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Liveness Detection on Mobile Biometric

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Abstract: *Liveness detection in mobile biometric is a challenging issue in iris recognition system security. RGB iris image is used for the image acquisition. In this work feature extracted between the genuine and fake by comparing the chromatic feature, blurred feature and pupil displacement. High quality printed iris images are considering the presentation attacks in this project. The printed images on glossy and matte paper, images shown in laptop, tablet screen with high resolution. Pupil localization technique using one dimensional processing of the eye region is evaluated. SVM classifier is used to classify the live or fake one.*

I. Introduction

Biometrics is a research field with some decades of existence and a significant amount of research. Nevertheless, the interest it raises not only has not decreased but in fact has been increasing and gaining more and more relevance in daily life. The importance of personal recognition is of utmost importance in our most common activities. The fact that we live in a society increasingly networked in which our devices contain not only personal information but also professional and financial just like all sorts of details of the daily life of the user instigates the search to reinforce the security of all this data.

Iridology is a medicine technique to claim the colour, characteristics and pattern of iris. Iridology is used to determine the existence of basic genetics, irregularities in the body, dam circulation, toxin deposition and other weakness.Iris biometrics research is an interesting and expeditiously enlarging field. At the same time that there are successful wealthy applications that emphasize the power of iris biometrics, there are also many basic research issues to be clear up the way to larger scale and to many complex applications [1].

The first iris based recognition systems were highly efficient assuming very controlled imaging acquisition scenarios. A step forward was to broad the application of these systems to less controlled environments. One example is the mobile biometrics scenario. The spread of handheld devices equipped with cameras with increased quality has been a motivation for implementing iris recognition systems in this devices. For the authentication and identification process we mainly consider the face recognition and fingerprint. For more robustness we choose the iris. The iris has many unique features compared to other biometric such as face, fingerprint, palm, hand geometry etc. Comparison of biometric trait verse factor are show in Figure 1 Irises are perfectly possible for iris identification even certain hours after the individual's death [2]. So that we can say iris liveness detection is very important in today life. Iris recognition is used in different application areas like Immigration, border control, healthcare, welfare, finance, banking, hospitality, tourism, public safety, etc.

Iris spoof detection is rapidly growing recently. Liveness detection is an anti-spoofing technique. All of the existing work of iris liveness detection can be classified into techniques which require special hardware or algorithms designed to work on high quality static images/videos. Technique which require special hardware not be an ideal solution on smart phones as these increase the cost and decrease the usability.

Biometric trait \ Factors	Universality	Uniqueness	Permanence	Measurability	Performance	Acceptability	Circumvention
Face	H	L	M	H	L	H	H
Finger Print	M	H	H	M	H	M	M
Iris	H	H	H	M	H	L	L
Retina	H	H	M	L	H	L	L
DNA	H	H	H	L	H	L	L
Voice	M	L	L	M	L	H	H
Gait	M	M	H	M	M	H	M

Figure 1 Biometrics trait Vs. Factor

II. Material And Methods

Iris liveness detection methodology combines several feature extraction methods. These features are passes them through a feature selection process and feeds different classifiers with the best subset of features.A biometric liveness detection they have two class classification problem. Which are the input image being real one or fake one. The key points of the process are to determine a set of discriminant features and then develop an appropriate classifier [3].

Niladri B. Puban [4] presented a paper on liveness detection against contact lens spoofing. In this paper conveys the iris texture dissimilarity between two iris regions. The existence of the lens that expanded the pupil to outer iris boundary. This method the binary iris feature is normalized by hamming distance. High value of hamming distance is considering the input iris is live.

J. Galbally [5], proposed liveness detection based on quality related features. This technique is tested on 1,600 dataset containing real and fake iris samples. Here using SFFS feature selection algorithm. J. Galbally says that, it prevents direct attacks of the liveness. On this proposed method the feature extraction procedure measuring the focus, motion blur, occlusion and other contrast or dilation of the pupil. In focus feature property, it measures the High Frequency Power 1(HQF4) [6], High Frequency Power2 (IQF1) [7], High Frequency Power 3(IQF16) [7] and High Frequency Power 4 (IQF15) [8]. The motion feature is computed the Vertical High frequency Power 1 [7], Directional Strength (IQF5) [9] and Global Spectral Information (IQF20) [10]. Occlusion features are detected areas of the iris which are occluded by eyelids and eyelashes. In this occlusion feature different heterogeneous schemes such as Region of Interest [7], Frequency Distribution Rates [11] [12], iris/image ratio [10] and Binarization [13]. Other features are considering the Global contrast [8], Local contrast [8] and pupil dilation [13].

