Eye Diseases Detection based on covariance

Md Alamgir Hossain[1], Debabrata Samanta[2] and Goutam Sanyal[3]

[1]Department of MCA, Calcutta Institute of Technology, West Bengal, India
[2,3]Department of CSE, National Institute of Technology, Durgapur, West Bengal, India

***Abstract*— Eye diseases are the burning diseases now-a-days. Eye diseases detection is one of the imperative problems in computer vision. It has much relevance such as face live detection and driver fatigue analysis. In this paper first, the captured images are collected from different patients and are processed for enhancement. Then image segmentation is carried out to get target regions (disease spots). Finally, analysis of the target regions (disease spots) based on covariance approach to finding the phase of the disease and then the treatment consultative module can easily be prepared on the lookout for human being.**

Keywords: Covariance, disease detection, *morphological feature*.

I. INTRODUCTION

According to the importance along with consideration of almost the relevant features of human face, the eyes take part in a vital role in interpreting intension and attention of human being. Detecting and tracking eyes through image sequences is one of the fundamental problems in computer vision.

More and more people are anguish from some forms of eye diseases and the numbers have been rising over the years for old ages in particular. Generally the diseases infected the patients slowly and most of the cases, the patients are not aware of the diseases till their vision is seriously affected. So the earlier the doctors are able to detect the eye disease the higher the chance of the patients in preventing visual loss. But the problem with eye diseases is detection of the diseases usually is neither easy nor straightforward and detection is normally found only at a later stage.

Now a day technology that was use to detect different eye diseases is by capturing optical eye images. That technology depend computers program like neural network and feature extraction algorithms to extract feature from the optical images that are necessary for abnormality classification. But because this technology uses optical imaging thus it require standard lighting condition. Hence optical images are difficult to analyze mainly due to the variation that can come with different lighting condition and reflection on the eyes.

H. F. Jelinek, J. Leandro, R. M. Cesar, Jr, M. J. Cree [1] proposed that the utility of pattern analysis tools linked with a simple linear discriminate analysis that not only identifies new vessel growth in the retinal fundus but also localises the area of pathology. Huan Wang, Wynne Hsu, Kheng Guan Goh, Mong Li Lee [2] propose a novel approach that combines brightness adjustment procedure with statistical classification method and local-window-based verification strategy. James D. Weiland, Wolfgang Fink, Mark Humayun, Wentai Liu, Damien C. Rodger, Yu-Chong Ta, Mark Tarbell [3] have proposed an application specific integrated circuits (ASICs) design and they have tested to demonstrate closed loop power control and efficient micro stimulation and they novel packaging process has been developed that is capable of simultaneously forming a receiver coil, interconnects, and stimulating electrodes. Jorg Meier, Rudiger Bock, Laszlo G. Nyul, Georg Michelson [4] propose an automated system that detects glaucomatous eyes based on acquired fundus images. In contrast to other approaches they use image-based features of fundus photos that do not depend on exact measurements gained by segmentation techniques. This appearance based approach is new in the field of retina image processing. Our vision is to establish a screening system that allows fast, robust and automated detection of glaucomatous changes in the eye fundus.

In this paper, we proposed a novel methodology for capturing images of different patients from several hospitals for enhancement. After that, the image segmentation is carried out to get target regions (disease spots). Finally, we analysis of the target regions (disease spots) based on covariance approach for finding the phase of the disease so that the treatment consultative module can easily be prepared on the lookout for human being.

II. PROPOSED METHODOLOGY

A. *Image Acquisition*

The major difficulty for localizing of the eye and cornea is due to the reason that eyes in infrared thermogram does not acquire margin in between iris and sclera. Current investigate suggested the position of eye can be first estimated with the help of possessions of medial canthus, and the exact localization of eye can be SOLVED and 15 fluorescein angiographic retinal images (720X790 pixel) were obtained using a Topcon camera linked with Image 2000 software.

B. *Morphological Feature Extraction*

A number of features were measured on the vessel shapes. These included the area *s*, perimeter £, circularity ($\mu = £^2/s$) and wavelet fractal inspired measurements.

