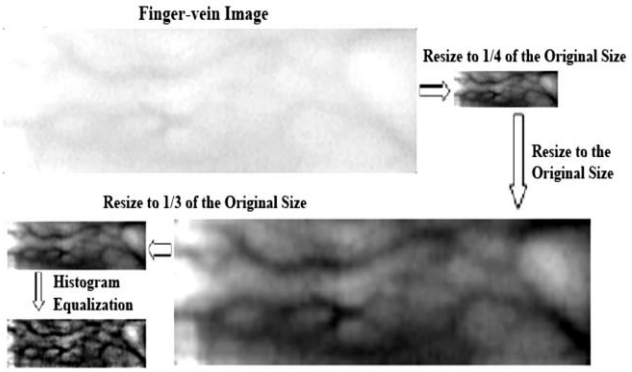


Fig.4.2 Image Enhancement of finger vein

2.5 Equal Error Rate

The rate at which both acceptance and rejection errors equal. The value of EER can easily obtained from the ROC curve. The EER is quick way to compare accuracy of devices with different ROC curves. Mostly, the device with lowest EER is the most accurate.

2.6 Failure To Enroll Rate

The rate at which attempts to create a template from an input is unsuccessful. This most commonly caused by low quality inputs.

2.7 Failure to Capture Rate

With automatic systems, the probability that the system fails to detect a biometric input when presented correctly.

2.8 Template Capacity

Maximum number of sets of data which can stored in the system.

2.9 Adaptive Biometric Systems

Adaptive Biometric System aim to auto-update the templates or model to the intra-class variation of the operational data. The advantages of these systems are solving the problem of limited training data and tracking the temporal variations of the input data through adaptation. Recent, adaptive biometrics has received a significant attention from the research community. Research direction expected to gain momentum because of their key promulgated advantages. with an adaptive biometric system, no longer needs to collect large number of biometric samples during the enrollment process. It is no longer necessary to re-enroll or retrain the system from scratch in order to cope with the change environment. The convenience can significantly reduce the cost of maintaining biometric systems. Despite the advantages, there are several open issues involved with these systems. For mis-classification error by the biometric systems, causes adaptation using impostor sample. However, continuous research efforts are directed to resolve the open issues associated to the field of adaptive biometrics. More information about adaptive biometric systems can be found in the criticalreviewbyRattani.

3. PROPOSED SYSTEM

Multi biometrics overcomes the limitations imposed by unimodal biometrics by using multiple biometric modalities. These systems are expected to be more reliable due to the presence of multiple, fair independent pieces of evidence. Multi biometric systems address the problem of non-universality and provide anti-spoofing measures by making it difficult for an intruder to simultaneously spoof the multiple biometric traits of a legitimate user. The variety of factors should be considered when designing a multi biometric system. It include the choice and number of biometric traits; the level in the biometric system at which information provided by multiple traits should be integrated.

Trapezium View In order to solve the problems occurred in rectangular strip normalization, a trapezium view is proposed. In this method, each pixel inside the iris disk is mapped to one and only one pixel in the normalized images.

3.1 Threshold

Each captured finger image is grayscale, and has 8 bits per pixel. The image of the finger is captured horizontally, and the fingertip is on the right side of the image. Histogram is generated for the the grayscale image & a threshold value is set based on finger vein region segmentation. In threshold, the value above the threshold & below the threshold are set to ones and zeros to obtain Binary Image. Boundaries are extracted from the threshold binary image for further processing.

3.2 The Maximum Curvature Method

To extract the centerline of veins with various widths and brightness's, our method checks cross-sectional profiles of a finger-vein image. The cross-sectional profile of a vein looks like a dent because the vein is darker than the surrounding area. These concave curves have large curvatures. Even narrow/wide or bright/dark veins in an image and the center position of veins do not have a local minimum brightness (position C), the curvature profiles of the veins are large. Therefore, center position of veins can be obtained by calculating local maximum curvatures in cross sectional profiles. To make feature extraction robust against vein width fluctuation, only the positions of the centerlines of veins are emphasized. A score assigned to each position, and larger when its dent is deeper or wider. A profile is classified as concave or convex depending on whether curvature is positive or negative . If positive, the profile is a dent (concave). In this step, the local maximums of curvature in each concave area are calculated. These points indicates center positions of the veins.

3.3 Repeated Line Tracking Method

The line tracking method tracks veins repeatedly, and tracking starts at various positions. A line is tracked by moving pixel by pixel along the veins, checking the cross sectional profiles of the image. When dark line is not detected, new tracking operation starts at another position. This operation executed repeatedly. Finally, loci of the lines overlap, and finger-vein pattern is obtained

3.4 Image Acquisition

Eye image acquisition is first and most challengeable step in iris recognition system. High quality iris image must be required for recognition system. Image quality depends on two main aspects: lighting system and positioning system of image capturing device. Some other factors should be considered while taking iris image for recognition:1) capture image having sufficient resolution and sharpness. 2) artifacts should be removed from the images for better recognition.The images are collected from database. Database means that consists set of images with different diamention.There is also already scanned images are available.

3.5 Preprocessing

It is a process used to produce an output which act as an input to another stage of compilation. In this stage both noise removal and image conversion is occurred. In image conversion the image will change into gray scale because of reducing the effect of illumination level by using matlab code "im2gray".Noise removal is done by blurring the image.

3.6 CircleCentre

The Pupil area is obtained after preprocessing the image. Circle Centre useful for identifying the outer radius of iris. Exact position of Pupil and sclera detection is done at this level.

