International Journal of Marketing, Financial Services & Management Research
Vol.2, No. 1, January 2013, ISSN 2277- 3622
Online available at www.indianresearchjournals.com

A GABOR IMPROVED PCA BASED FEATURE EXTRACTION APPROACH FOR IRIS RECOGNITION

DEEPALI*; AMIT KAMRA**

* Jasdev Singh Sandhu Inst.of Engg. & Technology,
Kauli, Patiala (INDIA)

** Guru Nanak Dev Engg. College,
Ludhiana (INDIA)

ABSTRACT

The Biometric Authentication Systems are based on some the human features and behaviors. A Biometric System can be based on Finger, Iris, Voice etc. In this proposed work we are working with an architecture in biometrics that includes the eye recognition. The presented system is a compositional architecture in which the detection of a person is performed on the basis of Iris and the Eye values. We have maintained a dataset of Iris and eye images. 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.

KEY WORDS: Iris Recognition, Gabor, PCA, Preprocessing, Recognition**.**

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 and/or its files. 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. The term biometric refers to any and all of a variety of identification techniques based on some physical and difficult to alienate characteristic. 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.
Facial recognition systems are built on computer programs that analyze images of human Irises for the purpose of identifying them. The programs take a facial image, measure characteristics such as the distance between the eyes, the length of the nose, and the angle of the jaw, and create a unique file called a "template." Using templates, the software then compares that image with another image and produces a score that measures how similar the images are to each other. Typical sources of images for use in facial recognition include video camera signals and pre-existing photos such as those in driver's license databases

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 2.1 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

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.
The Fingerprint biometric has a low data collection error rate and high user acceptability. Iris Scan has the potential to have very high search accuracy. Iris Scan is unobtrusive and, as such, is generally accepted by clients.

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. 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.

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. 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.

Interactive Iris Recognition is divided in to several phases; it includes

1) Creating drivers for the handheld device that link with the application with the captured image.
2) A Iris detection program is run inside the handheld device which detects the Iris from the image.
3) The obtained Iris is transmitted through wireless network.
4) The server performs the Iris recognition and is transmitted back.

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 are given

4.1 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.

4.2 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. 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.

Some properties of Gabor filters:

1) A tunable bandpass filter
2) Similar to a STFT or windowed Fourier transform
3) Satisfies the lower-most bound of the time-spectrum resolution
4) It's a multi-scale, multi-resolution filter
5) Has selectivity for orientation, spectral bandwidth and spatial extent.
6) Has response similar to that of the Human visual cortex (first few layers of brain cells)
7) Used in many applications – texture segmentation; iris, face and fingerprint recognition.

V. METHODOLOGY

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

Each isolated eye pattern is demodulated to extract its phase information using quadrature 2D Gabor wavelets. It amounts to a patch-wise phase quantization of the image pattern, by identifying in which quadrant of the complex plane each resultant phasor lies when a given area of the iris is projected onto complex-valued 2D Gabor wavelets.

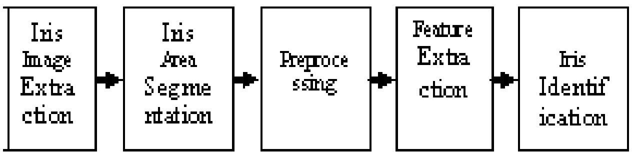

Figure 1: Stages of Recognition

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 figure 2. The proposed work is here presented in 3 Main Stages.

1. Preprocessing
2. Training the Dataset
3. Matching

The preprocessing work includes the conversion of image to the normalized image as well as to extract the features from the image. The filtration process includes the adjustment of brightness, contrast, low pass, high pass filtration etc. The filtration will be done in two phases for Iris and for Iris feature itself. Once the filtration process is done extraction of features will be performed. Just after extraction process the feature extraction will be done. These featured images are the main input image to the system.

Another task is performed on the available database. The database will be trained by using support vector machine. The training process will be done only once and after training a feature analysis based database will be created. The actual match will be performed on this PCA trained dataset. Again we have to generate datasets for the iris. Third and the final process is to perform the match. The matches will performed on both the iris image will be matched based on curvic definition. If both matches gives results better then expected value. The person will be identified.

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.

