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Iris Authentication Using LDA and PCA With Pyramid Model and Iriscode

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Abstract:

This Paper presents a comparative analysis of few of the existing methods available for iris recognition. The iris is a portion of the inner eye of an individual and contains an abstract and randomly generated texture pattern arising from orientation of complex tissues within this region. This random pattern can provide a unique identifier of a person if a mathematical model can be built to represent and compare it. Iris recognition is divided into four steps, viz Image Acquisition, Pre- processing, Feature Extraction and Matching. Iris recognition technology is able to give highly accurate results for human identification. But this technology needs more attention to overcome the disadvantages of the existing algorithms. In this paper comparative analysis of various iris recognition methods is done considering various performance evaluation criteria's like False Acceptance Ratio (FAR) , Genuine Acceptance Ratio(GAR), Feature extraction, Feature vector size, test bed used and accuracy of the identification.

Keywords: Biometrics, Feature Vector, Performance Evaluation.

1. INTRODUCTION

A wide variety of systems require personal recognition schemes to either confirm or determine the identity of an individual requesting their services. The purpose of such schemes is to ensure that the rendered services are accessed only by a legitimate user and not by anyone else. Verification of identities can be done whenever people log onto computers, access an ATM, pass through airport security, use credit cards, or enter high-security areas. People typically use user names, passwords, and identification cards to prove that they are who they claim to be. However, passwords can be forgotten, and identification cards can be lost or stolen. Thus, there is tremendous interest in improved methods of reliable and secure identification of people. Biometric methods, which identify people based on physical or behavioural characteristics, are of interest because people cannot forget or lose their physical characteristics in the way that they can lose passwords or identity cards. The basis of every biometric trait is to get the input signal image and apply some algorithms like neural network, fuzzy logic, wavelet transform, etc to extract the prominent features. Biometric methods based on the spatial pattern of the iris are believed to allow very high accuracy, and there has been an explosion of interest in iris biometrics in recent years.

The probability for the existence of two irises that are same has been theoretically estimated to be very high, i.e. one in 1072 which counts for the unique characterization of the iris. "Eye color" is the color of the iris, which can be green, blue, or brown. In some cases it can be hazel (a combination of light brown, green and gold), grey, violet, or even pink. In response to the amount of light entering the eye, muscles attached to the iris expand or contract the aperture at the center of the iris, known as the pupil. The larger the pupil, the more light can enter. The iris consists of two layers: the front pigmented fibro vascular tissue known as a stroma and, beneath the stroma, pigmented epithelial cells. Fig.2 shows an example image acquired by a

commercial iris biometrics system. The minute details of the iris texture are believed to be determined randomly during the fetal development of the eye. They are also believed to be different between persons and between the left and right eye of the same person [2]. The color of the iris can change as the amount of pigment in the iris increases during childhood.

2. RELATED WORK

John Daugman [10] presents the statistical variability that is the basis of iris recognition is analyzed, using new large databases. The principle underlying the recognition algorithm is the failure of a test of statistical independence on iris phase structure encoded by multi-scale quadrature wavelets. Combinatorial complexity of this phase information across deferent persons spans about 249 degrees-of-freedom and generates a discrimination entropy of about 3:2 bits=mm2 over the iris, enabling real-time identi/cation decisions with great enough accuracy to support exhaustive searches through very large databases. This paper presents the results of 9.1 million comparisons among several thousand eye images acquired in trials in Britain

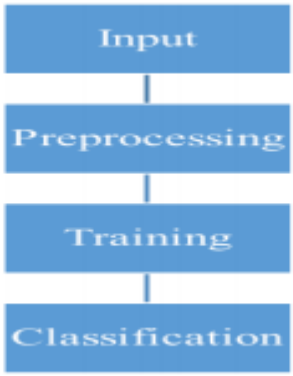

Fig.1.General Structure of the System

Pattern Recognition Society. Published by Elsevier Science Ltd. All rights reserved. Shideh Homayon proposes Improving Iris Recognition Accuracy by Score Based Fusion Method Iris recognition technology, used to identify individuals by photographing the iris of their eye, The proposed method combines the zero-crossing 1 D wavelet Euler No., and genetic algorithm based for feature extraction. The output from these three algorithms is normalized and their score are fused to decide whether the user is genuine or imposter.

3. LITERATURE SURVEY

Research in the area of iris recognition has been made in 1936 by the Ophthalmologist Frank Burch, he proposed iris patterns as an method to recognize an individual [24]. In 1985 Dr. Leonardo Flom and Aran Safir proposed the concept that no two irides are alike and in 1987 they were awarded a Patent for iris recognition. Iris was proposed as a reliable biometrics in 1987 by L. Form [2]. The core algorithms that underlie iris recognition were developed in the 1990's by Professor John Daugman, Ph.D, OBE (University of Cambridge Computer Laboratory). In 1993 Defense Nuclear Agency began work to test and deliver a prototype unit. In 1995 the prototype was completed with the help of Drs Daughman, Flom and Safir. In 2005 patent covering the basic concept of Iris Recognition.

