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IRIS RECOGNITION SYSTEM USING MATLAB

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ABSTRACT

A biometric system provides automatic identification of a human being based on some unique physical or behavioral feature of the individual. The world today is making rapid progress in its quest to realize the dream of a creating a user friendly, customer caring ambience. With every new dream comes the nightmare of a security of the system lapse which may allow the misuse of the system. A major success in trying to bridge the advent of a security lapse is the use of biometrics. Biometric technologies such as fingerprint, facial recognition, and iris recognition are deployed for verification and/or identification in applications such as access control, border management, and Identification systems. Iris is regarded as the most reliable and accurate biometric identification system being used in modern world. Most commercial iris recognition systems use patented algorithms developed by Daugman's and these algorithms are able to produce perfect recognition rates. However, published results have usually been produced under favorable conditions, and there have been no independent trials of the technology. The work presented in this paper developing an open-**source" for segmentation and** normalization of human iris image for iris recognition system using Hough Transforms for iris image segmentation and Daugman's Rubber Sheet Model for image normalization with empirical mode decomposition(EMD) in MATLAB.

Keywords: MAT LAB, Image processing, EMD, Daugman's Rubber Sheet Model, SVM

1. INTRODUCTION

Biometrics refers to statistical analysis of the physical and behavioral traits inherent in human beings.

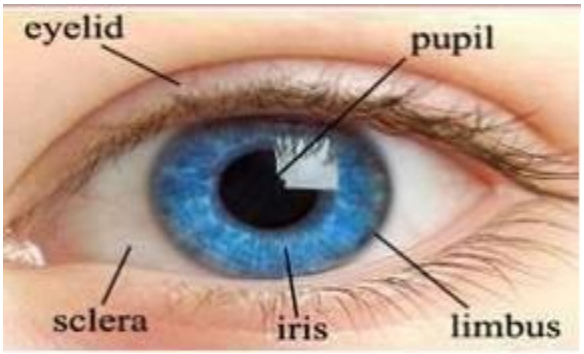


Figure (1): normal structure of human eye

Iris recognition is a biometric used for purposes of identification and security. The complexity, randomness, and the proven stability of iris patterns over one's lifetime makes it an ideal candidate for biometric identification. A challenging, yet crucial step in the iris recognition process is iris segmentation. The circular Hough transform is used to detect the iris and pupil. First, preprocessing steps involving morphology and filtering takes pace. Then, the outline of the eye is found using the Canny edge detector. The edge image is then transformed to

parameter, or Hough space, for a range of radii in order to determine the center and radius of the pupil and the iris. Successful segmentation is not enough to analyze the iris for recognition purposes. Stretching due to variations in pupil diameter and offset due to the lack of iris/pupil concentricity must be accounted for. Robust implementation of the recognition phase requires a conversion of the segmented iris from Cartesian coordinates to Normalizedpolar coordinates using Daugman**'**s transformation. Occlusion of the iris by the upper eyelid is likely. Therefore, features will only be

extracted from the lower 180 degrees. Feature extraction will be done using Haar wavelets. The high frequency information from the 3rd level sub-bands (HL3, LH3, and HH3) will be combined and threshold to generate the iris code. The Hamming distance between the generated iris code and iris code in a database is found. The iris code in the database that has the smallest Hamming distance is considered the match.

2. LITERATURE REVIEW

Algorithms developed by the author for recognizing persons by their iris patterns have now been tested in many field and laboratory trials, producing no false matches in several million comparison tests. The recognition principle is the failure of a test of statistical independence on iris phase structure encoded by multi-scale quadrature wavelets. The combinatorial complexity of this phase information across different persons spans about 249 degrees of freedom and generates a discrimination entropy of about 3.2 b mm2 over the iris, enabling real-time decisions about personal identity with extremely high confidence. The high confidence levels are important because they allow very large databases to be searched exhaustively (one-to-many **"**identification mode**"**) without making false matches, despite so many chances. Biometrics that lack this property can only survive one-to-one (**"**verification**"**) or few comparisons. This paper explains the iris recognition algorithms and presents results of 9.1 million comparisons among eye images from trials in Britain, the USA, Japan, and Korea

This paper combines different modules to improve the performance of an iris reorganization system. Iris is emerging as one of the important methods of biometrics-based identification systems. This iris system consisted of major components: image preprocessing, segmentation, edge detection, normalization, pattern matching and encryption decryption, as project basically explains the Iris recognition system developed by John Daugman and attempts to implement RSA algorithm in Java, with a few modifications. Firstly, image preprocessing is performed followed by extracting the iris portion of the eye image. The edge information is detected by four different directional line detectors. Significant edges are then selected using an adaptive thresholding technique, called quotient thresholding. The extracted iris part is then normalized, and Iris Code is constructed. Experimental image results show that unique codes can be generated for every eye image

3. METHODOLOGY

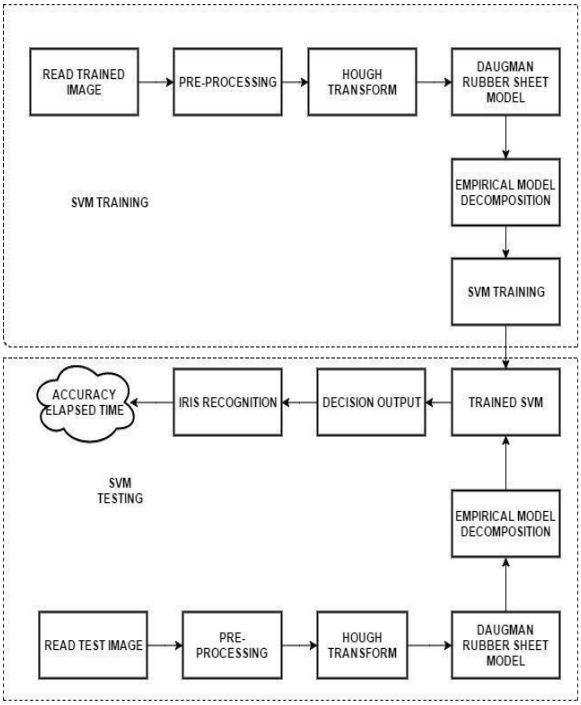


Figure (2); Proposed System Architecture

ALGORITHAM USED:

