International Journal of Innovation in Computer Science and Information Technology
Vol.1, NO.1 , P:54 - 60
Received: 29 Nov 2018
Accepted: 28 Feb 2019

Eyeball icons classification for authentication using hierarchical Visual Coding

Fatemeh Boroumand Moghaddam
Department of Computer, Doroud Branch, Islamic Azad University Doroud, Iran
Fatemeh.Boroumand70@gmail.com
Majid Farajzadeh
Department of Computer, Doroud Branch, Islamic Azad University Doroud, Iran
Farajzadeh4008@gmail.com

Abstract
In this article, a brief definition of safety is defined first and the authentication method, which generally consists of three cases. What a user knows like passwords is what the user owns, such as electronic cards and what the user is biologically owning, such as a fingerprint or an iris network pattern that is specific to each individual, then the iris and system Biometrics is explained and then we enter the main discussion of classification of iris images, which includes identifying the iris image alive, classifying the race, and identifying the large iris to the microfilm. The diagnosis of the iris image is carried out in two ways: the first method is to use special features of iridescent images introduced by optics and illuminating iris cameras and a second method which features live iris images based on tissue analysis, which has the advantage of independence Check for iris sensors. In the classification method, based on our argument that the human iris is a biometric element with phenotype and genotype characteristics, and is a fundamental assumption that is able to classify the racial based on the iris tissue. Finally, in the third method, the identification of large-sized iris, which is unique and stable as a biometric method, is used to define the large population in many government and commercial applications. Also, the method used in this study is a Hierarchical Visual Codebook, and its results are compared with three other methods.

Keywords: Iris, authentication, image categorization, biometric system.

Introduction

Today, there is a significant need for reliable and quick tools for automatically identifying individuals. Computer techniques used to identify personality traits such as face, fingerprint, retina, voice, palm geometry, eyes, etc. are widely used in security, monitoring, and property areas, but many existing methods have limited capabilities in identifying features in There are practical and realistic cases; some methods require contact with the body, some act as sampling, some methods require final adjustment by one person, and some others have high costs. The method recently considered more than other methods is to identify people from the properties of their iris. Also, these methods should be both unique and easily measurable and not be changed over time. The use of biometrics usually involves the use of either automated or semi-automatic physiological or behavioral features that depend on the human body. Physiological attributes, for example, include fingerprints or facial images. Behavioral characteristics include acts or behaviors that come from the person who can be referred to signatures or tones.
Comparing different biometric methods, due to the unique properties that have characteristic features and abundance of iris in the complex tissues, such as grooves and bulges, zigzag textures, rings, and stains, are

of particular popularity [9] and lead to better diagnostic performance In other ways. It's also easier and it's easy to change with time (such as DNA collecting samples rather than some methods (for example, tone of voice) or by dude (such as burning acid with a fingerprint).
Recent advances in information technology and more information security have led to the development of intelligent intelligence systems based on the human biometric characteristics. Biometric systems use the physiological or behavioral characteristics of each person accurately. Features include face, fingerprint, sound, facial expressions, iris, retina, walking, palm, hand geometry ... Among these features, the fingerprint is more than the rest of the work and In legal applications this feature is used. The use of iris scanning for identification and identification was first proposed in October 1936 by an ophthalmologist named Frank Bach. In 1987, two other ophthalmologists, Aran Ambassador and Leonard Flum, reiterated this theory, and in 1989, from the professor John Dougman himself, at Harvard, called for an algorithm to detect iris. These algorithms, given to Daegman's rights, were produced by the technology of irbil technology and were based on current systems and products. According to the research, the human eye is a unique feature of its own. So that the system error in this method is one in 1078, which is very significant. Also, iris scanning allows the system to scan and compare 200 iris points. In the human body, the iris is a seemingly structural, but somewhat preserved, eye structure. In most cases, the iris of the eye remains unchanged after surgery. Even blind people can use this method, as long as their eyes are iris [25].

Security
Safety is the protection of data against unauthorized access, unauthorized alteration, or destruction of data [7], as well as data retrieval by misconduct [9]. User authentication: User authentication is the first thing to do in any safety system. Without doing this properly, other system actions, such as virtualization and access control, are not desirable [1]. The user authentication is one or more of the following [22].

What the user knows
One of the most important of these is the passwords (written, spoken, etc.) that are easy to implement, but have many disadvantages, for example, you can give the password to another, or guess it, or use the software to reopen Software locks are made to achieve it, and to prevent disclosure, the user needs to be replaced frequently, which causes problems [5].