Iris liveness detection methods in mobile biometric scenario are explained Ana F. Sequeria [14]. In this paper gives the detailed study of liveness detection methods by using different databases. The results obtained suggest that the automated segmentation step does not degrade significantly the results. The segmentation step was tested by manually and automated.

Iris liveness detection by relative distance comparison is proposed Federico Pala [15]. This paper focuses presentation attack detects by measuring the pattern within the coloured concentric circle of eye. This paper develops a triplet convolutional networks. In this network it takes two real iris patches are input and one fake patches or two fake and one genuine. Thisarchitecture allows real time processing using smaller network and better than photo based and contact lens presentation attacks.

Procedure methodology

Current researches are done in iris is NIR images. The gender classification is also done at the NIR images. But in the smartphone liveness detection is using RGB image frames. That's very user interactive. The stages of iris liveness detection technique are explained below. The proposed technique, depicted in Fig1.

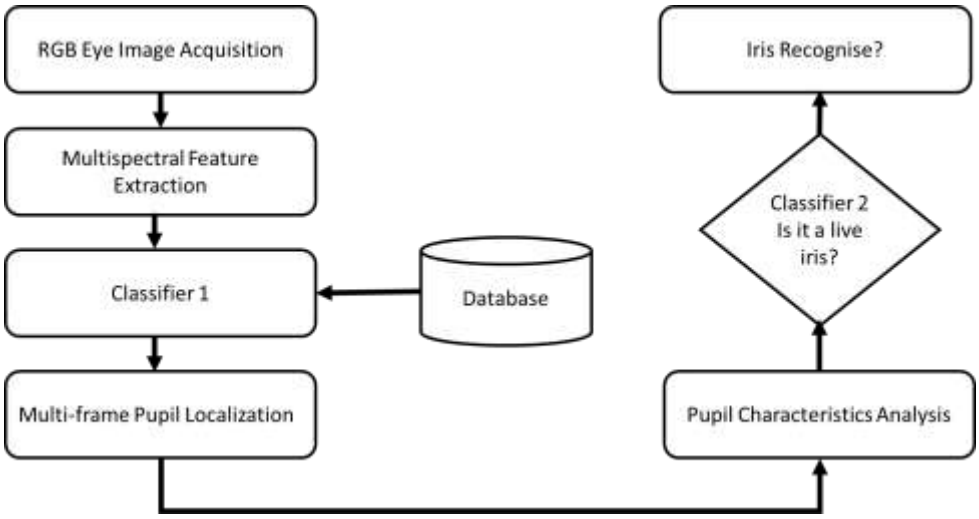

Figure 2: Liveness Detection

Various steps of the workflow of liveness detection is described in following subsection.

RGB Eye Image Acquisition.

Good quality RGB eye image captured from the smartphone. In this proposed technique we acquired 10-20 second video in both iPhone and Samsung. For the fake images are captured by still image video from laptop, tablet or hard copy image.

Multispectral Feature Extraction

Firstly, we detect liveness by the image is spoof or not. One of the feature we select the image is blurred or not. The spoofing medium usually have a limited size. For the clear image capturing the attackers close to the camera on the image. It conceals the edges of the attack medium. So that the spoofed eye images tend to be obsecurity and the defocus in the blur image can be used as another cue for anti-spoofing.

The blurriness feature [16] is calculated based on the variation between the blurred input image and its original version. The original image has the lower blurriness value. The edge width is considered the measurement value of blurriness [17]. The blurriness value in between 0 and 1, 0 means sharp image and 1 means blurred one.

Then next feature we considered the chromatic moment feature. The originally captured image colour tend to show a different in recaptured image. The chromatic moment feature [18] is capture the imperfect colour reproduction property. First we convert the normalized image from the RGB space to HSV space. Then compute the deviation, mean and skewness of each channel. These features are the chromatic moment feature. The percentages of pixels in the minimal and maximal histogram bins of each channel are used as two additional feature. Figure 2 illustrate the HSV value variations in spoofed image and original image.

