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Efficient iris Recognition System to Improve Performance Measure for live videos

Suganya D[*1], Vimal V.R[2], M.Rameshkumar[3]

[*1,2,3]Dept of CSE Vel Tech Multitech Dr.Rangarajan Dr.Sakunthala Engg College, India

dsuganya25@gmail.com

Abstract

Iris recognition is regarded as the most reliable and accurate biometric identification system available. Iris substantiation is one of the most successful applications in video analysis and image processing. In this project, several proficient approaches are proposed to increasing the performance measures of Iris Recognition system for Live Videos. Face detection is the first and foremost step, efficient face detection algorithm such as Viola-Jones algorithm is used for this purpose. Using feature extraction process left and right eye are isolated and stored in the database. Next is the Iris Segmentation process. Iris segmentation is almost the most challenging part in iris recognition. The main purposes are to improve accuracy and to reduce computational time of iris localization. Briefly, this approach tries to explore regions of interests (ROI) among image regions and to localize iris from one or more remaining regions. A new eyelash detection algorithm based on direction filter to achieve a low rate of eyelash misclassification is proposed. Final step is the Iris Recognition, in order to speed up the response time and to enhance the code searching speed Euclidean Distance Classifier is used to efficiently recognize the iris images from the database.

Keywords: Face Detection, Eyelash detection, Direction Filter, Distance Classifier.

Introduction

Image processing enhances specific image features. Processing of Multidimensional pictures using digital computers is termed as Digital Image Processing. Humans have used body characteristics such as face, voice, gait, etc. for thousands of years to recognize each other. Alphonse Bertillon, chief of the criminal identification division of the police department in Paris, developed and practiced the idea of using a number of body measurements for identifying criminals in mid 19th century. Biometric authentication, or simply biometrics, offers a natural and reliable solution to the problem of identity determination by establishing the identity of a person based on “who he is", rather than “what he knows" or “what he carries”. These Biometric ways of authentication gives us a secured way of survival in this unsecured world.

At the same time, a lot of biometric technologies, comprising automated methods for uniquely recognizing people based on their physical or behavioral traits, such as face [7], fingerprint [8], palm print [9], finger-knuckle-print [10], gait [11], are also based on video or image analysis. Specifically, iris recognition is regarded as one of the most Promising biometric identification technology. Fig.1. specifies the working of traditional iris recognition system. However, according to the state-of-the-art algorithms and technologies, there are several important factors that restrict the promotion of iris recognition systems. First, the identification performance is greatly affected by the Manuscript received revised based on the prevalent complex iris segmentation algorithms [17], the iris encoding algorithms also need to be improved to deal with the complicated normalized iris images. Third, the elapsed searching time will sharply increase with the growing volume of iris database.

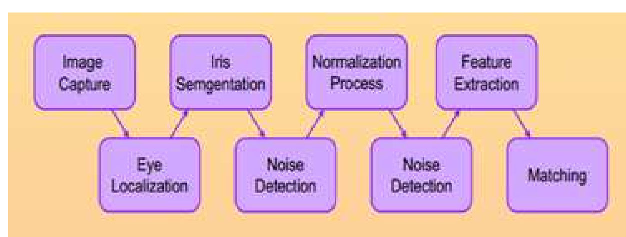

Fig.1. WORKING OF IRIS RECOGNITION

A. *Outline of this work*

There are various researches in progress, which concentrate on improving the accuracy and robustness of iris segmentation. One typical instance is the eyelash detection, which plays a significant role in the segmentation process of a high-accurate iris recognition algorithm. On the other hand, feature extraction and matching are also hot research areas for iris recognition. In front of the tough nut, some pathbreaking ideas have been raised by Mukherjee *et al.* [22] and Mehrotra *et al.* [23]. The existing iris indexing methods, such as SPLDH [22], and SIFT keypoints detection [23], have all achieved some desired results.

The above mentioned methods have greatly improved the performance of iris recognition systems. It is worth noting, however, that the key issues for guaranteeing the robustness, accuracy and rapidity of the non cooperative, noisy and large-capacity iris identification systems have not been fully addressed, this paper will focus on the following three important issues.

First, detecting face from live videos. Although there are various face detection algorithm are available, Viola-Jones face detection algorithm is highly suitable for detecting live objects. Once, face is detected then valid left eye and right eye are isolated from the face and stored for further processing.

