Enhanced Iris code Modelling Using Canny Edge Detection

Subramanian.S[*1], Prabhakaran.S[1], Siva Kumaran.V[1], Alphin Ezhil Manuel.M.L[2], Jeyamohan.H[2]

*[*1]U.G Students, Dept of CSE, Alpha College of Engg, Chennai, T.N, India.*
[#2]Asst Prof, Dept of CSE, Alpha College of Engg, Chennai, T.N, India.
[1]subu.hunter@hotmail.com

Abstract-Daugman is the most influential iris recognition algorithm.. In this paper we are introduce the new technique bit pair attributes based secure key, its central ray, being a rough representation of the original biometric signal. The central ray is an expected ray and also an optimal ray of an objective function on a group of distributions. This algorithm is derived from geometric properties of a convex polyhedral cone but does not rely on any prior knowledge. These experimental results indicate that, without a thorough security analysis, convex polyhedral cone templates cannot be assumed secure. Additionally, the simplicity of the algorithm implies that even junior hackers without knowledge of advanced image processing and biometric databases can still break into protected templates and reveal relationships among templates produced by different recognition methods. V The extraordinary market success of Iris Code relies heavily on its computational advantages, including extremely high matching speed for large-scale identification and automatic threshold adjustment based on image quality many methods modified from IrisCode were proposed for iris and user attributes based recognition. This paper refers to these methods as generalized Iris Codes..

Index Terms—Canny edge detection, Iris Codes, Gabor Filter

I.INTRODUCTION

Iriscode1 has over 100 million users from approximately 170 countries [1]. As of 4 January 2012, the total number of people just in India who have had their iris patterns enrolled by Iris Code is 103 million. The Unique Identification Authority of India is enrolling about one million persons per day, at 40,000 stations, and they plan to have the entire population of 1.2 billion people Enrolled within 3 years [33]. The extraordinary market success of Iris Code relies heavily on its computational advantages, including extremely high matching speed for large-scale identification and automatic threshold adjustment based on image quality (e.g., number of effective bits) and database size [1]–[3]. In the last two decades, this algorithm influenced many researchers [4]–[15]. Many methods modified from IrisCode were proposed for iris, palmprint, and finger-knuckle recognition. This paper refers to these methods as generalized Iris Codes (GIrisCode) [4].

The simplest modification replaced the Gabor filters in IrisCode with other linear filters or transforms. A more complex mod- ification used a clustering scheme to perform feature extrac- tion and a special coding table to perform feature encoding [4]–[5]. With these modifications, feature value precision could be increased, and many Iris Code computational advan- tages could be retained. Another modification replaced the Gabor filters in Iris Code with random vectors to con- struct cancelable biometrics for template protection [16]–[17]. A complete understanding of Iris Code is thus necessary. Though many research papers regarding iris recognition have been published, our understanding of this important algorithm remains incomplete. Daugman indicated that the imposter distribution of IrisCode follows a binomial distribution, and the bits “0” and “1” in Iris Code are equally probable [1].Hollingsworth et al.2 analyzed bit stability in their iris codes and detected the best bits for enhancing recognition perfor- mance [18]. Kong and his coworkers theoretically derived the following points: IrisCode is a clustering algorithm with four prototypes and a compression algorithm; the Gabor function can be regarded as a phase-steerable filter; the locus of a Gabor function is a two-dimensional ellipse with respect to a phase parameter and can often be approximated by a circle; the bitwise hamming distance can be considered a bitwise phase distance; and Gabor filters can be utilized as a Gabor atom detector, and the magnitude and phase of a target Gabor atom can be approximated by the magnitude and phase of the corresponding Gabor response [4], [19]–[20]. Using these theoretical results and information from iris image data- bases, Kong designed an algorithm to reconstruct iris images from Iris Codes [20]. Nevertheless, the geometric structure of Iris Codes has never been studied. This paper primarily aims to provide a deeper understanding of the geometric structures of Iris Code and its variants and secondarily seeks to analyze the potential security and privacy risks from this geometric information.

