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A noval approach to measure the progress of pterigium from the diagnosed eyes

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***Abstract*---**Pterygium is a disorder characterised by the development of fibro vascular tissue across the cornea, and it is considered to be moderately normal around the world. Careful meditation should be postponed for a period of time, since this type of ailment can manifest itself more forcefully following a medical examination. By the way, the ophthalmologist is now observing the disease incorrectly, without the support of a specific technology. This proposed system has been utilized to develop a computer technique for tracking the progression of pterygium based on previously examined eye images.

***Keywords*---**Pterygium, image segmentation, iris detection

Introduction

Pterygium is an infection of the front fragment of the eye that is portrayed by a fibro vascular tissue with am aspect of three different angles, which develops in the interpalpebral area of the bulbar conjunctiva, with potential outcomes of arriving at the cornea [1]. Typically it happens on the nasal area of the visual globe, yet it can, appear on the temporal region. Pterygium might cause obscuration of the visual pivot or through unpredictable astigmatism, which can be instigated by contortion of the cornea or the hub tear film [2]. Besides that, it

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can also leads persistent disturbance [3]. Fig. 1 shows a picture of an eye with pterygium.

It is pertinent to make reference that the development rate will be more excessive in an instance of the repeat of the illness after the medical procedure [4]. Along with these lines, an early removal can speed up the advancement of the fibro vascular tissue in routine cases, and then again, the unnecessary deferral of the medical procedure can make a few harms to the patient, including visual deficiency.

So, the main aim of this work is to develop a mechanism dependent on computerized processing of images for the strategies to consequently measure the progression of the pterygium. The proposed algorithm utilizes the Circular Hough Transform (CHT) for iris segmentation. Then, at that point, a development of region based algorithm called Otsu's mechanism is used on the sectioned space of the iris to segment the fibro vascular tissue of the pterygium.

It is observed that the segmentation of the pterigium images at an earlier stage is difficult. The primary trouble lies in the way that it can show itself in various ways. Along these lines, the fibro vascular tissue might have various textures and smooth advances on the iris. This research article is described as follows. section 2 analyzes two various mechanisms for the segmentation of iris. Part 3 presents about the setup of experiment. Section 4 exhibits about the obtained results. Section 5 narrates the conclusion.

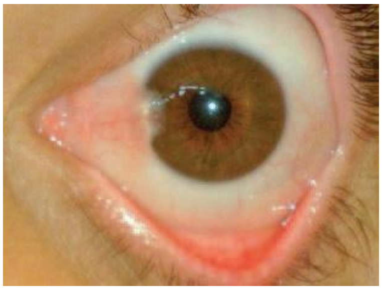


Fig1. Image of Pterigium Eye

Comparisson between circular hough transform and daugman algorithms

This part explain about the comparison of Circular Hough Transform [5][6] with Daugman's mechanism calculation to perform the segmentation of iris on eyes impacted by pterygium. To do that, first calculate the error rates from both of the algorithm utilizing Monte Carlo's reproduction. Then, at that point, we use Wilcoxon's aggregate position test to distinguish the error rates from the two methods.

At first, 100 examples of 30 pictures were generated without reposition from the data collection of 58 pictures. Then, at that point, the two techniques were executed on each model. In every execution, the error rates have been calculated from the two algorithms. The segmentation accomplishment owas characterized abstractly. Fig. 2 shows an instance of an off-base division, furthermore, Fig. 3 shows an effective division.