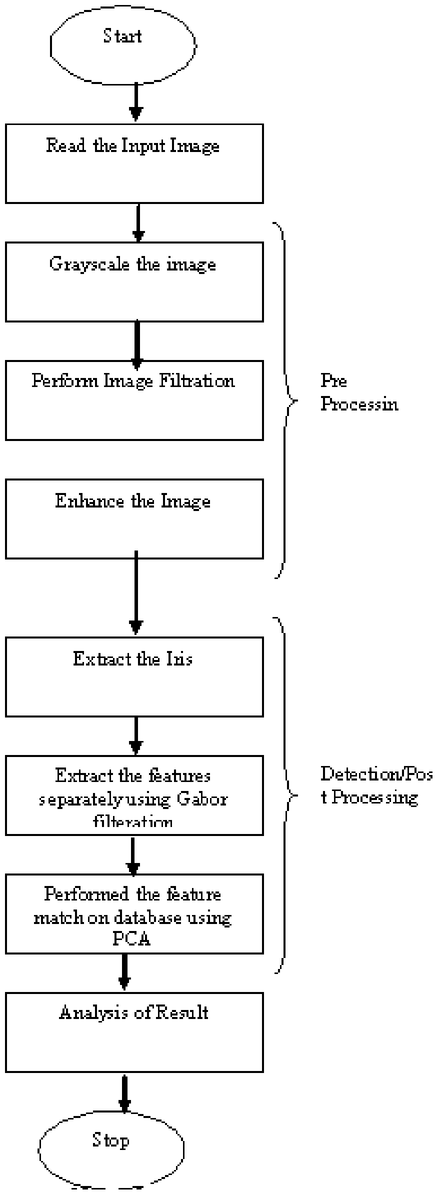

Figure 2: Flow Chart of Work

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.

REFRENCES

[1]. Boles W. and Boashash B. (1998), "*A human identification technique using images of the iris and wavelet transform*", IEEE Trans. Signal Proc., Vol. 4, pp. 1185-1188.

[2]. Chen J., Hu G. S., Xu J. (2003), " *Iris image quality evaluation method based on wavelet packet decomposition*", Journal of Tsinghua University (Sci. & Tech.), Vol.43, No. 3, pp. 377-380.

[3]. Cui J. L., Wang Y. H., Tan T. N. (2004), "*A Fast and Robust Iris Localization Method Based on Texture Segmentation*", Proceeding of SPIE, Bellingham, WA, Vol. 54, No. 04, pp. 401-408.

[4]. Daugman J. G. (2006), "*Probing the Uniqueness and Randomness of Iris Codes: Results From 200 Billion Iris Pair Comparisons*", Proceedings of the IEEE , Vol. 94, No.11, pp. 1927-1935.

[5]. Daugman J. G. (2004), "*How Iris Recognition Works*", IEEE Transactions On Circuits And Systems For Video Technology, Vol. 14, No. 1, pp. 21-30.

[6]. Donald M. M., Soumyadip R., Dexin Zhang (2007), "*DCT-Based Iris Recognition*", IEEE Trans. on Pattern Analysis and Machine Intelligence, Vol. 29, No. 4, pp. 586-595.

[7]. Dorairaj V., Schmid N. A., Fahmy G. (2004), "*Performance Evaluation of Iris Based Recognition System Implementing PCA and ICA Encoding Techniques*", Biometric Technology for Human Identification II, Proceeding of SPIE, Bellingham, WA, Vol. 54, No.04, pp. 51-58.

[8]. Du Y., Ives, Chang, D. Etter, T. Welch, (2004), "*Information divergence-based iris pattern recognition for automatic human identification*", Proceedings SPIE, Vol. 54, No. 04, pp. 78-85

[9]. Daugman J. G. (1995), "*High Confidence Recognition of Person by Rapid Video Analysis of Iris Texture*", European Convebtion on Security Detection and Brighton, Brighton, UK, pp. 244-251.

[10]. Daugman J. G. (1993), "*High confidence visual recognition of persons by a test of statistical independence*", IEEE Trans. Pattern Anal. Machine Intell., Vol.15, No. 11, pp. 1148-1161.

[11]. Jafar M. H. Ali, Aboul Ella Hassanien (2003), "*An Iris Recognition System to Enhance E-security Environment Based on Wavelet Theory*", AMO - Advanced Modeling and Optimization, Vol. 5, No. 2, pp. 93-104.

[12]. Jain A., Ross A., Prabhakar S. (2004), "*An introduction to Biometric recognition*", IEEE Trans. on Circuits and Systems for Video Technology, Special Issue on Image- and Video-Based Biometrics, Vol. 14, No.1, pp. 4-20.

[13]. Ma L., Tan T. N., Wang Y. H. (2004), "*Efficient iris recognition by characterizing key local variations*", IEEE Trans. on Image Processing, Vol.13, No. 6, pp. 739-750.

[14]. Ma L., Tan T. N., Wang Y. H. (2003), "*Personal identification based on iris texture analysis*", IEEE Trans. on Pattern Analysis and Machine Intelligence, Vol. 25, No. 12, pp. 1519-1533.

[15]. Seung, Kwanghyuk, Kang Ryoung, Jaihie Kim (2005), " *New Iris Recognition Method Using Independent Component Analysis*", IEICE Transactions on Information and Systems, Vol. 88, No. 11, pp. 2573-2581.