II. ESTIMATING THE CENTRAL RAY OF A CONVEX POLYHEDRAL CONE

For clear presentation, a set of notations is neces- sary. Given a zero DC Gabor filter gj with parameters (rj0,θj0,ωj,αj,βj), which generates a bit pair Bj = (bjr,bji) in an Iris Code, gjr and gji represent its real and imaginary parts. I is used to denote I0(ρ,φ)ρ. I0 can be computed from I, because ρ can never be zero. For other biometric methods, I represents an original image and biometric signal. Bold font is used to denote matrices and both two-dimensional filters and images. For example, gji is an imaginary part of a two-dimensional Gabor filter, while gji is a column vector form of gji, and i is a two-dimensional image, while I is a column vector form of the image. T represents the transpose of a matrix or vec- tor. Therefore, the inner product of two real valued vectors (e.g., gjr and gkr) can be defined as < gjr,gkr >= gT krgjr. A. Fundamental Knowledge of a Convex Polyhedral Cone Convex polytope, a branch of mathematics, has strong connections with constraint optimization (e.g., linear program- ming) [21]–[22]. A convex polyhedral cone is a special type of convex polytope. In this subsection, we introduce the convex polyhedral cone for readers without background knowledge. A convex polytope can be defined in several different ways. This paper uses the half-space representation, which defines a convex polytope through the intersection of closed half-spaces. Let C ⊆ d be a convex polytope. Using the half-space representation, C ={ x ∈ d :Qx ≤ z}, where Q∈m×d and z ∈ m. Each row in the inequality system describes a half- space, i.e., qkx ≤ zk [21], where qk is the kth row in Q, and zk is the kth element in z. Note that qkx = zk is a hyperplane. When z is a zero vector, C becomes a convex polyhedral cone with apex zero [22]. This paper considers only convex polyhedral cones with apex zero; C ={ x ∈ d : Qx ≤ 0} is thus used as a definition of the convex polyhedral cone. Three properties can be derived: (1)C is a convex set; (2) the intersection of convex polyhedral cones is also a convex polyhedral cone; and (3) if x ∈ C, thenλx ∈ C, ∀λ ≥ 0, where λx is called a ray. The following discussion uses these three properties. Fig. 1 illustrates convex polyhedral cones and other cones. Fig. 2 illustrates that the intersection of convex polyhedral cones is also a convex polyhedral cone. This section shows that templates produced by Iris Code and G Iris Codes are convex polyhedral cones in different hyper- spaces and provides an algorithm to project these cones into a lower-dimensional space to find a unique solution for Eq. 9 for iris and palmprint templates. Additionally, an algorithm based on the intersection of convex polyhedral cones is also offered to demonstrate that protected templates are vulnerable.

A. IrisCode and Its Low-Order Generalization Let us consider IrisCode first. Using the notations provided in Section 2, we can derive the inequalities −ˆ bjrgT jrI ≤ 0 and −ˆ bjigT jiI ≤ 0, where ˆ bjr = 2(bjr − 0.5) and ˆ bji = 2(bji −0.5) from Eqs. 1–4. ˆ bjr(i) = 1 whenbjr(i) = 1 and ˆ bjr(i) =−1 whenbjr(i) = 0. The notation r(i) signifies either real or imaginary part from the Gabor filter. Each bit in an Iris Code generates one inequality, which associates with a hyper plane, i.e., −ˆ bjr(i)gT jr(i)x = 0. Putting these inequalities into a matrix form, we obtain −T ˆ b I ≤ 0, where ˆ b =[ˆ b1rg1r,...,ˆ bnrgnr, ˆ b1ig1i,...,ˆ bnigni and n =1024. An Iris Code is clearly a convex polyhedral cone. ˆ b is an N by 2048 matrix, where N equals the total number of pixels in a normalized iris image. The central ray of this convex polyhedral cone can be obtained by solving the linear system −T ˆ b I = ε, where =[11···1]T and ε<0, because all gjr(i)s have been normalized, i.e., gjr(i) = 1.It is clearly an under-constrained system, because N 2048. In our experiments, N is 32,768. The result in Section 2 pinpoints that if y is a solution of the linear system for a hyper sphere with radius|ε|, λy, where λ>0, is also a solution of the linear system for the hyper sphere with radius λ|ε|

III PROPOSED MODEL

Iris code Bit Pairs decompression by exploiting Daugman compression algorithm. Gabor filters, which influence the distributions of the bits to identify the bitwise Hamming distance of phase .Decompressed iris images obtained from two public iris image databases are evaluated by visual comparison, two objective image quality assessment metrics, and eight iris recognition methods. Implements and their analyses specifically focused on the intra-relationship of bit pairs in Iris-Codes and local intensity variation-based method proposed by using this technique, the user will have the unique identification for his personal details. We can have more efficiency and security to the applications and also there will less memory usage while storing in the data base. Instead of storing the iris image, the iris code is going to store in the database

IV.DESIGN AND IMPLEMENTATION

"Spoof" method. Our post-processing techniques are Normalization, Segmentation using phase-based , texture analysis methods.

IV.A.IMAGE CONVERSION

Grayscale images are distinct from one-bit black-and-white images. Grayscale images have many shades of gray in between. Grayscale images are also called monochromatic, denoting the absence of any chromatic variation. Grayscale images are often the result of measuring the intensity of light at each pixel in a single band of the electromagnetic spectrum (e.g. infrared, visible light, ultraviolet, etc.