What the user owns
E-cards (containing a unique encryption key) or tokens are instances of this category that still have defects. If the electronic card or logo is used by another person (without a work permit), the system is unable to identify the offender and inform And if the logo or e-card is not available in any way, the main user will have difficulty logging in [5].

What the user is biologically
It can be said that the use of this method is much more secure than the previous two methods, and the system can authenticate the user more accurately, for example by using a fingerprint pattern or an iris network pattern that is specific to each individual [5].

Iris
The iris is the pigmentation of the eye. In all animals, the only bunch of iridescent wreaths are. The iris is located behind the cornea. The middle of the iris is a hole, and this is the pupil's hole. The iris is in the form of a light from inside the iris eye in front of the eye, and this valve adjusts the amount of light, that whenever the environment is brighter and brighter, the pupil gets darker and whenever the dark environment is darker, the pupil becomes thicker. To allow enough light to penetrate the eye. The iris is the front part of the vascular muscle that lies vertically in the front of the lens. The iris has two front and anterior "posterior" and posterior "posterior" sides. Its front surface is to the cornea and is slightly convex. The dorsal surface is slightly "concave" and its outer side adjacent to the protuberance of the protuberance and its central part is lens. The curtain divides the space between the lens and the cornea into the front and back rooms. In Figure 1, the components of the human eye and the location of the iris are shown.

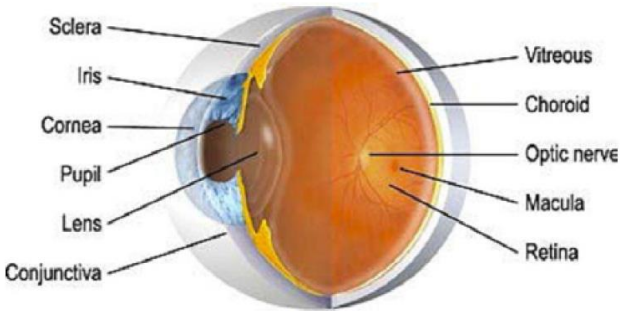


Figure (1) Human eye components and iris placement

Biometric system

Biometric technology is the method of automatically checking the authenticity or identification of a live person (humans) based on physiological or behavioral characteristics. In this definition, there are two words, "auto" and "person." The word "auto" separates biometrics from the larger field of human identification. Biometric identity authentication techniques are performed entirely by a machine that is generally (and not always) a digital computer. Although automated identification techniques can be used for animals, fruits and vegetables and so on, they are subject to biometric authentication, and even to living humans. For this reason, it is probably more correct to say that this is the "affirmation of the identity of the human body" [12].

Classification Module

In this module, the image format extracted from the previous step is compared with the templates in the gallery, and it turns out that the figure taken is in addition to the existing templates and can be identified, if the answer is positive, the decision maker of the person's identity module Based on the comparison result of the classification module. Based on the score obtained from the comparison, which is the percentage of matching the mold with existing molds, the user is approved or not approved.

Categorize iris image

Iris image classification tasks for common applications (eg, iris detection, race classification, identification of large iris) can be summarized as follows.

Determine the iris' survival

An iris diagnostic system may suffer from unlawful attacks, as it is commonly used to protect valuable resources [17]. The attack on the iris sensor with fake iris patterns on the contact lens or paper is a straight line for iris biometrics. To diagnose an iris diagnostic system, fake iris images are necessary to detect iris early. There are mainly two methods used to check the life of the input image iris. The first method uses special features of iris illustrations introduced by optics and illuminating iris cameras, for example, the IR-LED reflective spheres of the halite [4] or the reflection ratio between iris and sclerosis as a function of wavelength [24] . This approach requires a special design of iris sensors. An alternative approach is to investigate the live features of iris images based on tissue analysis, which has the advantage of iris sensor independence. Therefore, the classification of the actual and fake iris images is more flexible to detect iris sensitivity in practice. Fake crystal patterns on contact lenses, paper, plastic plates, and glasses generate special high-frequency information, so Dougman, Ma et al [17] and his and his colleagues [26] have been suggested to detect seminal print images By analyzing the frequency of image measurements based on quality, it was also used to detect lens sensitivity [14]. True and fake iris images have distinct texture patterns, so texture analysis is well developed and template classification methods can be used to detect live iris. Useful tissue features for identifying iris weakness include gray-co-occurrence matrix [27], initial distribution of tissue clusters, local binary patterns (LBP) [30], and weight [11].

