IRIS Recognition using Gabor Filter & Vector Machine Methods: A Review

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Abstract — The work present in this paper involve the development of an "open-source" iris recognition system to verify the uniqueness feature of human eye and also the performance of system as a biometric system. To determine the performance of the present system we use the two databases of digitized grey scale eye images. Iris recognition system is a automatic image segmentation process which is based on support vector machine and this system is able to locate the circular iris and pupil region, and also eliminates the eyelids, eyelashes and reflection present in image. After segmentation the image is normalize into a simple rectangular blocks with the fixed dimensions to check the any inconsistency in image. In the end we extract the phase data from the 1D Log-Gabor filters and then we quantize that data into four level to encode the unique pattern of iris into bitwise biometric template.

Keywords—*Anti-spoofing, Direct Attacks, Fake IRIS images SVM, Gabor Filter*.

I. INTRODUCTION

Biometric authentication is basically a pattern recognition system in that we can identify a individual by its physiological and its behavior characteristics which a individual have. These characteristics vary according to the person. These characteristics are based on the various factors like the shape of body, like its fingerprint, palm print, rating scanning, DNA, iris recognition etc. behavioral characteristics are based on the behavior of a person like its voice its rhythm etc. the biometric method for the recognition is being accepted worldwide instead of conventional methods like the PIN or password recognition. These conventional methods are not much secure and can be attack by the attackers. The biometric identification makes the security system more accurate because for this a person have to be physically present and by this we can minimize the extra security efforts like he doesn't need to carry a token or he doesn't have need to remember a password thus makes the security checking more user friendly. As in today scenario there are various applications which needs the reliable human identification thus this method is accepting worldwide and gaining more popularity due to its advantages over the other methods.

While choosing the perfect biometric recognition scheme we have to consider various factors on which it being tested. Seven factors which are being considered while selecting a biometric recognition scheme are as follows: Universality, Uniqueness, Permanence, Measurability, Performance, Acceptability and Circumvention. Universality means that the every person which is using that system has that identification trait. Uniqueness means that the trait must be present in all the personals but it has different for the different individuals like they can be easily differentiate from the others. Permanence shows that how a trait is varied with time. Measurability shows that how much easier the method for the calculation thus it shows the measurable nature of the trait.

Therefore the data must be present in such a form that it can easily be processed and the output can be received in the desired form. Accuracy related to the speed accuracy and the robustness of the technology we used. Acceptability relates to the personal choice that is the personal agree to accept that technology is they ready to give their biometric signature for the access. Examples of biometric characteristics which are being accepted now a days are fingerprint, voice, face recognition and iris recognition. But these are only the few characteristics which are used except these there are various traits which are being evaluated like ear shape, head resonance, body odor and ECG. As there are various characteristics which can be used so we need a variety of image recognition technologies for this method. The rest of the paper is organized as follows.

Literature Review given in section II. Section III outlines the Iris Pre-processing and Iris Localization. Iris Database is discussed in Section IV. The conclusions are given in Section V.

II. LITERATURE SURVEY

N. Pattabhi Ramaiah, Ajay Kumar proposed a domain adaptation framework to address this problem and introduces a new algorithm using Markov random fields (MRF) model to significantly improve cross-domain iris recognition. The proposed domain adaptation framework based on the naive Bayes nearest neighbor classification uses a real-valued feature representation which is capable of learning domain knowledge. Our approach to estimate corresponding visible iris patterns from the synthesis of iris patches in the near infrared iris images achieves outperforming results for the cross spectral iris recognition. In this paper, a new class of bi-spectral iris recognition system that can simultaneously acquire visible and near infra-red images with pixel-to-pixel correspondences is proposed and evaluated.

B. Sabarigiri, and D. Suganyadevi (2014) presented that the iris recognition is important topic for both the research and sensible applications. He also discuss that the fraud IRIS is a major threat to this system which has to be solved. In this paper the author discuss about the fake iris attack and its performance measures. Thus to make the iris recognition system more secure the Electroencephalogram (EEG) is added.

IoannisRigas, and Oleg V. Komogortsev. (2014) in this paper the author discuss about detecting the fake iris prints attacks by using the gaze features which are present in the eye tracking process. Basically here we use a gaze algorithm which is based on the various parameters and the functions of the eye, thus this provides the various parameters which are useful for the iris detection and prevent it from the various spoof attacks. In this study the author present a combine dataset that was assemble for the investigation of these features, these features manly consist the movement of eye and thus correspond to this there are almost 100 of iris images has been collected. The obtained results indicate a best correct classification rate (CCR) of 95.7%. **Chun-Wei** Tan, and Ajay Kumar (2014) In this paper the author describes that the iris recognition system is most advanced and famous non-contact biometric authentication system which has been employed for the identification of the humans successfully. There are various ID programs which uses iris recognition system like AADHAR which use the iris pattern to provide a unique identity for every person. Thus if this technology is used in such a large scale its security has also be concerned. Due to the increasing popularity this method is also become vulnerable to the attacks.

Adam Czajka(2015) in this paper the author discusses about the liveness detection which detect the any artifact biometric feature present in the system to attack the system. In this paper the author presents a complete database which have a controlled quality feature and namely development of liveness detection method for iris recognition. As in database only the images of printout which are accepted by the commercial camera are collected., i.e. the iris template of an human which is being scanned is compared with the iris data or that person stored in our database.