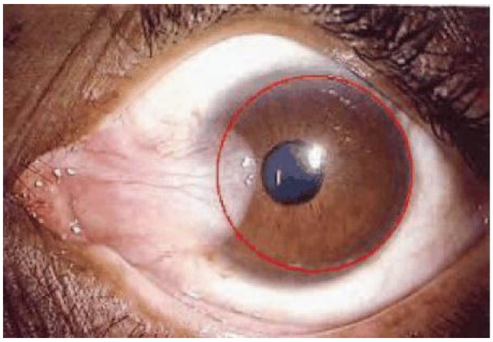


Fig1. Wrong Segmentation using Daugman's Algorithm

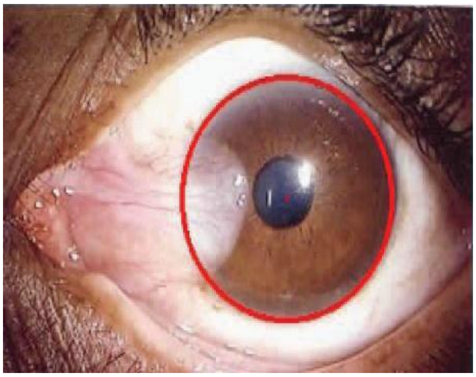


Fig2. Correct Segmentation using CHT

After that, the ordinariness of the blunder rates was investigated. Using the Shapiro-Wilks' test, it was determined that error rates do not follow a normal distribution procedure with a 95% confidence level. As a result, a non-parametric test was necessary to examine the algorithms' outcomes. When compared to Daugman's mechanism, this method uses Wilcoxon's total position test and achieves better results in iris segmentation impacted by pterygium with 100 percent confidence inferred by CHT.

Proposed Method

The proposed framework comprises of three essential steps: (I) segmentation of iris, (II) segmentation of pterygium and (III) assessment of the progression of the pterygium. These were discussed below.

Segmentation of iris

The CHT technique was employed to carry out the iris segmentation based on the results obtained in Section 2. Figure 3 depicts the application of the Circular Hough Transform calculation to an image of an eye that has been diagnosed with pterygium, as previously mentioned. The edges of the greyscale image of the eye were removed using the Canny [8] edge locator before applying the CHT in this study. The standard deviation for the Gaussian channel in the Canny locator was 1, and the edge discovery was done with a 5x5 Sobel administrator, with the primary edge being F1 =0.77*m and the second edge being F1 =2.25*m, where m is the image's median.

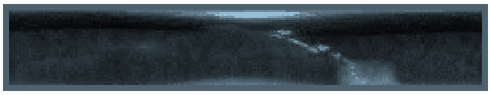
Segmentation of pterigium

After the segmentation of iris, it is important to segment the pterygium area, and for that no arrangement was found on the survey. Thus, this work presents an underlying way to deal with working on the segmentation of pterygium. Our proposition is based on an area developing method and is characterized beneath. Fig. 4 delineates the essentials steps of the proposed calculation.

1. Convert the segmentation of iris region to the image of polar coordinates $f(\delta, \theta)$
2. Develop an image of seed $s(\delta, \theta)$ from $f(\delta, \theta)$ has pixel alone that inferred to conversion of edge of iris to conjunctiva.
3. Develop an image $f_q(\delta, \theta)$ with respect to binarization of an area for iris. In this proposed method Otsu mechanism has used.
4. Expand $s(\delta, \theta)$ sequentially, given to $f_q(\delta, \theta)$. Else apply $V_{n+1} = V_n \oplus A \cap f_q(\delta, \theta)$, till

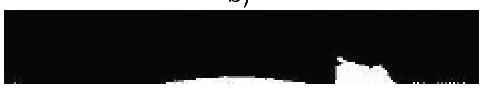
$$V_{n+1} = V_n \text{ and } V_o = s(\delta, \theta).$$

5. Mine the image with certain connected components and keep the largest one as well discard the remaining. The intention of this step is to discard the fake elements.
6. To apply the edge detection sobel[1] method is used.



a)

b)



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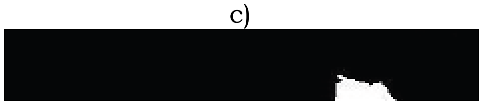

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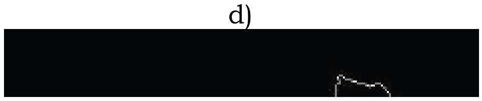

e)

Fig (4) a. Polar coordinates representation of iris, b-e represents the proposed algorithm steps from 3 to 6

Pterigium advancement evaluation

After the identification of iris and pterygium, this method can assess the progression of the pterygium over the iris dependent on the contrasts of the Euclidean distances between the iris' focus to the appendage and between the iris' middle and the pterygium's tissue. Thus, it can compute the level of the appendage community distance that has been involved by pterygium.