Classifier1

This classifier means that making the intermediate decision. In the enrolling stage, feature vector for the live user are calculated. For the training procedure, we make the decision which features are consider for the live iris and which are in spoofed one. Such classifier will be able to predict whether the incoming images are most likely belonging to live person or an attacker.

Seventy-five percentage of the images in database are used as training set and rest of the images are consider for the testing. The intermediate decision is making depends on the iris circle movement. The genuine eye video the iris circle's radius and position are varies in each frame. But in the spoofed medium the radius and position are still constant.

Multi-Frame Pupil Localization

Smartphone have capabilities to acquire 120 – 240 per second. It would double in next generation. Fast and sufficiently accurate pupil localization is required in this scenario. Circular Hough Transform [19] can be used for this project. To improve the accuracy, the RGB input image is converted to grayscale image.

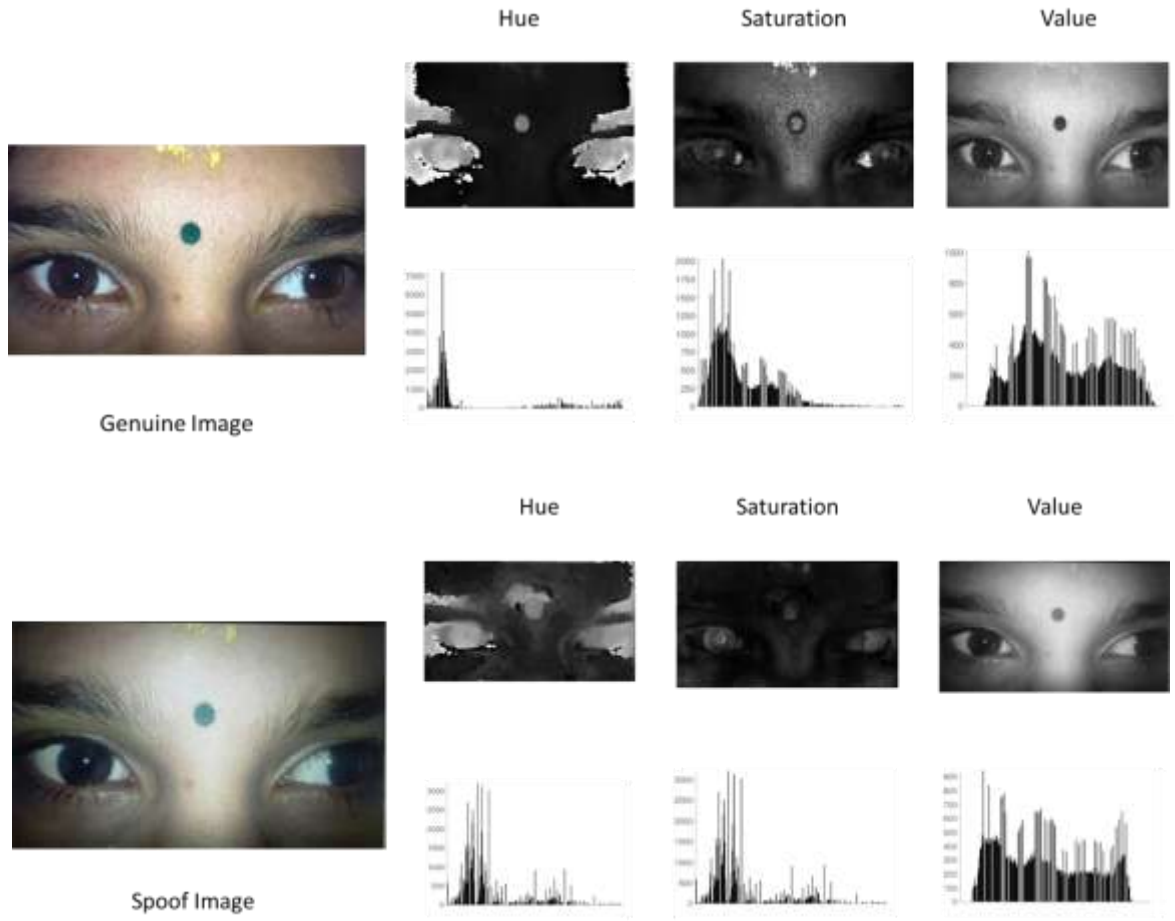

Figure 4: HSV value variations in spoofed image and original image.