Diego Gragnaniello, Carlo Sansone, and Luisa Verdoliva (2015) in this paper the author present hat the iris recognition method is well suited for the mobile devices because of its intrinsic security and non-intrusiveness. As the authentication are more vulnerable towards the attack thus can be attacked by high quality printing. Thus for this we need a liveness detection module. Thus for this we present a fast and precise technique which can detect the printed iris pattern effectively by using local binary pattern descriptor. To make linear binary pattern more effective, this is being perform on the high pass version of image with a 3 3 integer kernel. Adam Czajka (2015) In this paper, the primary objective of this paper is to propose a complete methodology for eye liveness detection based on pupil dynamics. Due to a lack of public databases that would support this research, we have built our own iris capture device to register pupil size changes under visible light stimuli, and registered 204 observations for 26 subjects (52 different irides), each containing 750 iris images taken every 40 ms. Each measurement registers the spontaneous pupil oscillations and its reaction after a sudden increase of the intensity of visible light. To answer the question whether the eye is alive (that is, if it reacts to light changes as a human eye) or the presentation is suspicious (that is, if it reacts oddly or no reaction is observed), we use linear and non-linear Support Vector Machines to classify natural reaction and spontaneous oscillations, simultaneously investigating the goodness of fit to reject bad modeling.

AyuFitrieHaziqahSallehuddin et.al (2016) in this paper the author discusses about the liveness detection which detect the any artifact biometric feature present in the system to attack the system. Thus here a new method is present against the semi transparent contact lenses spoofing. In this paper the method works on the difference between the two textures and the difference between the two iris due to the pupillary light reflex. The texture dissimilarity is calculated by the iris region which is superimposed by the contact lens and exist from the expended pupil to the outer iris boundary.

C. Rathgeb et.al (2016) in this paper the author present a method to detect the liveness in the iris detection system which is based on the movement of eye to identify the person. Liveness is computed by assuming the anatomy structure of the eye which is not visible termed Oculomotor Plant Characteristics (OPC). Thus the developed OPC approach can prevent the spoof attack by comparing the eye motion and can easily detect the artifact. Thus to test our proposed scheme we test it on the two eye replicas via their mathematical representations.

Rangaswamy Y et.al (2016) An iris is unique physiological biometric trait compared to other biological traits to authenticate a person. In this paper we propose straight line fusion based iris recognition using Adaptive Histogram Equalization (AHE), Histogram Equalization (HE) and Discrete Wavelet Transform (DWT).

III. IRIS IMAGE PRE-PROCESSING& IRIS LOCALIZATION

In general, there are three important factors that influence the iris recognition result. First, the size and location of the iris in the images are different. Second, the eyelashes can shade the iris. At last, the iris image gray scale is variable because of non-uniform illumination. In order to reduce these influences, the pre-processing of the iris localization, removal of eyelash shading and image normalization should be done before iris feature extraction. After acquiring the iris image, the first step is to segment the iris. The texture of the iris is contained between the inner and outer approximate circle boundary parts, so the inner and outer boundaries should be extracted. The iris inner boundary is approximately circular with a large gray gradient. According to this characteristic, the pupil is separated through the thresholding method and the iris inner boundary is extracted. Then the outer edge is detected by using the Canny edge detector [9]. The iris can be located accurately in the iris image. Further, the eyelash shading will influence the recognition result, so it is necessary to be eliminated. We can see that the shading of eyelash can be eliminated effectively.

IV. IRIS DATA BASE

For the effective analysis we make the collection of the large database of the eye track data thus by this we can perform the analysis on large scale of the fixation points and thus this facilitate the ground truth data. All the data which is being used for the MATLAB is available online like images of eye tracking data, and accompanying code etc thus this will help in research. Thus here we collect the 1003 randomly selected images from Flickr and Label Me [15] (Fig 3) and we also restore the eye data for 15 user that free view these images. The largest dimensions for a pixel among these images is 1024 pixels and rests of dimensions are ranging between 405 to 1024 and mostly of them are at 768 pixels. The landscape and portrait image among these images are 779 and 228 respectively. The age group of people selected are ranging between 18 and 35. Among these two are researcher and other are viewer. For experiment all these viewers are stood in a raw at a distance of 19 inch from the computer screen of size 1280x1024 in a dark room and to stabilize their head for the effective tracking we use the chin rest. Thus after this a eye tracker will record the gaze path on a different computer. They view the image at full resolution at 3 seconds separated by 1 second of viewing a gray screen. To get the higher quality tracking result we check the calibration level of camera at every 50 images. To make the process easier we divide the process in two session of viewing 500 images in each session. Every session is perform at time difference of one week. To motivate the participants for the test we provide them ory at the end: thus here we provide the candidate around 100 images and ask them that which image they saw before. Thus after this we discard those images thus it will cause the error of repeating information present in test.

V. CONCLUSION

In present paper we review about the iris recognition method which is based on Curvelet, Gabor and SVM. To accomplish this first we perform the pre-processes by iris localization, eliminating the eyelids, reflections and normalization. In the end we extract the some features from image and decrease the dimensions by using

Gabor and SVM. In this method we consider the iris texture curve features and it also eliminate the environmental noise present in image but along with this it also reduce the feature dimension of image. The experimental results show that our method can recognize the iris effectively.

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