Experimental setup

For the tests, we utilized an informational index of 58 pictures of various sizes of eyes with pterygium. In our dataset, each image addresses an alternate phase of the movement of the sickness. The experimental arrangement comprised of playing out the following systems. To begin with, apply the CHT on all images, to segment the the iris area. The pictures with great segmentation were utilized in the subsequent stage, while the rest were eliminated. Significantly, the rule used to assess the nature of segmentation was skewed not really settled dependent on the experience of the researchers. The following method comprised of applying the locale developing calculation portrayed in Section 3 on the chose images in the past advance of the test arrangement. As referenced in Section 3, this progression intends to fragment the pterygium. Once more, it has the images with great segmentation. The remaining images were discarded. The final phase of the exploratory arrangement comprises of assessing the progression of the pterygium for each image that had an acceptable segmentation of the pterygium. The computation of this result is given by the level of progression, which is characterized as the proportion between the Iris Radius (IR) and the progression of pterygium (PP). As indicated in Section 3, the iris, in spite of its circular shape, was drawn closer by a circle by the Circular Hough Change. The range of this circle will be utilized to characterize the range of the iris. The progression of the pterygium, in turn determined from the edge map that is received in the last phase of the development of the region calculation. The technique for this computation is proceeded as follows. In the first place, calculate the Euclidean distance from all marks of the edge guide to the focal point of the circle of the iris. Then, at that point, select the littlest of these distances, which is called SD. Consequently, the Progression of the pterygium (PP) is given by the contrast between the sweep of the iris and the littlest distance between the marks of the edge guide and focus of the iris, i.e., PP = IR -SD. From the headway of the pterygium, one can work out the level of headway of the pterygium (PAP) as the proportion between its development (PP) and the sweep of the iris (IR). The consequences of the level of the headway of the pterygium are given and clarified in the following segment.

Results

The following Fig. 5 and Fig. 6 show some of the findings of the pterygium's region. The circle in these photographs refers to the outcome of Circular Hough Change iris segmentation. Pterygium division is addressed by the irregular curve. The pterygium division was acceptable, as can be seen in these photos. In all 42 right divisions of the iris area, the Hough computation was used. As a result, these pictures progressed to the next stage, the pterygium division phase. The evolution of the pterygium's division resulted in a collection of 26 images that were appropriately labelled as fragmented.

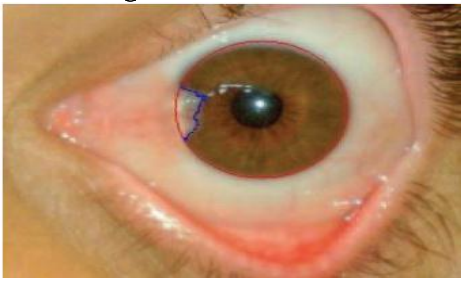

Fig5. The result of segmented pterigium

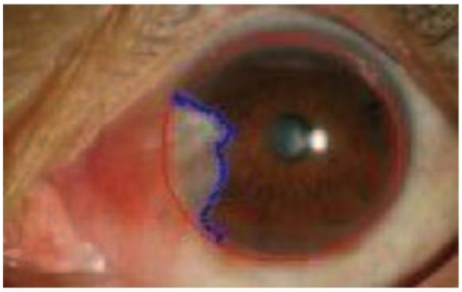

Fig 6. The result of segmented pterigium

The advancing rate of the pterygium was calculated for each of these images after pterygium segmentation. The IR and SD for the image shown in Figure 5 are shown in Figure 7. Tab. 1 shows a few results for determining the amount of pterygium headway (PAP) using the proposed calculation of the IR and SD for each of the images with a satisfactory pterygium segmentation. Line 1 of Tab. 1 refers to the level of pterygium progression in Fig. 7, while lines 15 and 19 refer to the effects of the application on Figs. 3 and 6.application on Figs. 3 and 6.