- Hough man transform for circle detection
- Daugman's rubber sheet mode
- Empirical mode decomposition
- Support vector machine

1. Preprocessing

Preprocessing is the set of operation which make input image characteristics proper to perform the algoritham.it includes image resizing, noise removal, histogram and image enhancement.

2. Hough transform

Segmentation is the process of partition the input image in to several parts. Here in order to find the people and iris circle we are using Hough man circle detection. The success of segmentation stage depends on the image quality of eye images. So the iris database should be created by using near infrared light. To avoid specular reflections. That occurs in imaging under natural light and results in corrupting the iris pattern. Some important segmentation techniques are: 1. Hough transform 2. Daugman's integral-differential operator 3. Active contour models 4. Eyelash and noise detection.

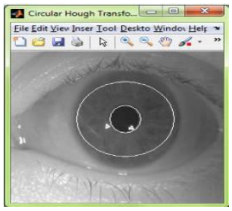


Figure (2)Detected iris circle

3. Normalization

Normalization is used to transform the iris region so that it has fixed dimensions in order to allow comparisons. The normalization process produces iris regions, which have the same constant dimensions, so that two photographs of the same iris.

The homogenous rubber sheet model devised by Daugman's remaps each point within the irisregion to **a pair of polar coordinates (r,θ) where r is on the interval [0,1] and θ is angle [0,2π].**

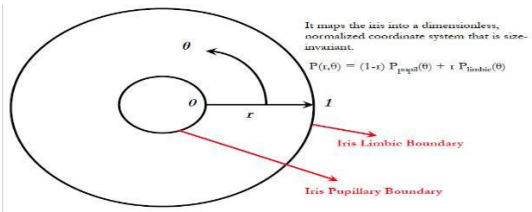


Figure: Normalization process

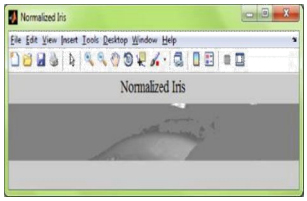


Figure (3) Normalized image

4. Empirical Mode Decomposition

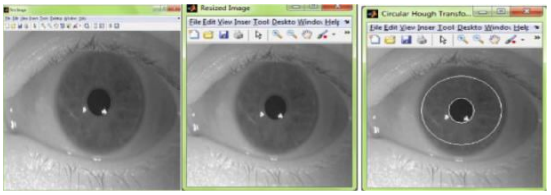
Empirical Mode Decomposition (EMD), an adaptive multi-resolution decomposition technique, appears to be suitable for non-linear, non-stationary data analysis. Based on EMD, a fully data-driven method without using any pre-determined filter or wavelet function, an iris recognition scheme is presented by modifying EMD as a low-pass filter to analyze the iris images. To evaluate the efficiancy of the proposed approach, three different similarity measures are used. Experimental results show that three metrics have all achieved promising and similar performance. Therefore, the proposed method demonstrates to be feasible for iris recognition and EMD is suitable for feature extraction

5. Support vector machine (SVM)

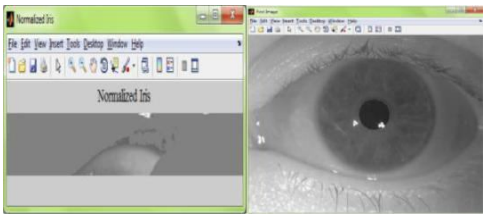
In machine learning, support vector machines (SVMs, also support vector networks)are supervised learning models with associated learning algorithms that analyzedatausedfor classification and regression analysis.

4.RESLUT

As the same image is taken as input and database, so the proposed algorithms output is shown in below,



(a) (b) (c)



(d) (e)

figure (a) input image, (b)resized smoothen image,

(c) iris circle detection, (d) normalized image, (e) recognized image

Iris recognition system with graphical user interface

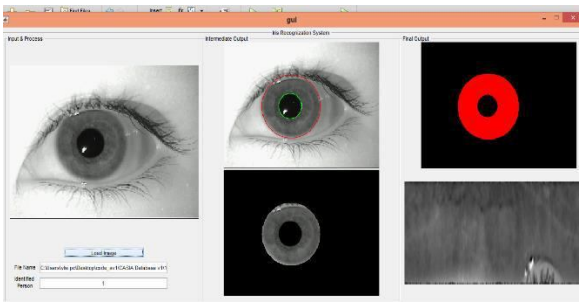


Figure (4): iris recognition for person 1

5. CONCLUSION

We have successfully developed an Efficient and Optimal Iris recognition system using MATLAB image processing and tested it on 10 individual persons' eye images of CASIA SV1Iris image dataset successfully. There were some areas they need to be improved like, segmentation and matching stage as they are the one of the most important stage of the Iris recognition system. And in this research work we have not considered the image acquisition stage, and Iris image acquisition from video or live recordings to make an efficient real time based Iris recognition system. So this may be the further scope of development. Here we have used empirical mode decomposition with normalization for recognition. It automatically increases the filter performance. SVM classifier tool increase the accuracy of the classification and making less complexity.

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