The proposed Hierarchical Visual Codebook

Given the low level visual features, it is suggested to obtain the statistical texture representation for iris image classification. So that the individual difference of detailed iris texture can be tolerated and the global texture representation is discriminative enough to distinguish iris images of different categories. Bag-of-Words model (BoW) is demonstrated as the most popular statistical feature representation in object recognition. So BoW
is a good starting point to design iris feature representation for classification purpose. The most important issue in BoW is visual codebook learning and coding. The basic idea of our feature representation method for iris image classification is a reliable coarse-to-fine BoW model minimizing coding errors. Therefore our focus is to develop a novel visual codebook adaptive to the iris texture characteristics. Compared with the visual signals in general object recognition or scene classi-fication tasks, iris images do not contain abundant structural information and the main visual features in iris patterns are texture information. In addition, the global texture features between various iris images are much more similar than the vi-sual features between different objects or natural scene images. It indicates that the variations of iris textures are distributed in a relatively small part of the feature space. Therefore it is better to find a visual representation of iris texture to illustrate the detailed differences between iris images from genuine and fake samples (iris liveness detection), Asian and non-Asian subjects (race classification), or Category A and Category B in central database (coarse-to-fine iris identification). Considering these characteristics of iris images, a novel visual feature representation method called Hierarchical Visual Codebook (HVC) is specially developed for iris image classification. The proposed HVC is inspired by two successful algorithms for visual pattern classification, namely Vocabulary Tree [3] and Locality-constrained Linear Coding (LLC) [16]. Vocabulary tree (VT) was originally proposed to improve quality and efficiency of image retrieval [3]. The basic idea of VT is to hierarchically represent a large set of representative visual words through recursive applications of K-means clustering. Therefore a larger vocabulary can be used to better model the visual contents of images with a much more efficient lookup of visual words. Since iris images are rich of various texture primitives, it is a good idea to extend the idea of VT to iris image classification. A success of a Bag-of-Words model is mainly contributed by a good visual codebook and a good visual coding strategy. Although VT is a good approach to build visual codebook, the hard voting based Vector Quantization (VQ) coding in VT is not a good visual coding strategy. Some coding errors may be introduced into visual representation because of the similarity of some visual words. So we prefer to a soft voting based visual coding strategy such as LLC.

Classification of iris images

Auto Identification The racial feature of an issue is desirable for many real-world programs such as smart marketing, services, and justice. Some attempts have been made to categorize the contest based on biometric images. Most of the initial work is based on facial images, such as work in [23], [7] and [28]. It is visual that the visual appearance of human iris is related to racial intelligence. For example, Western eyes tend to show a bright, colorful blue look with clear texture patterns. In contrast, the eyes of most Asian people show a brown or dark look, and the inaccessibility of accurate texture information is visible in brightness. Therefore, we argue that human iris is a biometric element with phenotypic and genotype characteristics, which is a basic assumption that is able to classify a racial-based iris tissue. The iris biometric phenotypic features are mainly illustrated in the local details of iris tissue patterns that are unique to each subject. The features of the biometric irony genotype are relatively less defined, and advanced pattern recognition techniques are essential for finding the global inner correlation between iris patterns of the same race. Although we can see similarities in both color and texture of cloud images between human eyes (same race or family, twin pair, left / right eye of an individual), this research mainly involves the automatic problem of race classification by feature Iris tissue. We suggested for the analysis of the primary tissue based on the conventional radiofrequency classification method [30]. In the beginning, a bank has been used from

several Channel-D2 Gabor Filters to extract global textual information from iris images, and then AdaBoost is used to learn discriminatory categorization for race. Gabor filters may not be better for the initial description of the tissue in iris images. So, we created a special visual vocabulary, iris tissue, to classify Asian and non-Asian people based on radio images. Recently, face recognition ideas, including the Bag of Words model and encoding, have been borrowed well for racial image classification. And Lyle et al. [15] use local binary patterns of biometrics around the eyes for gender and match classification**.**

Data base

In order to evaluate the effectiveness of iris image breeding classification methods, three multi-racial database databases have been used in this research.

Table 1-Imaging of multiracial iris image databases used to classify iris image breeds.

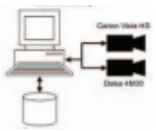
Database	CASIA	ND-LG2200	ND-LG4000	Clarkson
Iris sensor				
Asian				
White				

Table 2- Performance criteria for iris detection methods in a single data set.

