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A Review on Iris Segmentation Based On Eyelid Detection for Non Ideal Images

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ABSTRACT

Recently, Iris recognition systems have gained increased attention especially in non-cooperative environments. One of the crucial steps in the iris recognition system is the iris segmentation because it significantly affects the accuracy of the feature extraction and iris matching steps. The existing algorithm starts with the acquired iris image and determining the expected region of the iris using the K-means clustering technique which is totally region based. Such this method shows good recognition rate but performance of the system degrades in noisy environment. This paper presents the study of iris recognition. Also the challenges are discussed in it.

Keywords- Biometrics, Iris recognition, Iris Segmentation, Fuzzy C means, Hough Transform, Canny edge detection etc.

I. INTRODUCTION

Biometrics used to recognize person uniquely in a natural and intuitive way. Biometric traits are unique to the individual. Biometric based on two characteristics- Physiological and Behavioral. Physiological are related to the shape of the body. For Example- Fingerprint, Face Recognition, Iris Recognition. Behavioral are related to the pattern of behavior of a person. For Example- typing rhythm, gait, trait. Iris Recognition is a physiological biometric that are unique to the individual.

The concept of automatic iris recognition was proposed in 1987.Iris recognition systems have gained increased attention especially in non-cooperative environments. One of the crucial steps in the iris recognition system is the iris segmentation because it significantly affects the accuracy of the feature extraction and iris matching steps. When a person is to be identified by an iris recognition system, their eye is first photographed, and then a template is created for their iris region. Then this template is compared with the other templates stored in a database until either a matching template is found and the person is identified, or no match is found and the person remains unidentified.

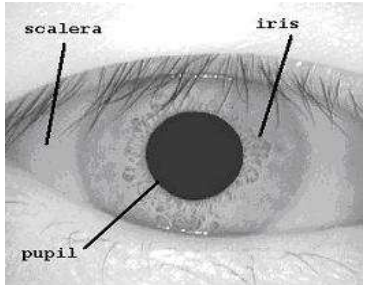

Fig 1 Structure of eye

Step 1 Enhancing and Smoothing the image for cropping eye from taken image

Gaussian filter is used in this step in order to smooth the image. The purpose of doing this is that the edges will be more clear by doing this step and the noisy variations in the image will be smoothed to nearest pixels which can

result in better segmentation as well thresholding needed to extract iris.

Step 2 Segmentation

After this fuzzy-c-means clustering has been applied on the cropped window. It divides the whole image into a number of clusters results in better segmentation of whole iris region. FCM works on the membership function basis in which each pixel has been allotted to all clusters with a weightage which tells its proximity to a particular cluster based on intensity values. Later on we applied some operations in which we put all pixels to that clusters only having highest weightage value in membership function matrix. This helps us better clustering of iris region.

Step 3 Edge detection

Edge detection has been carried out to find the circles in the image as we need circular pattern of iris for our work. There are many filters available to carry out this operation but we choose canny edge detector to extract edges in the image. Canny edge detector gives better results even for less sharp edges in the image.

Step 4 Extraction of valid circular iris region and removal of pupil area

Circular Hough transform has been applied to get valid iris circle and removing pupil circle from it. First Iris pixels have been extracted as they were in original image using circle found by Hough transform. Pixels outside this circle are set to zero. Then median filter is applied to a window extracted from center surroundings in order to get circular pupil area having less intensity then iris region. Pupil area has been set to zero in order to exclude it from iris circle.

Step 5 Locating and removing upper and lower eyelids

As sclera region has high intensity in the eye region. We use a new approach for removing eyelids by generating two points on left and right side of iris boundary where sclera region is just started. As some sclera region has been covered by eyelids that will be excluded while locating these points.

Step 6 Template generation using canny edge filter and hamming distance matching

For generating the template, upper region from upper eyelid marking line and lower region from lower eyelid marking line has been excluded. These results in the required valid iris template region needed for matching process. Minutia points are evaluated using canny edge detector which is unique for each person. Finally template has been stored in the folder in binary forma as one dimensional array.

II. CHALLENGES IN IRIS RECOGNITION

1. Problem in Segmentation- In the segmentation, features were extracted for the Iris Segmentation used different types of operators or regions. In existing methods, K means clustering used for iris segmentation but its properly based on region.

