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Performance analysis of on Iris Detection Recognition and its Applications"

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***Abstract*—** It is possible to identify an individual based on "who they are rather than what they possess or what they remember" by using biometric features like Thumb print, face, chin etc because to remember password or to take care of cards are difficult task. From all Biometrics security organs Iris is one of the most carefully protected organs in one's body. It is not affected by aging; the feature of the iris remains fixed and stable from one year of age until death. Biometric-based solutions are able to provide for confidential financial transactions and personal data privacy there has been a lot of work carried out on face recognition using the PCA. Here I have tried to use the same concepts in detecting Irises. Here to implement iris recognition but here I have implemented iris detection from eye and recognition using PCA algorithm.[1]

***Keywords*—** Co-variance matrix, Eigenvectors, Iris Recognition, Mean image, correlation coefficients

I. INTRODUCTION

Rapid development of Computer technology and the increasing need for security, intelligent personal identification has become a very important topic. Biometric measurements (such as fingerprints or voiceprints), which are physiological or behavioural characteristics unique to an individual, have the capability to reliably distinguish between an authorized person and an imposter. The need for biometrics can be found in federal, state and local governments, in the military, and in commercial applications World-wide. Among all biometric technologies Iris recognition becomes the hot topic of research pattern recognition for following reasons Iris is as distinct as fingerprint it is stable with age and is no enveloping.

II. IRIS STRUCTURE

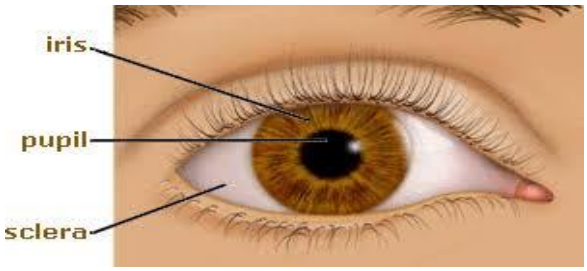

Figure 1. Example of an eye image [8]

Iris Structure consists of following Parts.

Sclera: It is the outer covering, a protective tough white layer called the sclera (white part of the eye).

Iris: A dark muscular tissue and ring like structure behind the cornea are known as the iris. The color of iris actually indicates the color of the eye. Ex: A person with Green eyes have the green iris.

Pupil: A small opening in the iris is known as a pupil. Its size is controlled by the help of iris. It controls the amount of light that enters the eye.

III. IRIS LOCALIzATION

Iris Localization means to remove iris from eye after isolating iris from eye. This circular image formed is binary having the inner area of value 1 and the outer area of value 0. We have to be careful regarding the diameter of the circular image, as it should encircle the entire iris. The diameter chosen should be common to all human iris images. This binary image when multiplied with the iris image leaves us with only the iris and most of the surrounding regions get eliminated. The circular contour around the iris is shown. The circular contour image is moved such that it is concentric with the pupil. The limbs as the Pupilary boundary of the iris, are concentric about the Pupilary center and hence this center needs to be determined [2].

We use simple point processing techniques viz. Thresholding and grey level slicing to eliminate every feature other than the pupil Formation of a circular contour around the iris This is done using a simple technique. We find the row and the column having the maximum number of pixel. This corresponds to the centre. Once the centre is known, we shift the centre of the circular contour that we had generated to the centre of the pupil. This alignment is required as minor shifts occur due to offsets in the position of the eye along the cameras optical axis. The localized iris is now at the centre of the image frame.[9]

IV. STEPS FOR PUPIL AND IRIS DETECTION

1) We first obtain a binary image from an input image.
2) It requires the threshold value which is given by T=i + max(20, 0.4i), I is the intensity value.
3) We flood fill the foreground regions from step 1 to eliminate any small holes caused by specular reflection.
4) Now mark the beginning and ending point of white portion on the horizontal and vertical axis resulting into two lines. With the two lines intersecting, we can find the center and radius of the pupil.

