

REVIEW PAPER ON RETINA AUTHENTICATION AND ITS SECURITY ISSUES

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Abstract: Now a days biometric technology is becoming the foundation of providing highly secure solutions for personal identification and authentication. In this paper the major focus is being considered on Retina biometric because of its invariant features. The retina is itself a secure object as it lies behind the lens and unforgeable and it is unique to each individual. The process of authentication includes the detection of blood vessels and feature points. In this we analyzed different methods required to extract, filter, and store the blood vessels, and features of retina the methods are bifurcation method, bifurcation and crossover method, optic method and retina feature points extraction algorithm. We also have compared them as well as finally we have made our conclusion that which method is best.

Index Terms: Feature extraction, Retinal image, Biometric authentication, registration, optic disk (key words)

I. INTRODUCTION

Biometric-based authentication applications include workstation, network, and domain access, single sign-on, application logon, data protection, remote access to resources, transaction security and Web security. Trust in these electronic transactions is essential to the healthy growth of the global economy. Utilized alone or integrated with other technologies such as smart cards, encryption keys and digital signatures, biometrics is set to pervade nearly all aspects of the economy and our daily lives. Utilizing biometrics for personal authentication is becoming convenient and considerably more accurate than current methods. Different types of biometrics are used in terms of authority and their applications [1]. For e.g.: finger, thumb, iris, Face Recognition, retina etc.

DNA Matching (Chemical Biometric): The identification of an individual using the analysis of segments from DNA.

Eyes - Iris Recognition (Visual Biometric): The use of the features found in the iris to identify an individual.

Face reorganization (Visual Biometric): The analysis of facial features or patterns for the authentication or recognition of an individual's identity. Most face recognition systems either use Eigen faces or local feature analysis.

Gait Behavioral Biometric The use of an individual's walking style or gait to determine identity.

Voice / Speaker Recognition: There are two major applications of speaker recognition:

- Voice Speaker Verification / Authentication
- Auditory Biometric the use of the voice as a method

of determining the identity of a speaker for access control.

- Voice Speaker Identification Auditory Biometric Identification is the task of determining an unknown speaker's identity.

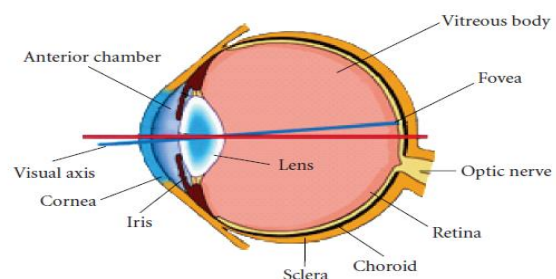


Fig.1 [2]. Schema of the retina in the human eye. Blood vessels are used as biometric characteristic.

II. RETINAL ISSUES

The retinal data is stored in the retina database in order to match the true and accurate value with the false one. Before storing the hash value, retinal templates are being stored in the database and then hash values are applied to it. The issues that are associated with the data storage can be given by:

A. Feature extraction and correspondence selection [3]:

Image quality plays an important role in defining the proposed system. Thus it is required that image should be consistent intensity in order to determine the background and foreground

B. Feature Compression issues [4]

The retina itself is a large image. Therefore if the number of users is more, it would be a challenge to reduce the size of the pixels we consider.

C. Authentication issues: [5]

The retina is itself used as an authenticated parameter but the major issue comes in picture when an attacker or man in the middle attack occurs. Thus an attacker always tries to use brute force on the key which is used for the cryptography. Thus it is a challenge to decide the proper authentication and the key size and its attributes.

D. Retina reorganization issues:

Each user when store the image in the database it happens that due to many process and further processes the image can

change its attributes and parameters, it could either transform, pixels can change, and image rotation can occur. This will lead into error and the output image cannot be retrieved. Thus the image must be acquired in the same position in which it has been stored.

III. COMPARATIVE STUDY

1	Bifurcation method [7]	Here bifurcation of structuring is taken as consideration where branches having the longest length as well as which contains 3 sub branches is only taken as consideration and feature is extracted on the basis of that. This method helps in reducing noise error as well as time.
2	Bifurcation/crossover method[11]	Here both bifurcation as well as crossover points are extracted in this method when it is been extracted filtering is done by taking the average of two neighboring feature points if it is been extracted which reduce noise but it is more time consuming
3	Optic disc detection Method[8]	Here optic disc is taken as consideration which extracts blood vessels from retinal fundus image. For extracting feature point's optic disc is used as reference in this process this is mainly used in diagnosis of any diseases.
4	Retina feature point extraction algorithm [12]	Here minutiae centered region is been constructed to avoid translation errors. It also detects the feature such as ridge bifurcation points etc. In this minutia is divided into 2 parts one is core minutiae's and another is neighbour minutiae.

method of bifurcation structure for retinal image registration has been introduced namely bifurcation point and bifurcation structure matching. By this paper author conclude that registration of retinal images is easy and efficient by using these two methods as compare to existing methods. In [10] authors describe how feature points are extracted from retinal images. The author has given four steps by which at the end level the output consist of only minor feature points.

The four steps include:

1. Labeling of the vessels segments [10]
2. Establishing the joint or union relationships between vessels
3. Establishing crossover and bifurcation relationships between vessels [11]
4. Filtering of the crossovers and bifurcations

And thus, the author concluded that feature points are the most important aspects in authentication and characterizing individuals and how these feature points are used at the matching as well as at the registration level. In [12] author represents a network security method using retinal vessel tree for personal authentication. The retinal vessel tree is a unique attribute for each person and thus used for the authentication purpose. The author has described various steps user registration, extraction of retinal features, retina normalization and how the secret key is build. Morphological operations[13]detection of blood vessels in retinal image using 2 dimensional matched filter[14] are performed on retina template, then bifurcation points in terms of x and y coordinates are used for generating secret key. Encoding and decoding are applied on these coordinates. It has been concluded by the author that a cryptographic method is used along with the retinal template such that the key cant not be easily available to anyone without proper authentication. The [15] paper presents a novel authentication method which uses retinal fundus image, fast optic disc and a fast vessel segmentation method based on phase congruency. Phase congruency is used for vessel segmentation which uses fourier components to detect edges. Phase congruency is a dimensionless quantity that is invariant to changes in image brightness or contrast; hence, it provides an absolute measure of the significance of feature points. The author has concluded that by introducing phase congruency there is no requirement of the manual calculation and C method can be used along with this novel method in order to improve the running time. In [16] author proposed a new method for segmentation, bifurcation and template generation using noninvertible construction algorithm (NIC). The noninvertible method is used because the original biometric can't be recovered. The author has defined certain parameters of each process.e.g retinal vessels are characterized based on magnitude of image intensity and ridge strength. Similarly features are extracted using minutie points which are coordinates as distance and angle. After applying the template which collects all extracted bifurcation and its coordinates. The author has concluded that this method has better recognition accuracy and low error

IV. PROBLEM AND THEIR SOLUTION GIVEN BY DIFFERENT RESEARCHERS

The research paper [7] basically deals with the detection of blood vessels and optical disc, where OD [8] is detected using sobel edge detection [9] method and blood vessels are detected using kirsch method. In this paper, two major

rates.

V. CONCLUSION

In this paper we briefly reviewed the different methods used for extracting the features of retina. We have mainly focused on retina because of its distinguished characteristics. The retina is the most secure biometric in terms of its stability, uniqueness and independence. In future we will review the different issues related to the storage of retina. And at the end we concluded that the best parameter used for retina recognition is retina feature point using bifurcation method because it reduces time works speedily compared to other methods and less chance of any change in future.

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