Pupil Characteristic Analysis

After the pupil localize in each frame of the input video, the next step is analysing the pupil characteristics. Three parameters are used for pupil analysis - pupil radius, centre and pixel intensity. The person moves close to camera the pupil area changes. The iris, pupil and sclera are detected on the base of pixel intensity.

Over the sequence of frame, the values are changed in a real input image and constant values in spoofed one. Over a sequence of frames, eye blinking also may happen in the genuine image. This blink alters the pupil area. This can show in figure 3.

Classifier 2

The SVM classification is used to classify the input image as either a live person or a spoofed one. The SVM is a binary classifier that divided the data into 0 or 1. SVM classifier falls under the category of supervised learning algorithm. SVM is a linear classifier that classifies the data using linear hypothesis. If data is not linearly separable in the original space, then it maps the data into higher dimension using kernel trick. Kernel trick reduces the expensive computation to map data from original space to higher dimension.

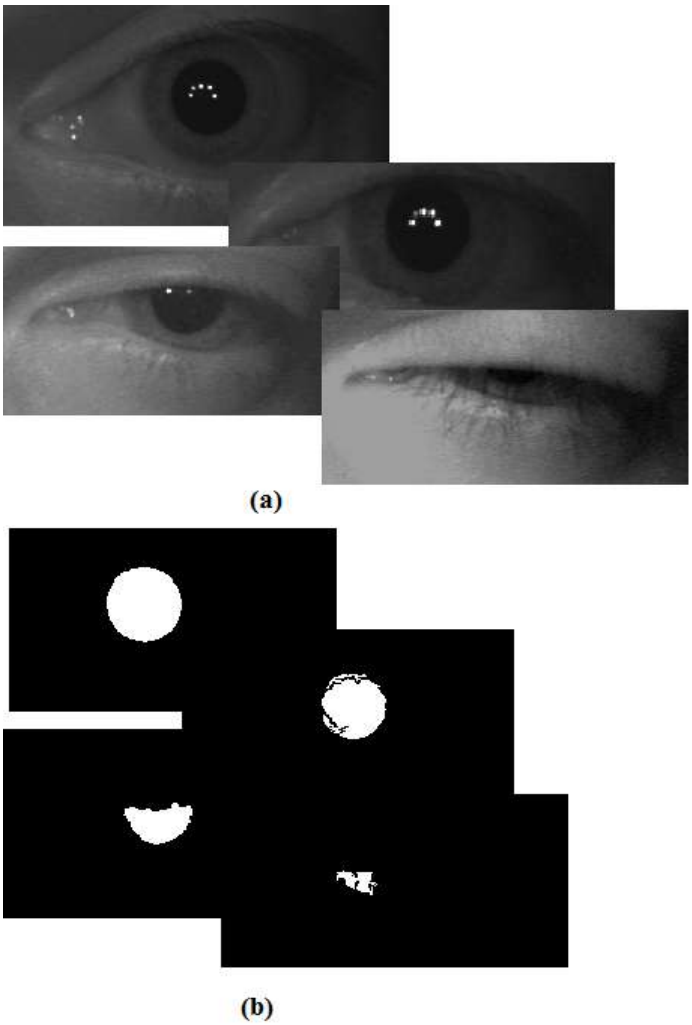

Figure 5. Pupil analysis in blinking process.

III. Result

Segmentation is the most important part of iris recognition because areas that are wrongly identified as iris regions will corrupt bio-metric templates resulting in very poor recognition. Totally 2800 images are trained for gender classification. 700 distinct persons left and corresponding right eye. 400 images are tested. That is 50 distinct persons left and right eye from the data-set we can accurately predict the gender. Number of images are trained and calculating the accuracy by true positive rate verses false positive rate. True positive is correctly predicting the genuine iris image are real one. False positive means fake iris image is predicting real one. The following graph shows it. The confusion metrics of the proposed technique give the detailed study of performance. In this technique they have produce the binary output. The row value indicates the output class and the column values are the true class. It gives percentage of the performance. These results explain the performance of the classifier model in discriminating the features of gender and liveness.