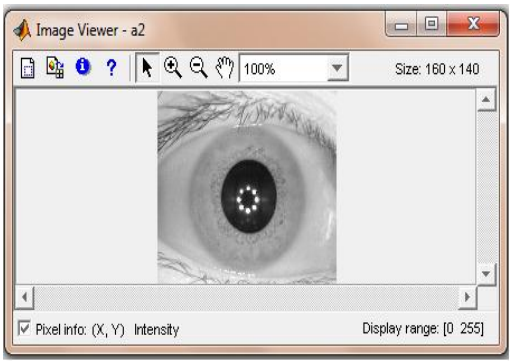

Figure 2. Input image from which pupil and iris portion is to be detected.

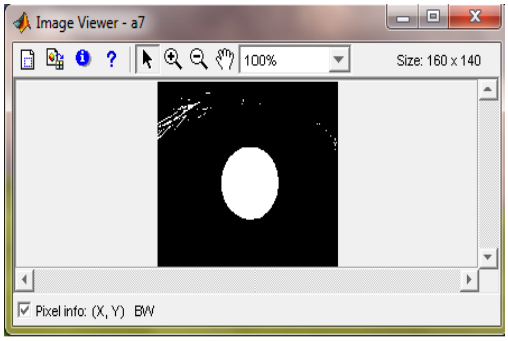

Figure 3 .Binary Image

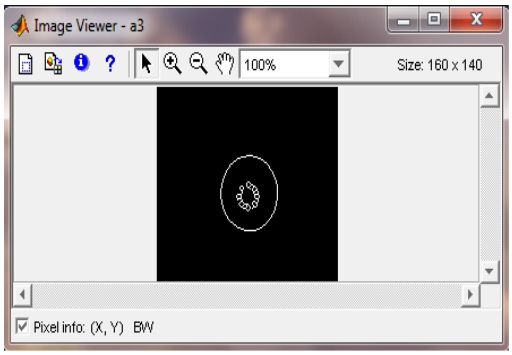

Figure 4. Edges detected from pupil portion using Canny edge method.

Figure 5.Edge Detection

Figure 6.Iris Detection from Eye

V. PCA ALGORITHM STEPS FOR IRIS RECOGNISION

Iris recognition project I have implemented in MATLAB 6.0. For this project I had used inbuilt toolbox and library of the MATLAB. To reduce the time I have taken database of iris from UBIRIS available on internet plus I have taken iris from the above detected method. I have used 3 samples from different positions are taken for 1 person.

There are six steps in iris recognition using PCA.

1) The first step is to acquire an initial set of iris images (i.e. training set).
2) The second step is to calculate Eigen iris from training set.
3) Calculate distribution in M-dimensional weight space for each known individual, by projecting their iris images onto the iris space.
4) The fourth step is to calculate set of weights based on the input image and M- Eigen irises by projecting input image onto each Eigen irises.
5) Determine to which class that particular iris belongs by checking to see if the image is sufficiently close to iris space.
6) Based on it classify the weight pattern as known or unknown.

Step1:- Read the image of the iris.

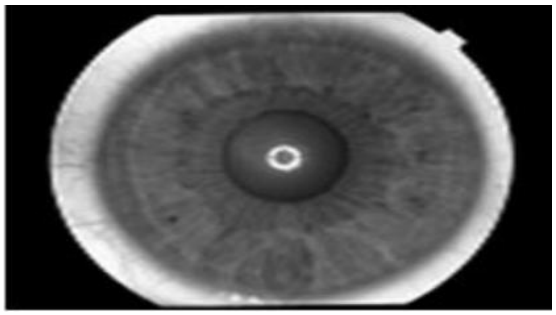

Figure 7. Example of an iris image.