Second, the present eyelash detection algorithm needs to be improved to avoid too much iris texture misclassification. Although 1-D algorithm is robust when extracting iris features, it is difficult for this method to describe the directional information of iris textures. Therefore, 2-D filtering is a better choice since it well describes the scale and orientation information of iris textures.

Finally, iris recognition is performed using effective methodology. In order to speed up the response time and to enhance the code searching speed Euclidean Distance Classifier is used to efficiently recognize the iris images from the database.

Face Detection

Viola-Jones face detection algorithm is a widely used method for detecting real world objects. Three stages of this algorithm are,

Detection

This strategy checks whether an image represents a particular object.

Recognition

To find out what particular instance of the object appears in the image.

Tracking

This strategy follows a moving target on the images of a video sequence.

The Viola-Jones detector is a strong, binary classifier build of several weak detectors. Each weak detector is an extremely simple binary classifier. During the learning stage, a cascade of weak detectors is trained so as to gain the desired hit rate / miss rate (or precision / recall) using Adaboost. To detect objects, the original image is partitioned in several rectangular patches, each of which is submitted to the cascade. If a rectangular image patch passes through all of the cascade stages, then it is classified as "positive. The process is repeated at different scales.

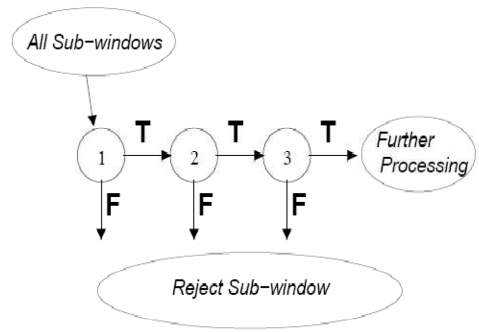

Fig.2. CASCADE OF CLASSIFIER

The Weak Classifier

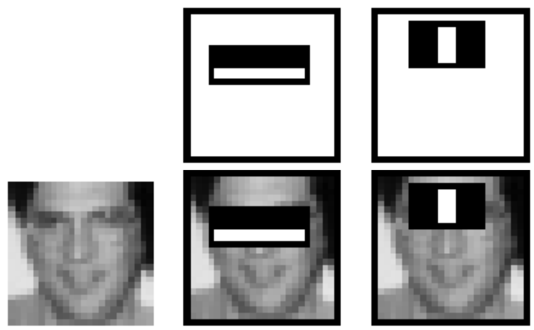

Fig.3. HAAR-LIKE FEATURES

Feature = I(White area) – I(Black area)
The differences between different features are the location and size of the white and black area.
Classifier A:
if I(White area) – I(Black area) > θ1 then sub-window is a face
Classifier B:
if I(White area) – I(Black area) > θ2 then sub-window is a face

$$f(x, y) = \sum_i p_b(i) - \sum_i p_w(i)$$

The algorithm uses a set of weak classifiers to create a strong classifier. A Weak classifier has correct detection rage 99.9% and a false positive rate of 40%. On the other hand a Strong classifier has correction rate of 98% and a false positive rate of 0.01%.

ROI Segmentation

Iris segmentation has become more irregular and accurate than before due to the state-of-the-art segmentation algorithm. In order to weaken the influence of this side effect, this section proposes a multiscale and multiorientation data fusion strategy after 2-D Gabor filtering, which describes both of the scale and direction iris texture features.

Eyelash detection with directional filter

The removal of invalid information in iris images is necessary for an accurate matching algorithm, that is to say the invalid iris textures, which are occluded by eyelids, shadows, eyelashes or specular highlights, must be detected and masked before the feature extraction process. In [21], Kang proposed an excellent eyelash detection method based on iris focus assessment, where eyelashes were detected by several simple kernels. The sizes of the kernels and detective thresholds were adaptive with different focus scores.

The proposed eyelash detection procedure is illustrated in Fig. 4. Fig. 4(a) is a typical iris image in the IIT Delhi iris database with the region of interest (*ROI*) marked. At the beginning, according to [21], the adaptive edge map of the *ROI* is obtained, as shown in Fig. 4(b). It can be noticed that the contrast between the ridges and furrows in the iris area is as high as that in the eyelash region, and the textures and eyelashes are detected at the same time.

