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Detection of Eye Cataract using MATLAB

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Abstract: ***This paper proposes and evaluates an algorithm to automatically detect the eye cataract with the help of digital image processing technique using MATLAB. Currently, methods available for cataract detection are based on the use of either fundus camera or Digital Single-Lens Reflex camera; both are very expensive. The main motive behind this work is to develop an inexpensive, robust and convenient algorithm which is conjugation with suitable devices which will be able to diagnose the presence of cataract. Here we provide a simple innovation idea which can be implemented for common man to detect the eye cataract disease in very affordable way. An algorithm is proposed for cataract screening based on texture features like uniformity, its shape, size, intensity and standard deviation. Retinal vessel segmentation algorithms are a fundamental issue of automated retinal sickness screening structures. This work examines the blood vessel segmentation methodologies in two dimensional retinal pix acquired from a fundus camera and a survey of techniques is offered. This paper reviews, examine and categorize the retinal vessel extraction algorithms, strategies and methodologies, giving a quick description, highlighting the important thing points and the performance measures. We intend to present the reader a framework for the existing research; to introduce the range of retinal vessel segmentation algorithms; to speak about the modern trends and destiny guidelines and summarize the open issues.***

Keyword: Cataract, Digital Image Processing, Fundus image, Graphical User Interface, Human eye,

I. INTRODUCTION

In this present arena, people are facing lots of eye health issues among them eye cataract is very commonly occurring disease in the people of age group of 40s or 50s. Today almost every human being knows about Eye Cataract disease. According to research, about 20 million people worldwide are blind due to cataract. Cataract becomes more common with age. Cataract is a kind of eye disease that is a clouding in the lens of the eye that affects vision. According to the World Health Organization (WHO), it is estimated that there is an annual increase in the backlog of people requiring surgery of over 2 million persons newly blind from cataract. About 2.2 billion people around the world are affected by blindness and vision impairments, more than 50% of the blindness is caused by cataract and around 40 million people will be blind by the year 2025[1]. At present cataract are detects by conducting various tests, including Visual Acuity test, Slit Lamp examination and Retinal exam. [2]

People living in rural and remote areas are the most affected by blindness due to inaccessibility to health services and ophthalmologists. For these people digital eye cataract detection system will be very useful and affordable. Therefore, the eye cataract detection system has been a research focus for some time. In the resent years many electronics devices have developed for retinal fundus image capturing and detecting cataract but these devises are reported to be expensive and have poor ability to detect cataract. [1] The entire computer aided cataract detection methods uses retinal, ultrasound or slit lamp images. These systems have increased complexities, and the cost of acquisition module is very high. Therefore there is a need for the development of low cost computer assisted cataract detection technique. Our iris color differs from person to person. The pupil is circular in shape so we can detect is using circular region detection algorithms for which Hough transform is the most common choice. This paper proposed a cataract detection system based on MATLAB that detect the cataract and non cataract from retinal fundus image. The basic method proposed in this paper for robust cataract detection algorithm can be described in three steps: preprocessing, feature extraction, and decision making.

II. RELATED WORK.

Utilizing Computer-assisted prognosis of retinal fundus image is turning into an alternative to manual inspection of the fundus by using a expert, called direct ophthalmology. Moreover, laptop-assisted prognosis of retinal fundus photos turned into shown to be as dependable as direct ophthalmology and calls for less time to be processed and analyzed. Various eye associated pathologies that can result in blindness, consisting of macular degeneration and diabetic retinopathy are automatically identified with the aid of making use of retinal fundus snap shots. Although several segmentation methods were proposed, this segmentation stays difficult due to variations in retinal vasculature community and photograph quality. Many research have been carried out on detection of eye cataract, some of them are given below

A. Retinal Blood Vessel Segmentation in Fundus Images using Improved Graph Cut Method by P.R Wankhede-

The extraction of blood vessels is a challenging for disease classification due to their complex and variable anatomic structures in the fundas images. Several methods have been proposed in literature for segmentation of blood vessels from the retinal images. Ophthalmologist uses retinal image features for early detection and possible treatment of retinal diseases. It is necessary to segment blood vessels automatically from retinal images to avoid manual time consuming processes. In this paper they have presented the extension of graph cut based algorithm for segmentation of blood vessels from retinal images. This method is robust for segmentation of blood vessels. They addressed central light reflection problem associated with retinal images and `shrinking bias' problem associated with graph cut algorithm. They introduced modified Gaussian filter for removing central light reflection from retinal images. The geometric concept of flux of a given vector field and length/area combined within the global optimization framework of graph cuts. In this paper it is shown that how to integrate flux concept in graph cuts for improving segmentation of long thin blood vessels which helps to remove `the shrinking bias' problem.