Step 3- compute the average of all 5 iris images
We then compute the Zero mean images
Step-4 Each of these Zero mean Images are then converted into a one-dimensional column vector by placing each column one below the other.
Step-5 Assuming the original size of the iris image to be N×N, this stacking would give us 3 column vectors each of size N 2 ×1. These are then arranged as a matrix of size N 2 ×3

$$\begin{bmatrix} A_{11} \\ A_{21} \\ A_{31} \end{bmatrix} \quad \begin{bmatrix} A_{12} \\ A_{22} \\ A_{32} \end{bmatrix} \quad \begin{bmatrix} A_{13} \\ A_{23} \\ A_{33} \end{bmatrix}$$

Step 6. compute the Covariance matrix
Step 7. compute the Eigenvectors and eigenvalues
Step 8. We multiply each of the eigenvectors with e_iris1=cm*e_vect.
Step 9. We finally compute the eigen-irises by converting into a 2-dimensinal image.
Step 10. Output eigen-iris.
Step 11. Recognition of a person is a process where it must be decided if the individual has already been seen, A new image I new is transformed into its eigen-iris components (projected into 'iris-space') by a simple operation, wk.
Step 12. Here k = 1,2,….5. The weights obtained from the equation are arranged to form a vector Ω.
Step 13. This vector describes the contribution of each eigen-iris in representing the new input iris image [2]. This vector can then be used in standard pattern recognition algorithm An iris class can be calculated by averaging the weight vectors for the images of one individual. The Euclidean distance of the weight vector of the new image from the iris class weight vector can be calculated using the Euclidean distance [2] as follows, $\varepsilon k = \| \Omega - \Omega k \|$
Where, Ω k is a vector describing the k th iris class. The iris is classified as belonging to class k when the distance ε k is below some threshold value θε.
Otherwise the iris is classified as unknown.

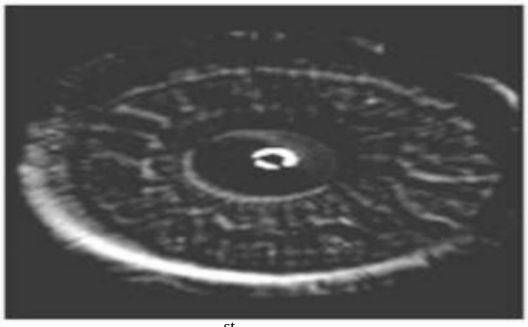

Figure 8. 1st eigen iris image.

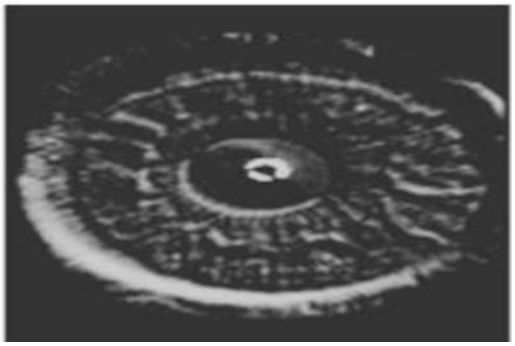

Figure 9. 2nd eigen iris image.

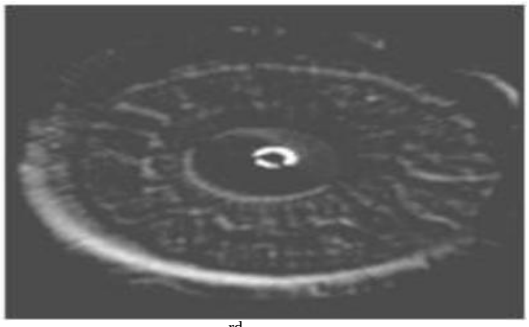

Figure 10. 3rd eigen iris image.

VI. CONCLUSION

Good work has been done in face recognition using the PCA. This is an attempt at using the same technique in identifying irises. The Principal Component Analysis reduces the dimensionality of the training set, leaving only those features that are critical for iris recognition. Iris recognition is a fast developing art. It is a classic biometric application used for security purpose at airport, school various government projects.

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