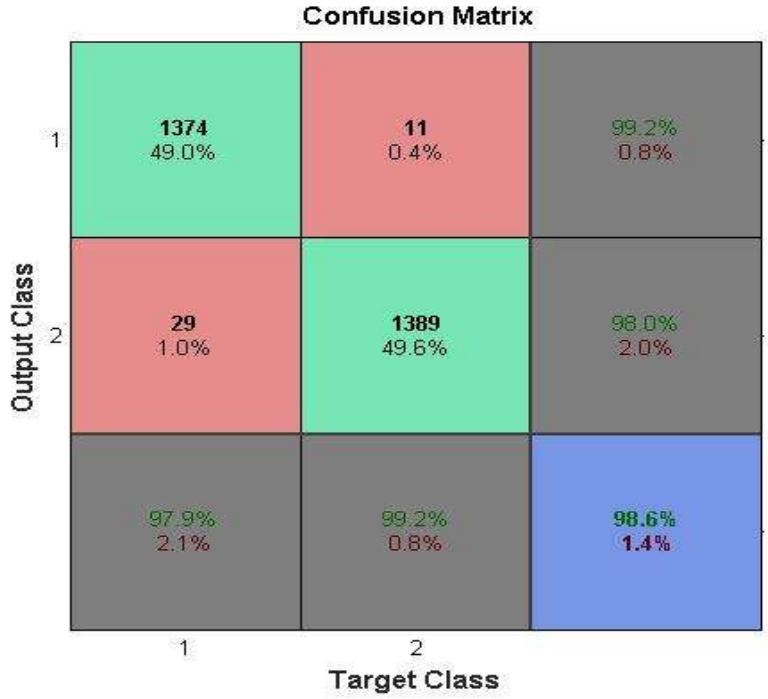

Figure 6: Confusion Matrix for gender classification

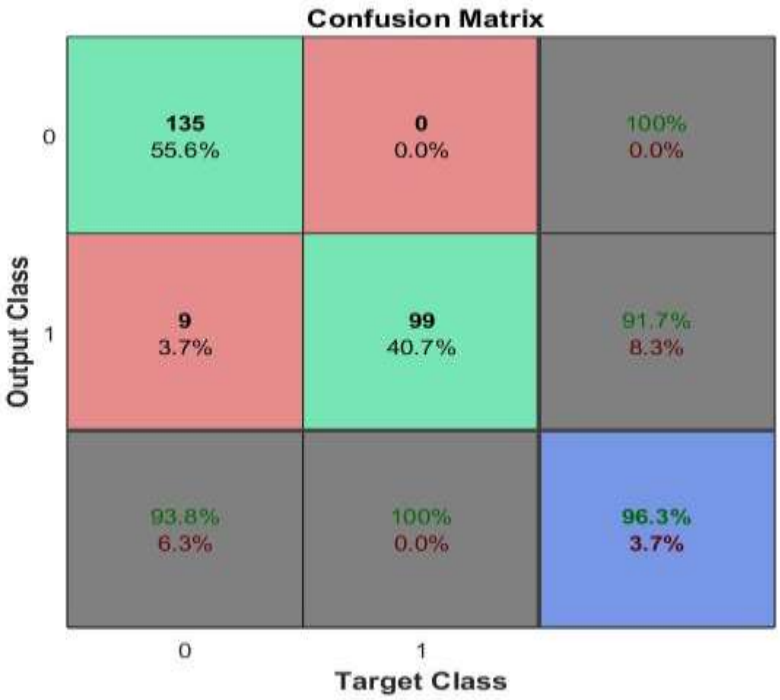

Figure 7: Confusion Matrix

IV. Conclusion

Biometrics is a research field with some decades of existence and a significant amount of research. Nevertheless, the interest it raises not only has not decreased but in fact has been increasing and gaining more and more relevance in daily life. The importance of personal recognition is outmost importance in our most common activities. The fact that we live in a society increasingly networked in which our devices contain not only personal information but also professional and financial just like all sorts of details of the daily life of the