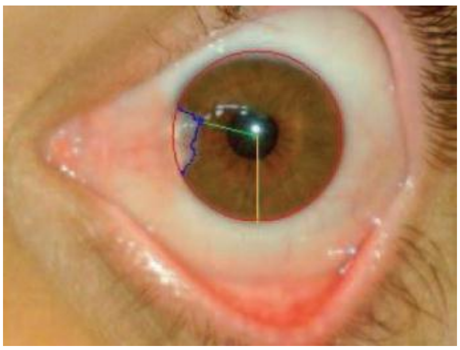

Fig7. IR and SD from Fig5

Table1
Results of PP, IR and PAP for the Test images

Image	PP	IR	PAP
Iamge1	47.108	68	46.02068
Iamge2	10	10	10
Iamge3	51.1096	74	45.76625
Iamge4	19.43398	73	95.02542
Iamge5	61.264	151	30.4258
Iamge6	59.366	72	54.23076
Iamge7	39	62	78.91835
Iamge8	38.2843	101	71.08625
Iamge9	38.0179	82	71.08625
Iamge10	34.1868	62	63.48692
Iamge11	13.60555	60	98.7889
Iamge12	30.3961	90	84.0487
Iamge13	15.38516	66	98.3836
Iamge14	99.0225	117	26.8014
Iamge15	13	75	98.5224
Iamge16	34.0208	77	74.14805
Iamge17	44.9285	68	49.77844
Iamge18	50.1622	129	76.25025
Iamge19	29	68	77.24137
Iamge20	173	18	67.48552

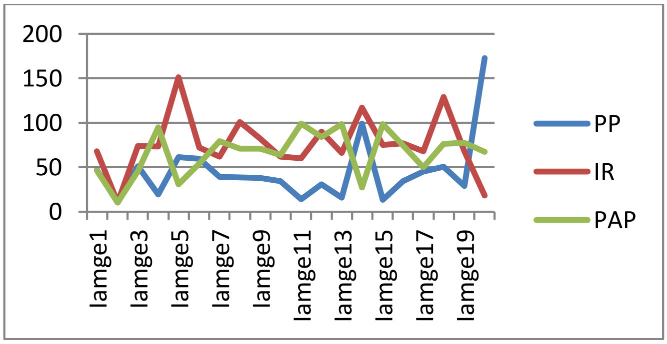

Fig 8. Analysis of PP, IR and PAP images

In the above graph, 20 samples of pterigium has been analysed with PP,IR as well as PAP images. Among those images the PAP images have achieved a great performance of measure the progress by using this proposed method.

Conclusion

In this paper, it proposed a unique way to deal with measure the progression of the pterygium after its segmentation. To recognize the progression of the pterygium this method performed two segmentation. The previously was the segmentation of the iris in the eye area. For this, we utilized the Circular Hough Change (CHT). This calculation was utilized on the grounds that it was more precise, contrasted with different procedures, in the instances of irises impacted by the pterygium. The subsequent segmentation was the recognition of the area of the pterygium in the iris. In this segmentation, this method utilized a development of region calculation in light of Otsu's thresholding strategy. From the last segmentation this technique can compute the progression of the pterygium, as portrayed in Section 4. The outcomes showed that from the pictures portioned accurately by the CHT was feasible to get a hit pace of 98.78% of right division of the pterygium. Accordingly, one can consider that the proposed calculation accomplished a sensible execution with the pictures from the test set. By the examination of erroneous segmented images, it was seen that the segmented calculation fizzled in the following circumstances: little progression of the pterygium over the iris, and in situations where the consistency of the pterygium slowly diminishes and it converges with the iris. Accordingly, the utilization of a bunch of normalized test images for use of the calculation could result in higher hit rates. Also, the utilization of other limiarization methods, rather than Otsu's calculation, at the third phase of the pterygium division calculation could accomplish better outcomes. Accordingly, this work decreased the pterygium segmentation issue to a limiarization issue. At last, it presumes that this review was effective in show the achievability of the assessment of the progression of the pterygium, in view of computerized picture handling methods.

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