C. *Extract Eye portion*

Eye intensity of an image is the average of the three color elements. So the gray scale image that represents the original color image can be computed as:

$$Eo = (Red_i + Green_i + Blue_i)/3 \text{----------(1)}$$

Eo is the output intensity, Red_i, $Green_i$, and $Blue_i$ are the red, green, and the blue element intensity. The formula for more realistic result is by adding different weight for each R, G, and B element. We normally percept green color brighter that red color, and red color brighter than blue color. That's why we usually set the weight higher for red and higher for green.

$$Eo = (0.299Red_i + 0.587Green_i + 0.144Blue_i)/3 \text{ ----(2)}$$

D. *Reflection Eye image*

With respect to the image pixel value we store the left eye image data to the new reflection eye data as given below::

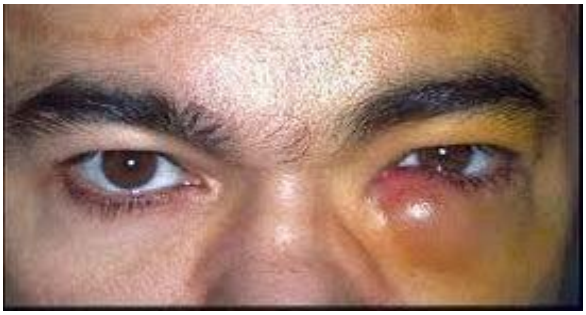


Fig 1: Original Image

Fig 2: Left Eye

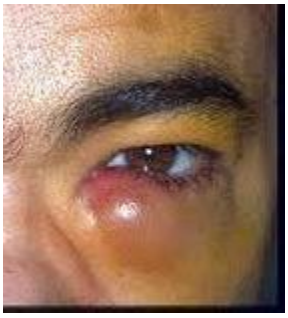


Fig 3: Right Eye

E. *Covariance of Each Eye*

The covariance between two images (left eye and right eye) E_l and E_r is given by the inner product of their centered versions, i.e, $Cov(E_l , E_r)$. Now after taking the threshold value (w.r.t. Retina) calculating the greed value, i.e.

$$COV\ (E_{r\_est}) = (M^T M)^{-1} M^T COV(E_l \Theta E_r) M (M^T M)^{-1} \text{ ----------(3)}$$

If the individual elements in the data vector d are uncorrelted and have the same variance δ2
In this case, $(M^T M)^{-1}$ is –except for the factor δ^2 , i.e, $COV(d) = \delta^2 I$ (1) reduces to

$$COV\ (E_{r\_est}) = (M^T M)^{-1} \delta^2 \text{ ----------(4)}$$

In this case, $(M^T M)^{-1}$ is –except for the factor δ2 –directly the covariance matrix of the model parameters.

This means that the diagonal elements contain the variances of the model parameters.

F. Disease grading based on covariance

Covariance based System is developed for disease grading by referring to the disease scoring scale in Table I. The main grading system depend on

$$G_r = \sum_{k=0}^{i-1}\sum_{l=0}^{j-1} Q(u,v)\log Q(u,v) \text{ -------(5)}$$

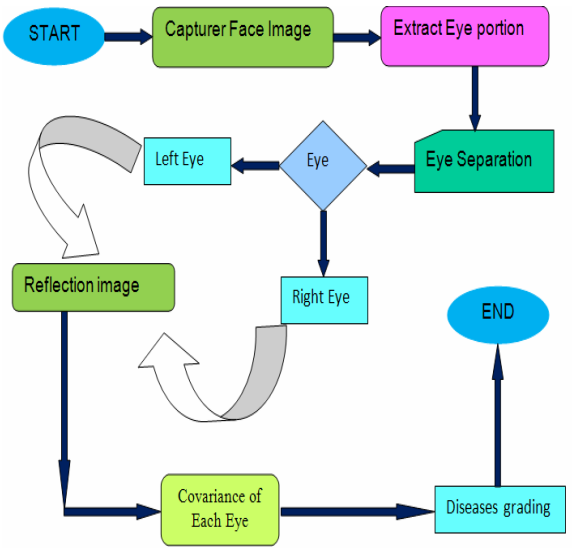
Where G_r = grade value, Q(u,v)= Image matrix function , k=row value and l=Colum value of each eye image.

$$Q(u,v) = \frac{q(u,v,1,0)}{\sum_{k=0}^{i-1}\sum_{l=0}^{j-1} Q(u,v,1,0)} \text{ -------(6)}$$