user instigates the search to reinforce the security of all this data. Biometrics play its role as a way of identification which relies on behavioral and anatomical properties of the individual and not on knowledge which he can forget or possessions that he can lose or can be stolen. The spread of biometric applications is impossible to overlook as we see this systems appearing in airport control, bank management, military applications and access control of our hand held devices, among several others. Therefore, new scenarios appeared in which the acquisition conditions are much less controlled and consequently the data collected will be much noisier. The characteristics observed in the biometric data captured in these new and challenging scenarios demand new biometric tools adequate to the more defying conditions. Not only in this scenario but mainly in the recent field of Mobile Biometrics an effort to develop new methods as to be performed in order to guarantee a satisfactory minimum efficacy in the biometric applications deployed. In spite of the enormous variety of biometric traits suitable for biometric recognition, some are specially well shaped for the mobile scenario. Due to the spread of high quality cameras in these devices as well as voice recorders face, iris, periocular zone and voice have been used in this contexts. This work had as a first focus the unconstrained scenario in iris biometric recognition which motivated a collaboration in the development of a segmentation method for noisy images.

References

[1]. K. H. Kevin W. Bowyer and P. J. Flynn. A survey of iris biometrics research: 2008-2010. Handbook of Iris Biometrics, 2012.

[2]. Justin Lee, Biometrics researcher developing new is liveness detection technologies. Jul 24, 2016.

[3]. J. Galbally, J. Fierrez, and J. Ortega-Garcia. Vulnerabilities in biometric systems: attacks and recent advances in liveness detection. DATABASE, 1(3):4, 2007.

[4]. Niladri B. Puhan, N. Sudha, Suhas Hegde A. A new iris liveness detection method against contact lens spoofing, IEEE 15th international symposium on consumer electronics, ISSN - 978-1-61284-6/11.

[5]. J. Galbally, J. Ortiz-Lopez, J. Fierrez, and J. Ortega-Garcia. Iris liveness detection based on quality related features. In 5th IAPR International Conference on Biometrics (ICB), pages 271–276. IEEE, 2012.

[6]. J. Daugman. How iris recognition works. IEEE Trans on Circuts and systems for vedio technology,14:21 – 30, 2004.

[7]. Z.Wei, T. Tan, et al. Robust and fast assessment of iris image quality. In Proc. IAPRICB, pages 464 – 471. Springer LNCS-3832,2006.

[8]. A. Abhayankar and S. Schukers. Iris quality assessment and bi-orthogonal wavelet based encoding for recognition, 42: 1878-1894,2004.

[9]. N. Kalka, J. Zou, et al. image quality assessment for iris biometric. In Proc. SPIE BTHI III, volume 6202, pages 61020D1-61020D11,2005.

[10]. J. Zou and N. A. Schmid. Global and local quality measures for nir iris video. In Proc. IEEE WCVPR, pages 120-125, 2009.

[11]. L. Ma, T. Tan, et al. personal identification based on iris texture analysis. IEEE Trans. On Pattern Analysis and Machine Intelligence, 25: 1519 – 1533, 2003.

[12]. Y.Chen, S. C, Dass, and A. K Jain. Localized iris image quality using 2d wavelets. In Proc. IAPR ICB, pages 373 – 381, 2006.

[13]. Y. Du, C. Belcher, et al. Feature correlation evaluation approach for iris feature quality measure. Signal Processing, 90:1176 – 1187, 2010.

[14]. Ana F. S, J. Murari, J.S. Cardoso. Iris liveness detection methods in the mobile biometrics scenario, IEEE Trans.IJCNN, 978-1-4799-1484-5/14, 2014.

[15]. F. pala, Bir B. Iris liveness detection by relative distance comparison, IEEE Conf. Computer vision and Pattern Recognition Workshops, 2160-7516/17. 2017.

[16]. F. Crete, T. Dolmiere, P. Ladret, and M. Nicolas, "The blur effect: Perception and estimation with a new no-reference perceptual blur metric," Proc. SPIE, vol. 6492, p. 64920I, Feb. 2007.

[17]. P. Marziliano, F. Dufaux, S. Winkler, and T. Ebrahimi, "A no-reference perceptual blur metric," in Proc. ICIP, vol. 3. 2002, pp. III-57–III-60.

[18]. Y. Chen, Z. Li, M. Li, and W.-Y. Ma, "Automatic classification of photographs and graphics," in Proc. ICME, Jul. 2006, pp. 973–976.

[19]. Noureddine Cherabit, Fatma Z C, Amar Djeradi, "Circular Hough Transform for Iris Localization" in Proc. Science and Technology 2012, 2(5): 114-121.