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A Gabor Improved Feature Extraction for Iris Recognition

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Abstract - The security is the one of the major requirements for any application, network or the internet. The Biometric systems have improved this authentication process by involving human features. A Biometric System can be based on Finger technology, Iris, Voice etc. This paper presents the hybrid model with two main techniques called Eigen value & Eigen face analysis and Gabor filter. One have maintained a dataset of Iris and eye images then the user will pass the input in the form of Iris image and the comparison will be performed on both the Iris and the eye images. To perform the recognition process the PCA and the GABOR FILTER approach is used collectively. The combination of these two approaches given the improvement in terms of efficiency as well as accuracy. As the PCA gives a feature based analysis approach so that the size of training dataset is reduced. Because of this the identification time is reduced. As the feature analysis is based on Gabor filter, all aspects of the image is estimated in terms of directional effect. The image is analyzed based on radial analysis, so that the recognition rate is improved.

***Keywords*-GABOR Filter, Iris Detection & Recognition, PCA.**

I. INTRODUCTION

A new authorization/identification technique, "biometric," has been developed that can determine more accurately if a person is authorized to access a computer system. A biometric is both the most convenient and the most secure identification device available. It is not based on something the user remembers like a PIN code, nor is it based on something that the user has in possession like a smart card. A biometric identifier is the most reliable solution currently available [3]. They include fingerprints, iris, Iris, signature, voice, hand geometry, retina, ear, DNA, voice spectrograph, and signature dynamics. Biometric refers to the automatic authentication of a person based on his/her physiological or behavioral characteristics. Biometric offers many advantages over traditional PIN Number or password and token-based (e.g., ID cards) approaches; for example, a biometric trait cannot be easily transferred, forgotten or lost, the rightful owner of the biometric template can be easily identified, and it is difficult to duplicate a biometric trait. Biometric technology has now become a viable and more reliable alternative to traditional authentication systems in many government applications. With increasing applications involving human-computer interactions, there is a growing need for fast authentication techniques that are reliable and secure. Biometric recognition is well positioned to meet the increasing demand for secure and robust systems [5]. Eye recognition system uses the Iris of the human to recognize him. Non-invasive, non-contact and extremely fast, high-resolution cameras are used to capture the image of the iris, translating it into an encrypted digital code, called Iris Code. This is stored into the database for future identification of the person. When the person needs to prove his identification, the same camera and process is used to build the Iris Code. The code previously stored in the database is then used to more than two seconds thus avoiding the wastage of time as is done in other techniques such as Fingerprint recognition system. This technology does not use the retinal scan technology and no laser is projected in the eye as in the retinal scan.

II. COMPARISON OF DIFFERENT BIOMETRICS

The biometric methods comparison among Fingerprints, Facial Recognition, Hand Geometry, Retinal Scan, Iris Scan, Signature Dynamics, and Voice Dynamics are shown in table 1.1.The parameter are taken on Y axis and Biometrics on X axis.

Table I Comparison of different biometrics

Biometrics /Parameter	**Eye/Iris**	**Eye/Retina**	**Face**	**Finger Scan**	**Hand Geometry**	**Signature**	**Voice**
Level of accuracy	Very High	Very High	High	High	High	High	High
Ease of use	Medium	Low	Medium	High	High	High	High
Barrier to attack	Very High	Very High	Medium	High	High	Medium	Medium
Long term Stability	High	High	Medium	High	Medium	Medium	Medium
Possible Inferences	--------	-------	Aging	Dry, Dirty Damaged Finger Images	Disease like arthritis	Illiteracy, Constantly changing Signatures	Background noise, cold & other factors

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Signature Dynamics and Voice Dynamics have the lowest accuracy rates as compared to other biometrics techniques. Retinal Scan has high accuracy but also has high data collection error rate and low user acceptability. Facial Recognition does not seem to be a dependable technique to establish identity because the error rates for this biometric appear to increase with time, angle of the image captured, lighting, and facial expression [6].