Disease Grade	Training Sample	Testing Sample	Classifier Accuracy
Anterior	110	37	96.7%
Stye	110	48	87.86%
Seborrheic	110	39	95.2%
Staphylococcal	110	48	93.56%

Table I: disease grading

III.PROPOSED WORK FLOW DIAGRM



IV. RESULT AND DISCUSSION

Now, Eye images are used to test proposed algorithm. First we get the Original Left Eye (Fig2) and another disease Right Eye (Fig3).Then we calculate the gray value of each Eye (Fig3 & Fig4).Now we get picks values from each histogram (Fig7 & Fig8) based of covariance and define the disease grading.

Fig1: Original Left Eye

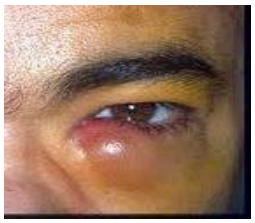


Fig2: Original affected leaf

Fig3: Gray Image

Fig4: Gray Image

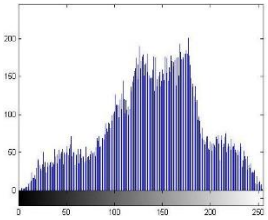


Fig7: Histogram

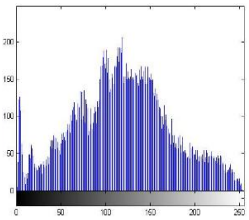


Fig8: Histogram

V. Conclusion

In this paper first, the captured infected eye images are collected from different patients and are processed for enhancement. Using the covariance approach and scoring scale technique to exact intensity pattern to *anterior* disease accordingly it is then possible to analyze the different Eye diseases. Then image segmentation is carried out to get target regions (disease spots). Finally, analysis of the target regions (disease spots) based on covariance approach to finding the phase of the disease and then the

treatment consultative module can easily be prepared on the lookout for human being. The result from the preliminary study indicated that the proposed strategy is effective to assess disease.

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AUTHORS PROFILE

Md. Alamgir Hossain has acquired the degree of MCA from University of North Bengal and M Tech from Bengal Engineering and Science University,Shibpur (BESUS),west Bengal. He is working his PhD in Computer Science and Engg. In the year 2012 from National Institute of Technology, Durgapur, India in the area of Image Processing .He is presently working as an Asst Professor of Calcutta Institute of technology under the department of MCA, Uluberia, Howrah, West Bengal, India. His areas of interest are Artificial Intelligence, Natural Language Processing and Image Processing.

Debabrata Samanta is a member of the IAENG, Board member of the Seventh Sense Research Group Journals (SSRGJ), member of Editorial Board of IJSCE. He obtained his B.Sc. (Physics Honors) in the year 2007, from the Vivekananda Collage, Takurpukur, under Calcutta University; Kolkata, India .He obtained his MCA in the year 2010, from the Academy Of Technology, under WBUT. He is working his PhD in Computer Science and Engg. In the year 2010 from National Institute of Technology, Durgapur, India in the area of Image Processing .He is presently working as a Lecturer of CSE in Abacus Institute of Engg. And Management, West Bengal, India. His areas of interest are Artificial Intelligence, Natural Language Processing and Image Processing. He has guided 6 PG and 15 UG thesis. He has published 26 papers in International Journals / Conferences.

Gautam Sanyal is a member of the IEEE. He has received his B.E and M.Tech degree from National Institute of Technology (NIT), Durgapur, India. He has received Ph.D. (Engg.) from Jadavpur University, Kolkata, India, in the area of Robot Vision. He possesses an experience of more than 25 years in the field of teaching and research. He has published nearly 98 papers in International and National Journals / Conferences. 3 Ph.Ds (Engg) have already been awarded under his guidance. At present he is guiding six Ph.Ds scholars in the field of steganography, Cellular Network, High Performance Computing and Computer Vision. He has guided over 10 PG and 130 UG thesis. His research interests include Natural Language Processing, Stochastic modeling of network traffic, High Performance Computing, Computer Vision. He is presently working as a Professor in the department of Computer Science and Engineering and also holding the post of Dean (Students' Welfare) at National Institute of Technology, Durgapur, India.