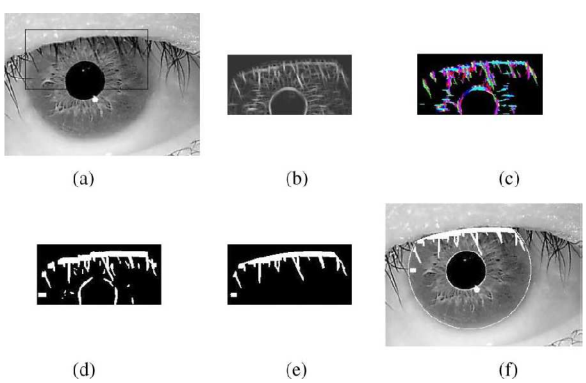

Fig.4. Eyelash detection with directional filters.

(a) An original iris image with the region of interest (*ROI*). (b) Edge detection result of the *ROI* with an the adaptive threshold [21]. (c) The directionally filtered result of (b) where each color represents a certain direction. (d) The pixels selected obeying the connection rule. (e) The refined detected eyelash region. (f) The result of eyelash detection and segmentation for the original iris image.

In order to distinguish these two subjects, this image is filtered by some directional filters along the directions of 0, 30, 45, 60, 90, 120, 135, and 150, as shown in Fig.5, and the results after convolution are displayed. The eyelash trend is recorded by using the following expression:

$$I_o(x,y) = \begin{cases} \arg(\max I_{oj}(x,y)), & \text{if } (\max I_{oj}(x,y) \geq \text{Th}) \\ 0, & \text{if } (\max I_{oj}(x,y) < \text{Th}) \end{cases}$$

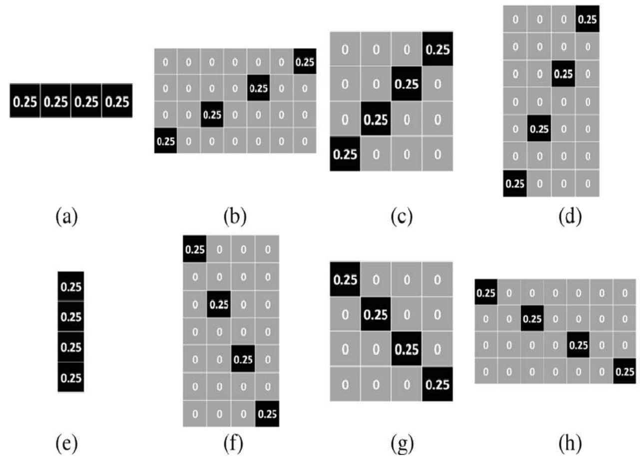

Fig.5. Directional filters with eight directions. 0 , 30 , 45 , 60 , 90 , 120,135, and150.

One kind of connection rule is described in Fig. 6 used to observe eyelashes usually grows along a single direction or with a tiny deflection which can be described by two directions close to each other.

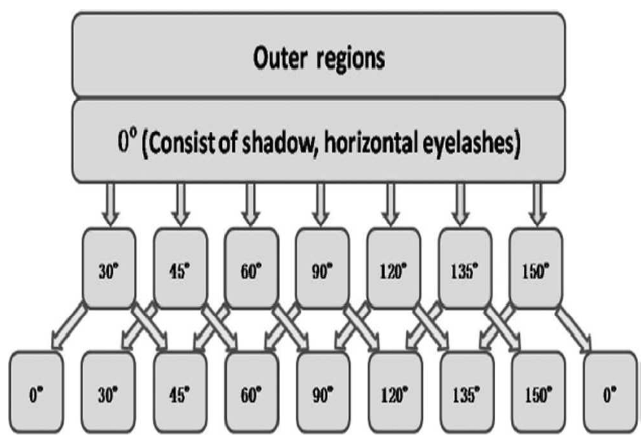

Fig.6. Connection rule of the detected pixels

Multiscale and Multiorientation feature extraction

Segmentation and occlusion detection results are shown in Fig. 7(a) and (b). Fig. 7 illustrates the process of iris feature extraction. Initially face is detected from live videos. Viola-Jones face detection algorithm is used for detecting live objects effectively. Once face is detected, Iris images are isolated from the detected face and stored in the database. Two typical iris images belonging to one subject are selected.

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After that, the segmented irises are normalized, which is a preprocessing unit that unfolds the segmented irises into rectangular images I_A and $I_{B,}$ as shown in Fig. 7(c) and (d). Simultaneously, it also produces rectangular binary images M_A and M_B which mask the invalid regions as displayed in Fig. 7(e) and (f). It is worth mentioning that the invalid regions are all filled with average iris intension.