3.7 Segmentation and Normalisation

By segmentation, eye is determined into approximate level. Localizing iris from an image delineates the annular portion from the rest of the image. the coordinate system is changed by unwrapping the iris and mapping all the points within the boundary of the iris into their polar equivalent. The normalization process will produce iris regions, which have same constant dimensions, so two photographs of same iris under different conditions will have characteristic features at the same spatial location.

3.8 ROI Template value

If you set this property to true, ROI is specified using input to the step method. Otherwise entire input image used. The default is false.

3.9 ROI Iris Score value

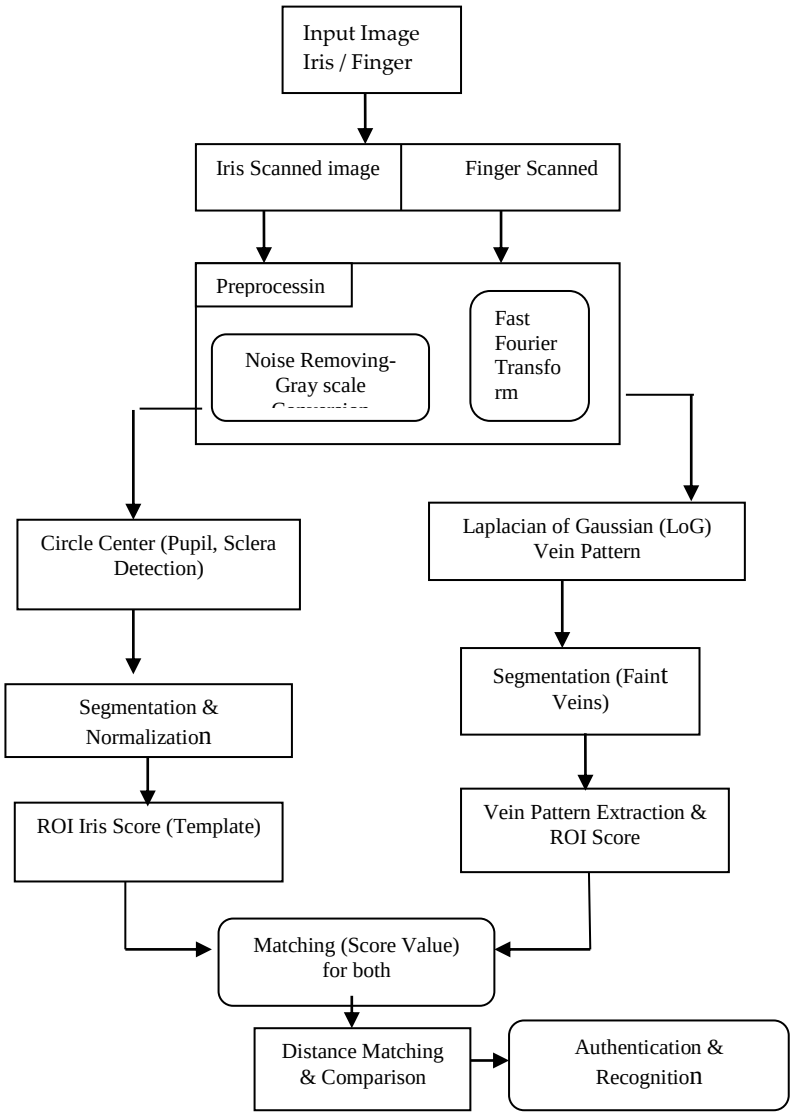
A Region of Interest is a portion of an image that you want to filter or perform some other operation on .The process to select the iris which pixel value is greater than 0.5.It is done by filtering method. We can define more than one ROI in image.

3.10 Matching Score and Authentication

In iris matching, iris features that are extracted through feature extraction are compared with the iris samples stored in the database. The matching process of iris leads to the final result that whether there is exact match of extracted iris image with iris images stored in database or not. Various techniques can used for feature matching are hamming distance, weighted Euclidean distance, normalized correlation etc. A biometric system provides automatic identification of an individual based on a unique feature or characteristic possessed by the individual .Iris recognition is regarded as the most reliable and accurate biometric identification system available.

4. SYSTEM ARCHTITECUTRE

The system Architecture consists of three hardware modules: image acquisition module, ROI, and human machine communication module. The structure diagram of the system .



5.PERFORMANCES

It was shown that the system performance will not keep increasing as we add more stages. In fact, the system will reach a saturation point in terms of performance very soon and any addition of more stages to the system will only serve to increase the complexity of the whole system.

Instead of Hand print in proposed system we are using Finger vein which cannot be fake. The drawbacks of existing system include accuracy of the biometric need to be improved and the noises in the biometrics need to be reduced. The proposed work is to enhance tsecurity using multi biometric cryptosystem in distributed system. Instead of storing iris image, the iris code is stored in the database.

6. CONCLUSION

The position of genuine matches in an ordered match score vector. Unimodal biometric recognition system a two stage cascaded classifier-based framework which compared with all the users in the database. Once the match scores become available the proposed quality measure will be evaluated and the side-lobes counted. Match scores using distance-based quality matrix is used as a parameter to reduce the candidate list. The final stage of the cascade to provide the decision. Weaker classifiers are employed for sections of the cascade responsible for the generation of the candidate lists and a stronger classifier is preferred at the end of the ensemble to calculate the decision.

7. FUTURE ENHANCEMENT

Each classifier in the ensemble can be designed to use a different modality as an input or it can be designed to work with the same modality. The number of side-lobes in the match score quality matrix is used as a parameter to reduce the candidate list. This parameter is able to detect the quality of images in the database as well as identifying the algorithms suitable for use in the cascaded classifier. The experimental results have shown the effectiveness of the proposed framework. The proposed framework also reduces the processing time by reducing the number of enrolled user the strong classifier has to evaluate.

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