Database	Learned iris texton[29]		LLC with SPM[16]		Vocabulary tree[3]		HVC		HVC with SPM	
	CCR(%)	EER(%)	CCR(%)	EER(%)	CCR(%)	EER(%)	CCR(%)	EER(%)	CCR(%)	EER(%)
Print	99.54	0.70	99.74	0.15	99.48	0.98	99.61	0.03	99.96	0
Contact	98.18	5.44	98.03	1.55	98.50	2.83	99.64	0.55	99.32	0.64
Synth	98.97	1.05	99.15	0.58	99.40	0.94	99.76	0.19	100	0
Plastic	97.58	1.38	99.52	0.18	99.55	1.13	99.79	0.13	99.97	0
ND-Contact	94.69	4.31	100	0	100	0	100	0	100	0

Identify the coarse iris to the thinner

As a unique and stable biometric method, the iris pattern is used to define a large population in many government and commercial applications. However, identifying large-scale iris can be much less and more efficient than usual. A possible solution to speed up the identification of the largest iris is to classify a large database into a number of iris based categories. Then, an iris image is a promising query element that uses the templates of its corresponding category Identify. Such a strategy is called the two phases of iris diagnosis (irregular-shaped and irregular-shaped irisography). Identification of large iris is fine.The

advantage of coarse-to-fine identification is multiple. It can improve the performance of iris diagnostic systems. This method can reduce the risk of depression by reducing the number of comparisons between classes during identification of iris. This method can improve the accuracy of iris detection by integrating global tissue information into the stage and characteristics of the local tissue at the diagnostic stage. There are several proposed image irradiation image methods for categorizing large iris. Yu et al. Described fractal dimensions using iris illustrations in four categories based on manual adjustment thresholds [19]. Fuel et al. Use an artificial color filter to detect color information from iris images and set margin to work as a classification for large iris image categorization. In our previous work [29], iris images were grouped into five groups based on statistical descriptions of the iris tissue. Varrota et al. [10] The use of energy-based histograms has been used from multi-resolution DCT transformation to iris images of a group. Sander et al. [20] The macro-iris features (such as mole, flea, mac, mole, melanoma) have been investigated for iris recovery and adaptation.

Conclusion

All identity identification systems have a percentage error of identification. In the ranking, these percentages are compared and according to the lowest percentage of the best method is introduced. As outlined in the introduction, iris-based identity identification is the best method for irritant biological characteristics, and different methods are only different in the use of techniques in the details of the steps.

Image classification of iris is organized in order to identify identity information to different groups and to different categories according to their usage characteristics (eg, life, ethnicity, tissue category). Since iris image classification is a significantly different problem for detecting aperture images in terms of definition, challenges, main problems and applications, special iris image analysis and model classification method are required for iris image classification. The iris image classification is an important topic in the biometric study of iris. In addition, research efforts have been made in the problems of iris image specific image software. In this research, iris visualization is initially considered a common problem in iris biometrics. This type of formulation is useful for uniting research efforts in early iris detection, race classification, large iris image classification for efficient identification, and so on. In addition, a general iris image classification module may be created in an iris detection system for a number of applications. So that the computational cost of extracting attributes and matching for several iris classification tasks can be greatly reduced.

References

[1] Aghakbi A, Nouri A, 1396, Identification of Human Identity Based on Biometric Models of Back and Palms, Fourth National Conference on Information Technology, Computer and Telecommunications, Mashhad, Torbat Heydarieh University.

[2] DATE C.J. , An Introduction to Database System, 8thed., Addison-Wesly , USA , 2003.

[3] D. Nister and H. Stewenius, “Scalable recognition with a vocabulary tree,” in Proceedings of CVPR, vol. 2, 2006, pp. 2161–2168.

[4] E. Lee, K. Park, and J. Kim, “Fake iris detection by using purkinje image,” in Proceeedings of ICB, vol. 3832, 2006, pp. 397–403.

[5] Farajzadeh, Majid and Reyhaneh Tati, 1395, Computer Security Measures in Database Security, Conference on the Development of Advanced Research in Electrical and Computer Engineering, Torbat Jam, Vahdat Institute of Higher Education, 1395.

[6] GARARIN George , Bases de Donnees Object & Relationnel , Eyrolled , Paris, 1999.

[7] G. Shakhnarovich, P. Viola, and B. Moghaddam, “A unified learning framework for real time face detection and classification,” inProceeed-ings of FG, 2002, pp. 14–21.