2-D Gabor filters are generally regarded as the most bionic filters corresponding to the visual perception of humankind. Paper [26] introduced a multiorientation data fusion method after 2-D Gabor filtering, which achieved good performance in removing eyelashes, which extracts the scale and orientation characteristics simultaneously. After obtaining the 2-D Gabor filtering results, the multiscale and multiorientation data fusion process is performed to construct the valid iris codes from the eye image.

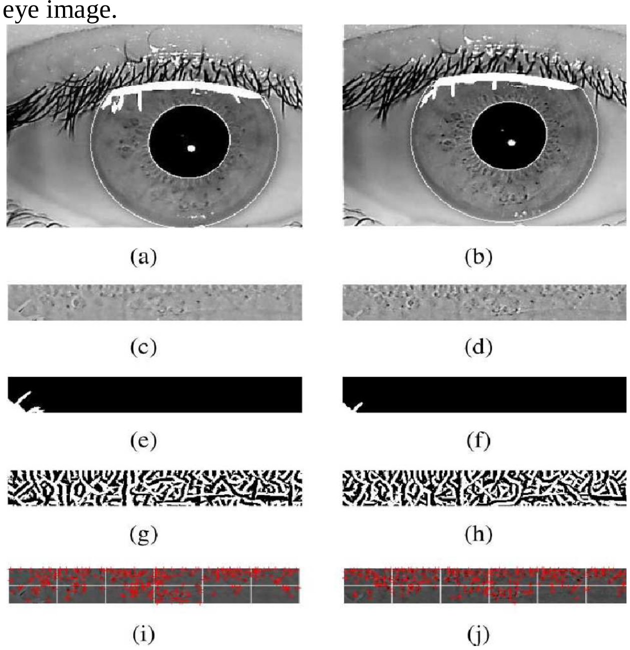

Fig.7 Feature extraction and iris indexing.

(a) and (b) Segmented iris images. (c) and (d) Normalized iris images. (e) and (f) Mask off codes for (c) and (d). (g) and (h) Iris codes extracted from (c) and (d) through multiscale and multiorientation data fusion after 2-D Gabor filtering. (i) and (j) Corner detection result for iris indexing.

Iris Recognition Using Euclidean- Distance Classifier

The most familiar point to distance measure is Euclidean distance. In image processing a distance transform is the derived representation of a digital image. A distance transform is also called a distance map. A distance map is such that it labels each pixel of the image with the distance of the nearest obstacle pixel. Its advantageous nature comes from the minimum time it takes to classify.

In Euclidean distance the metric that is chosen is obviously the Euclidean metric. For the distance measures either a low value or a high value indicates similarity. In the case of Euclidean distance a low of value of distance measure indicates similarity. The mean class values are used as class centers to calculate pixel-center distances for use by the Euclidean distance rule

A most commonly used algorithm for image classification is the Euclidean classifier. With this algorithm, each unknown pixel with feature Vector X is classified by assigning it to the class whose mean vector (M) is closest to X. The classifier based on this distance measure is direct and simple

With this method the clusters are approximated by N-dimensional spheres. In addition to the infinitive a peal and computational simplicity of this approach, it can be shown that it is a very special case of the general maximum likelihood classifier. The Euclidean distance is defined as

$$\sqrt{(x-y)^2} = |x-y|.$$

The Euclidean distance is computed for all classes and the pixel is assigned to the class for which the distance is minimal.

Experimental Results

Performance Evaluation of Feature Extraction

In this part, we will verify the accuracy of the proposed feature extraction algorithm. The performance indices are chosen as equal error rate (EER), where the false accept rate (FAR) and the false reject rate (FRR) are equal, and the separability between authentic and imposter matching distributions , which is defined as

$$d' = \frac{|\mu_1 - \mu_2|}{\sqrt{\frac{(\sigma_1^2+\sigma_2^2)}{2}}}$$

where, μ_1 and μ_2 are the means of authentic and imposter distributions, σ_1 and σ2 are their two standard deviations.

In order to test the performance of the multiscale and multiorientation data fusion method after 2-D Gabor filtering, some contrast experiments are conducted in this part. As a preprocessing module, iris features are extracted through *k*-scale and *l*-orientation data fusion with different parameters *k* and *l*, where *k* denotes the number of different scales, and represents the number of various orientations.

In the first test, we only care about how the multiscale data fusion affects the performance of iris recognition systems, where *l* is kept as a constant 4, and *k* varies from 1 to 3. It can be observed from the optimized scales listed in Table 1 that d' becomes larger and *EER* declines greatly with the increasing number of scales, which indicates that multiscale data fusion will improve the performance of iris recognition systems to a great extent.