III. IRIS DETECTION

Iris detection is essential front end for a Iris recognition system. Iris detection locates and segments Iris regions from cluttered images, either obtained from video or still image. It has numerous applications in areas like surveillance and security control systems, content based image retrieval, video conferencing and intelligent human computer interface. Most of the current Iris recognition systems presume that Iris are readily available for processing. However, we do not typically get images with just Iris. We need a system that will segment Iris in cluttered images. With a portable system, we can sometimes ask the user to pose for the Iris identification task. In addition to creating a more cooperative target, we can interact with the system in order to improve and monitor its detection [7]. With a portable system, detection seems easier. The task of Iris detection is seemingly trivial for the human brain, yet it still remains a challenging and difficult problem to enable a computer /mobile phone/PDA to do Iris detection [5]. Iris detection remains an open problem. Many researchers have proposed different methods addressing the problem of Iris detection. In a recent survey Iris detection technique is classified in to feature based and image based. The feature based techniques use edge information, skin color, motion and symmetry measures, feature analysis, snakes, deformable templates and point distribution. Image based techniques include neural networks, linear subspace method like Eigen Iris, fisher Iris etc [6] . The problem of Iris detection in still images is more challenging and difficult when compared to the problem of Iris detection in video since emotion information can lead to probable regions where Iris could be located.

IV. PROPOSED SCHEME

In this present approach we have combined two main approaches to perform the iris recognition effectively and efficiently. These approaches are PCA and Gabor filter. Here the small description of these two approaches is given:

A. PCA

PCA calculates the Eigen vectors of the covariance matrix, and projects the original data onto a lower dimensional feature space, which is defined by Eigen vectors with large Eigen values. PCA has been used in face representation and recognition where the Eigen vectors calculated are referred to as Eigen faces.

B. GABOR FILTER

Frequency and orientation representations of Gabor filters are similar to those of the human visual system, and they have been found to be particularly appropriate for texture representation and discrimination [9]. In the spatial domain, a 2D Gabor filter is a Gaussian kernel function modulated by a sinusoidal plane wave. The Gabor filters are self-similar: all filters can be generated from one mother wavelet by dilation and rotation.

V. PROPOSED ALGORITHM

The proposed system and the model is the composition of two approaches of feature extraction. One is Gabor filter and other is PCA. Gabor filter is used to identify the Iris and eye features from the database. Now from these feature the PCA training will be performed to match the Iris as well eye from the database.

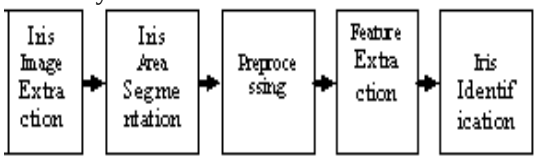

Fig 1: Stages of Recognition

Altogether such phase bits are computed for each Iris. Also an equal number of masking bits are computed to signify whether any Iris region is obscured by any other component. The work is presented in flowchart shown in fig 2. The steps of Proposed Algorithm are:

Step 1- Maintain the Database of Input Iris Images. The Database if collected from external sources

Step 2- Perform the training on input images and extract the features from the image set. These features includes the Eigen face extraction based on Gabor analysis

Step 3- Perform the image analysis and perform the image preprocessing to convert the image and image set to normalized format

Step 4- Extract the Eigen values and Eigen face from the images

Step 5- Store these Eigen vectors based on Gabor analysis in the form of database for later use

Step 6- For each iris image extract the feature vector and maintain the database

Step 7- For each new iris image to be identified, calculate its feature vector and compare it with the stored feature vectors of the face library members.

Step 8- If the comparison satisfies the threshold represents the image as identified image otherwise as unknown image

Step 9- Exit

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In this presented work the person will be identified by performing the architecture that includes eye recognition. In this work instead of comparing the whole image we will extract the feature along with eye of the image and the match will be performed on the basis of this PCA as well as Gabor filtering.

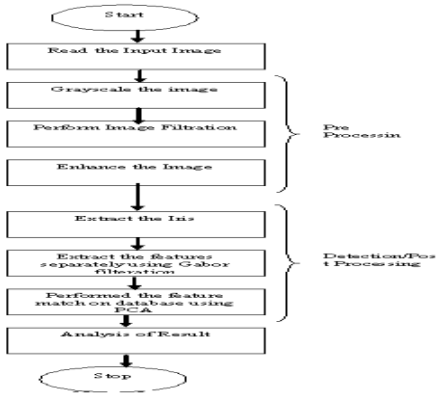

Fig 2: Flow Chart of Work

VI. CONCLUSION

The proposed work is the improvement of tradition PCA approach. For this improvement we are performing a feature based analysis. For the Feature extraction and representation Gabor and PCA will be collectively used. The proposed system will improve the detection ratio for Iris images.

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