[8] H. Zhang, Z. Sun, T. Tan, and W. J., “Ethnic classification based on iris images,” in Proceedings of Chinese Conf. on Biometric Recognition, 2011, pp. 66–73.

[9] H. Davision, "The eye," London: Academic, 1962.

[10] H. Mehrotra, B. Srinivas, B. Majhi, and P. Gupta, “Indexing iris bio-metric database using energy histogram of dct subbands,”Contemporary Computing, pp. 194–204, 2009.
[11] H. Zhang, Z. Sun, and T. Tan, “Contact lens detection based on weighted lbp,” in Proceedings of ICPR, 2010, pp. 4279–4282.
[12] Hathof M, 2007, Biometrics A New Approach to Security, Policymaking Human Development, Vol. 4, No. 12.
[13] J. Daugman, “How iris recognition works,” IEEE Trans. on CSVT, vol. 14, no. 1, pp. 21–30, 2004.
[14] J. Galbally, J. Ortiz-Lopez, J. Fierrez, and J. Ortega-Garcia, “Iris liveness detection based on quality related features,” inProceedings of ICB, 2012, pp. 271–276.
[15] J. Lyle, P. Miller, S. Pundlik, and D. Woodard, “Soft biometric classifi-cation using periocular region features,” inProceedings of BTAS, 2010,pp. 1–7.
[16] J. Wang, J. Yang, K. Yu, F. Lv, T. Huang, and Y. Gong, “Locality-constrained linear coding for image classification,” in Proceedings of CVPR, 2010, pp. 3360–3367.
[17] L. Ma, T. Tan, Y. Wang, and D. Zhang, “Personal identification based on iris texture analysis,”IEEE Trans. on PAMI, vol. 25, no. 12, pp.1519–1533, 2003.
[18] Learning appearance primitives of iris images for ethnic classi-fication,” inProceedings of ICIP, vol. II, 2007, pp. 405–408.
[19] L. Yu, D. Zhang, K. Wang, and W. Yang, “Coarse iris classification using box-counting to estimate fractal dimensions,”Pattern recognition, vol. 38, no. 11, pp. 1791–1798, 2005.
[20] M. Sunder and A. Ross, “Iris image retrieval based on macro-features,” in Proceedings of ICPR, 2010, pp. 1318–1321.
[21] Nasrarpour, Mehran and Mansour Esmaeilpour, 1395, Extraction of a binary genetic combination feature to improve the diagnostic function in iris recognition systems, Journal of Visual Machine and Image Processing, Year 3, Number 1, Summer 1394.
[22] Qajar, Syriac and Kuchari, 2010, Face Detection Using PCA and Gabor Filter, Quarterly, Symbolic Processing and Data, Part II, Number 1, Successive 13.
[23] S. Gutta, H. Wechsler, and P. Phillips, “Gender and ethnic classification,” in Proceeedings of FG, 1998, pp. 194–199.
[24] S. Lee, K. Park, and J. Kim, “Robust fake iris detection based on variation of the reflectance ratio between the iris and the sclera,” in Biometric Consortium Conf., Biometrics Symposium: Special Session on Research at the, 2006, pp. 1–6.
[25] Website, https://www.aisoft.ir, 09/09/1397.
[26] X. He, Y. Lu, and P. Shi, “A fake iris detection method based on fft and quality assessment,” inProceedings of Chinese Conference on Pattern Recognition, 2008.
[27] X. He, S. An, and P. Shi, “Statistical texture analysis based approach for fake iris detection using support vector machine,” in Proceeedings of ICB, vol. 4642, 2007, pp. 540–546.
[28] X. Lu and A. Jain, “Ethnicity identification from face images,” in Proceedings of SPIE Defense and Security Symposium, vol. 5404, 2004, pp. 114–123.
[29] X. Qiu, Z. Sun, and T. Tan, “Coarse iris classification by learned visual dictionary,” inProceeedings of ICB, vol. 4642, 2007, pp. 770–779.
[30] X. Qiu, Z. Sun, and T. Tan, “Global texture analysis of iris images for ethnic classification,” in Proceeedings of ICB, vol. 3832, 2006, pp.411–418.
[31] Z. He, Z. Sun, T. Tan, and Z. Wei, “Efficient iris spoof detection via boosted local binary patterns,” inProceeedings of ICB, vol. 5558, 2009, pp. 1087–1097.
[32] Z. Wei, X. Qiu, Z. Sun, and T. Tan, “Counterfeit iris detection based on texture analysis,” in Proceedings of ICPR, 2008, pp. 1–4.