TABLE 1
Performance comparison with different number of scales

Number of Scales	Scales	d'	$EER(\%)$
1-Scale	4	3.9335	0.95
2-Scale	$4, 2\sqrt{6}$	4.2559	0.71
3-Scale	$4, 2\sqrt{6}, 4\sqrt{2}$	4.6171	0.22

Conclusion

The approaches proposed in this work aim to improve the robustness, accuracy and rapidity of iris recognition systems for live videos. First, Face detection is performed using an efficient face-detection algorithm, eye point is isolated and stored. To improve the robustness, accuracy and rapidity of iris recognition systems efficient eyelash detection based on directional filters, is proposed with much fewer misclassifications. Second, in the iris feature extraction process, a multiscale and multidirectional data fusion strategy is introduced in this work, and the combination of adaptive scale selection and improved matching criteria will better describe iris textures. Third, using Euclidean Distance Classifier Iris recognition is done proficiently. The Euclidean distance is computed for all classes and the pixel is assigned to the class for which the distance is minimal.

References

[1] Picon, O. Ghita, P. Whelan, and P. Iriondo, “Fuzzy spectral and spatial feature integration for classification of nonferrous materials in hyperspectral data,” *IEEE Trans. Ind. Inform.*, vol. 5, no. 4, pp. 483–494,Nov. 2009.

[2] Bhumika G.Bhatt , Zankhan H. Shah (2011), “Face Feature Extraction techniques: A Survey” National conference on Recent Trend in Engineering & Technology

[3] Fabrizio Dini (2008), “An application of Viola-Jones algorithm: face detection and tracking”, Media Integration and Communication Center – University of Florence, Italy.

[4] Fuad .M. Alkoot (2012), ” A review on advances in iris recognition methods” International Journal of Computer Engineering Research Vol. 3(1), pp. 1-9.

[5] Dr. H.B. Kekre, Mr. Dhirendra Mishra and Mr. Anirudh Kariwals (2011), “A Survey of CBIR Technique and Semantics”, International Journal of Engineering Science and Technology (IJEST), Vol. 3 No. 5.

[6] Kevin W. Bowyer, Karen P. Hollingsworth and Patrick J. Flynn (2011), “A Survey of Iris Biometrics Research: 2008-2010”.

[7] P. Vadakkepat, P. Lim, L. De Silva, L. Jing, and L. Ling, “Multimodal approach to human-face detection and tracking,” *IEEE Trans. Ind.Electron.*, vol. 55, no. 3, pp. 1385–1393, 2008.

[8] Q. Zhao, D. Zhang, L. Zhang, and N. Luo, “Adaptive fingerprint pore modeling and extraction,” *Pattern Recognit.*, vol. 43, no. 8, pp.2833–2844, 2010.

[9] D. Zhang, G. Lu, W. Li, L. Zhang, and N. Luo, “Palmprint recognition using 3-D information,” *IEEE Trans. Syst., Man, and Cybern., Part C: Appl. Rev.*, vol. 39, no. 5, pp. 505–519, 2009.

[10] L. Zhang, L. Zhang, D. Zhang, and H. Zhu, “Online finger-knuckleprint verification for personal authentication,” *Pattern Recognit.*, vol. 43, no. 7, pp. 2560–2571, 2010.

[11] X. Li, S. Maybank, S. Yan, D. Tao, and D. Xu, “Gait components and their application to gender recognition,” *IEEE Trans. Syst., Man, Cybern., Part C: Appl. Rev.*, vol. 38, no. 2, pp. 145–155, 2008.

[12] Kresimir Delac and Mislav Grgic (2004), “A Survey of Biometrics Recognition Methods”, 46th International Symposium Electronics in Marine .

[13] A.H. Mir, S. Rubab and Z.A Jhat (2011), “Biometrics verification: a Literature Survey” International Journal of Computing and ICT Research, Vol. 5, No.2.

[14] Mohammed Nasir Uddin, Selina Sharmin, Abu Hasant and Muniruzzaman (2011) , “ A survey of Biometrics Security System” IJCSNS International Journal of Computer Science and Network Security, VOL.11 No.10.

[15] Muhammad H Dashtban, Parham Moradi (2011) ” A Novel and Robust Approach for

Iris Segmentation", *International Journal of Computer* Applications Volume 34– No.6.

[16] Olufemi Sunday Adeoye (2010) "A Survey of Emerging Biometric Technologies", International Journal of Computer Applications Volume 9- No.10.