Boles and Boashash [12] calculated a zero- crossing representation of one-dimensional (1D) wavelet transform at various resolution levels of a concentric circle on an iris image to characterize the texture of the iris. Iris matching was based on two dissimilarity functions. In this seminar we have made a survey of various existing iris recognition algorithms and comparative analysis of three methods [13, 14, and 15] is done. Here [13] iris recognition is done using the image feature set extracted from Haar Wavelets at various levels of decomposition. Euclidean distance is used as an similarity measure on the feature set. Analysis was performed of the proposed method, consisting of the False Acceptance Rate and the Genuine Acceptance Rate.

In this paper, the novel techniques is developed to create an Iris Recognition System, Here a fusion mechanism that amalgamates both, a Canny Edge Detection scheme and a Circular Hough Transform, to detect the iris‟ boundaries in the eye‟s digital image is used. Then applied the Haar wavelet in order to extract the deterministic patterns in a person‟s iris in the form of a feature vector.

4. PROPOSED SYSTEM

Transform coding is a low complexity alternative to vector quantization and is widely used for image and video compression. A transform coder compresses multidimensional data by first transforming the data vectors to new coordinates and then coding the transform coefficient values independently with scalar quantizers. A key goal of the transform coder is to minimize compression distortion while keeping the compressed signal representation below some target size. It is a way of identifying patterns in data, and expressing the data in such a way as to highlight their similarities and differences. PCA is a powerful tool for analyzing data. Principal component analysis (PCA) involves a mathematical procedure that transforms a number of correlated variables into a smaller number of uncorrelated variables called principal components. The first principal component accounts for as much of the variability in the data as possible, and each succeeding component accounts for as much of the remaining variability as possible.

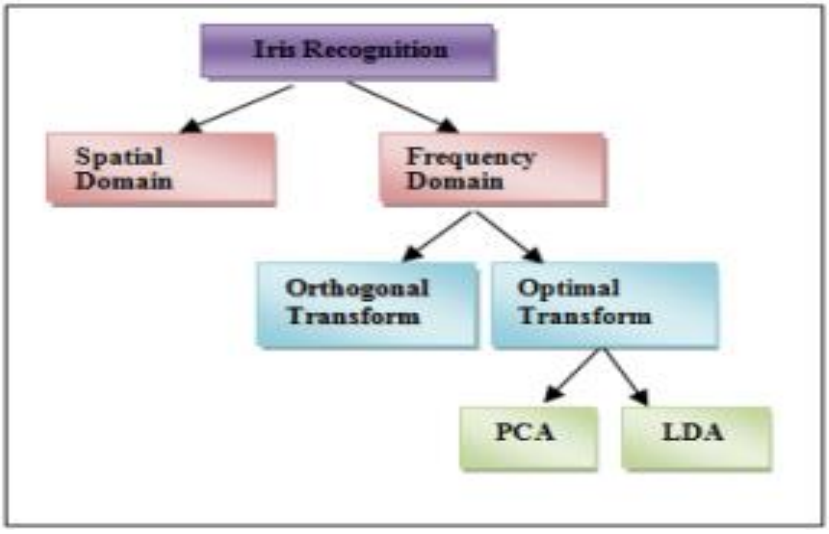

Fig.2.Methods Classification

By means of PCA one can transform each original Image of the training set into a corresponding eigenface. An important feature of PCA is that one can reconstruct any original image from the training set by combining the eigenfaces. The second module, Preprocessing involves various steps such as iris liveness

detection, pupil and iris boundary detection, eyelid detection and removal and normalization. Several methods can be used like Hough transformation, integrodifferential operator, gradient based edge detection to localize the portions of iris and the pupil from the eye image. The contours of upper and lower eyelids are fit using the parabolic arcs resulting the eyelid detection and removal. It is essential to map the extracted iris region to a normalized form. The iris localization methods are based on spring force, morphological operators, gradient, probability and moments. The inner boundary is detected by applying threshold, image opening and closing operators. The outer boundary is detected by applying threshold, closing and opening operators. The clustering algorithms like self-organizing maps, kmeans and fuzzy k-means were used to segment the image to produce as output the clusters-labeled images.

5. ANALYSIS

In this section comparison of various methodologies of Iris Recognition is done based on various criteria like whether the method required preprocessing or not, Feature Extraction is done by applying which method, size of feature vector, similarity measurement done using, initial image size, data beds used, Average correct recognition and query execution time required etc. In the first methodology a novel Haarlet Pyramid based iris recognition technique is discussed .

Fig.3.Output structure

Here iris recognition is done using the image feature set extracted from Haar Wavelets at various levels of decomposition. Euclidean distance is used as a similarity measure on the feature set. Analysis was performed of the proposed method, consisting of the False Acceptance Rate and the Genuine Acceptance Rate. The technique is tested on an iris image database having 384 images. The results show that Haarlets level-5 outperforms other Haarlets, because the higher level Haarlets are giving very fine texture features while the lower level Haarlets are representing very coarse texture features which are less useful for discrimination of images in iris recognition.

CONCLUSION

In First method recognition, accuracy, robust method and computational costs are topics that are taken into account when analyzing an iris recognition method. The FAR/GAR values show that Haarlets are outperforming Haar based image retrieval, proving that Haarlets has better discrimination capability.

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