2. Problem in localizing the Iris region- According to the techniques and operators that are used in iris segmentation, there are two common approaches used in localizing the iris region. The first approach applies a type of edge detection followed by CHT or one of its derivatives to detect the shape of iris and pupil. The main problem with this approach is that it is very expensive in time. The second approach uses different types of operators to detect the edges of iris like Daugman or wildes operator and then the

pupil and noises are defected and isolated[12].

3. Problem in Localizing the upper and lower eyelid- Due to sclera region, detection of the upper and lower eyelid is a big problem in iris segmentation because sometimes the noise are occur due to the fast movements while capturing the image.

III EXISTING APPROACHES

1. Daugman's Approach- The first practical automatic iris pattern encoding and recognition method was proposed by Daugman in 1993. Since then, the basic idea of Daugman's original approach inspired many of the new research developments as well as commercial products. Daugman makes use of an integro-differential operator for locating the circular iris and pupil regions, and also the arcs of the upper and lower eyelids. The integro-differential can be seen as a variation of the Hough transform, since it too makes use of first derivatives of the image and performs a search to find geometric parameters. Since it works with raw derivative information, it does not suffer from the thresholding problems of the Hough transform. However, the algorithm can fail where there is noise in the eye image, such as from reflections, since it works only on a local scale [4].

2. Wilde's Approach- The wildes' approach is also very prominent in the field of iris recognition. It uses different image acquisition and iris segmentation processes which gives it some advantages over Daugman's system in some aspects. In the iris segmentation step, the circular Hough transform is used to detect the pupil and limbic boundaries. The Hough transform is known to be tolerant to gaps in edge descriptions and is relatively unaffected by image noise. It is claimed that Wildes' approach achieved 0 false accept rate and 0 false reject rate, based on a database of 600 iris images from 60 different persons[5].

IV CONCLUSION

We have presented an efficient algorithm for noisy iris image segmentation in the context of non-cooperative and less-cooperative iris recognition. Firstly, fuzzy method applied to cluster the whole iris image into different parts. The genuine iris region is then extracted with the assistance of several semantic priors, and the non-iris regions (e.g. eyelashes, eyebrow, glass frame, hair, etc.) are identified and excluded as well, which greatly reduces the possibility of mis-localizations on non-iris regions. Secondly, Hough transform is applied to extract the valid iris region and for removal of pupil. Thirdly, upper and lower eyelids are located and removed which results in required iris region. Finally, binary template has been generated and matching has been performed for existed templates. Experimental results have been noted for image as true and false positive rates.

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REFERENCES

1. Bolle,R., Connell,J., Pankati,S., Ratha,N., Andrew,S., "Guide to Biometrics", springer Verlag, 2003.
2. Bouaynaya,N., Schonfeld,D., "Spatially-Variant morphological

image processing: Theory and applications", in Proceedings of SPIE Visual Communication and Image Process (VCIP'06), Vol. 6077, 2006.

3. Burt,P., Adelson.E., " The laplacian pyramid as a compact image code", *IEE Transactions on Communications*, Vol. COM-31, No. 4, 1983.
4. Daugman,J., "Statistical richness of visual phase information: update on recognizing persons by their iris patterns", International Journal of Computer Vision 45 (1) 2001.
5. Daugman,J., "How iris recognition works", Circuits and Systems for Video Technology, IEEE Transactions on, 14(1):21{30, Jan. 2004.
6. Dass,SC., Jain,AK., "Fingerprint-based recognition", Technometrics,49(3):262–276, 2007.
7. Field,D., "Relations between the statistics of natural images and the response properties of cortical cells", *Journal of the Optical Society of America*, 1987.
8. Hsiao,PY., Chen,C,H., Chou,S., Li,L., and Chen,S., "A parameterizable digital-approximated 2D Gaussian smoothing filter for edge detection in noisy image," in *IEEE Inter. Symp. Circuits and System*, Island of Kos, Greece, 2006, pp. 3189-3192.
9. Hough,P., "Method and means for recognizing patterns represented in logarithmic polar coordinates," Tech. Rep., 1962.
10. S. A. Sahmoud, I.S. Abuhiba, Efficient iris segmentation method in unconstrained environment,Elsevier,2013.