IV.B.EDGE DETECTION

Edge detection is a fundamental tool in image processing and computer vision, particularly in the areas of feature detection and feature extraction, which aim at identifying points in a digital image at which the image brightness changes sharply or, more formally, has discontinuities. The Canny algorithm basically finds edges where the grayscale intensity of the image changes the most. These areas are found by determining gradients of the image.

IV.C.PUPIL DETECTION

The first step in iris localization is to detect pupil which is the black circular part surrounded by iris tissues. The center of pupil can be used to detect the outer radius of iris patterns.
The important steps involved are:
1.Pupil detection(Inner Circle)
2.Outer iris localization
Circular Hough Transformation for pupil detection can be used. The basic idea of this technique is to find curves that can be parameterized like straight lines, polynomials, circles, etc., in a suitable parameter space.

IV.D. NORMALISATION

Localizing iris from an image delineates the annular portion from the rest of the image. The coordinate system is changed by unwrapping the iris and mapping all the points within the boundary of the iris into their polar equivalent. This normalization slightly reduces the elastic distortions of the iris.

IV.E. FEATURE EXTRACTION

Corners in the normalized iris image can be used to extract features for distinguishing two iris images. The steps involved in corner detection algorithm are as follows:
S1: The normalized iris image is used to detect corners using covariance matrix.
S2: The detected corners between the database and query image are used to find cross correlation coefficient.
S3: If the number of correlation coefficients between the detected corners of the two images is greater than a threshold value then the candidate is accepted by the system.

IV.F. MATCHING

Two irises are determined to be of the same class by a comparison of the feature vectors, using a Daugman like X-OR operation. Finally matching would be done of the iris. The matching would be done with the trained images. If the images are matched and present in our database it shows the details of that person. If he is not matched with the database, then his details will be collected for further investigation, if it is needed

V. CONCLUSION& FUTURE WORK

Two iris databases, the UBIRIS.v1 and West Virginia University (WVU) iris databases [27]–[28], and one palmprint database were used to test the proposed algorithms. The UBIRIS.v1 database contains 1,877 images from 241 irises, and the WVU7 iris database contains 3,099 iris images from 472 irises. All images in the WVU iris database were tested in the experiments. However, 48 images from the UBIRIS.v1 database were automatically removed, because of their poor quality (Fig. 6). Though some extremely low-quality images were discarded, many challenging iris images were retained for evaluation. Fig. 7 gives some examples of the challenging images. The UBIRIS.v1 iris images were taken under a visible lighting environment, while the WVU iris images were taken under an infrared lighting environment. The original images in the UBIRIS.v1 database are color images.

REFERENCES

[1] J. G. Daugman, "High confidence visual recognition of persons by a test of statistical independence," IEEE Trans. Pattern Anal. Mach. Intell., vol. 15, no. 11, pp. 1148–1161, Nov. 1993.

[2] J. Daugman, "How iris recognition works," IEEE Trans. Circuits Syst. Video Technol., vol. 14, no. 1, pp. 21–30, Jan. 2004.

[3] J. Daugman, "New methods in iris recognition," IEEE Trans. Syst. Man, Cybern. B, Cybern., vol. 37, no. 5, pp. 1167–1175, Oct. 2007.

[4] A. W. K. Kong, D. Zhang, and M. Kamel, "An analysis of IrisCode," IEEE Trans. Image Process., vol. 19, no. 2, pp. 522–532, Feb. 2010.

[5] A. W. K. Kong and D. Zhang, "Competitive coding scheme for palmprint verification," in Proc. Int. Conf. Pattern Recognit., vol. 1. 2004, pp. 520–523.

[6] A. K. Jain, S. Prabhakar, L. Hong, and S. Pankanti, "Fiterbank-based fingerprint matching," IEEE Trans. Image Process., vol. 9, no. 5, pp. 846–859, May 2000.

[7] Z. Sun, T. Tan, Y. Wang, and S. Z. Li, "Ordinal palmprint representation for personal identification," in Proc. IEEE Conf. Comput. Vis. Pattern Recognit., vol. 1. May 2005, pp. 279–284.

[8] L. Ma, T. Tan, Y. Wang, and D. Zhang, "Efficient iris recognition by characterizing key local variations," IEEE Trans. Image Process., vol. 13, no. 6, pp. 739–750, Jun. 2004.

[9] Z. Sun and T. Tan, "Ordinal measures for iris recognition," IEEE Trans. Pattern Anal. Mach. Intell., vol. 31, no. 12, pp. 2211–2226, Dec. 2009.