B. Retinal Blood Vessels Semantic Segmentation Method Based on Modified U-Net by Ling Lou1 –

Automatic segmentation of retinal blood vessels from fundus images plays a key role in the computer aided diagnostic system, which is helpful for the early treatment of many fundus diseases including diabetic retinopathy, glaucoma and hypertension. In this paper a modified U-Net is proposed to train semantic segmentation models for retinal blood vessels.

C. Retinal Image Enhancement Technique for Blood Vessel Segmentation Algorithm by A. M. R. R. Bandara-

The morphology of blood vessels in retinal fundus images is an important indicator of diseases like glaucoma, hypertension and diabetic retinopathy. The accuracy of retinal blood vessels segmentation affects the quality of retinal image analysis which is used in diagnosis methods in modern ophthalmology. Contrast enhancement is one of the crucial steps in any of retinal blood vessel segmentation approaches. The reliability of the segmentation depends on the consistency of the contrast over the image. This paper presents an assessment of the suitability of a recently invented spatially adaptive contrast enhancement technique for enhancing retinal fundus images for blood vessel segmentation. The enhancement technique was integrated with a variant of Tyler Coye algorithm, which has been improved with Hough line transformation based vessel reconstruction method. The assessment was done by comparing the segmentation performance with five widely used contrast enhancement techniques based on wavelet transform, contrast limited histogram equalization, local normalization, linear un-sharp masking and contour let transform.

D. A Novel Retinal Vessel Extraction Method Based on Dynamic Scales Allocation by Duüduü Güu-

Automatic extraction of retinal vessels is significant for diagnosis of eye diseases. Currently, the automatic extraction of the vessels in the retinal images with very low contrast and various widths is a bottleneck. In this paper an effective retinal blood vessel extraction method to detect fine vessels more accurately was presented. The contribution of this work is that a novel dynamic scale allocation scheme of the matched filter was proposed. The whole image is divided into sub-blocks. The histogram of each sub-block is fitted by Gaussian function whose fitting parameters are used to select the scales. Compared with the existing blood vessel extraction using uniform multistage matched filter, the proposed method detects many fine vessels drowned by noise and has good width estimation.

E. Blood Vessel Segmentation using Hessian Matrix for Diabetic Retinopathy Detection by Anupama. P-

Now a day is diabetes. The diabetic retinopathy (DR) is among one of the diseases lead to sight loss. The blood vessels are representation of retina pathology. Hence, in detection of diabetic retinopathy using image processing blood vessel segmentation is major step. It is challenging task for blood vessel segmentation as they are low contrast and narrow. Improving the blood vessel Segmentation is inspiration of the work. In this paper, Hessian Matrix is the process used for blood vessel segmentation. Eigen values are calculated based on the Hessian matrix for low Frequency of the FFT of green channel of the retinal image.

III. PROPOSED WORK

Segmentation and review of retinal vasculature characteristics for example normal or abnormal branching, shading and diameter as well as the optic disk morphology permits eye care experts and ophthalmologists to perform mass vision screening exams for early discovery of retinal ailments and treatment assessment. This could forestall and decrease vision debilitations, age-related diseases, and numerous cardiovascular ailments, and in addition diminish the expense of the screening. In manual assessment, segmentation and estimation accuracy also fluctuates relying upon nature of the retinal images, graders ability and experience. Moreover, manual segmentation and estimation procedures can take up to an hour for assessment of just a single eye. In this way, a completely automated framework extracting the vessel structures in retinal images could surely diminish the workload of eye clinician.

1) *Step1:* To calculate mean of blood vessels and area of exudates.
2) *Step2:* To train the SVM classifier using the mean values of the blood vessels and the area of the exudates of the training database.
3) *Step3:* To classify the images of testing database using Support Vector Machine Classifier into Healthy or Diabetic retinal images.

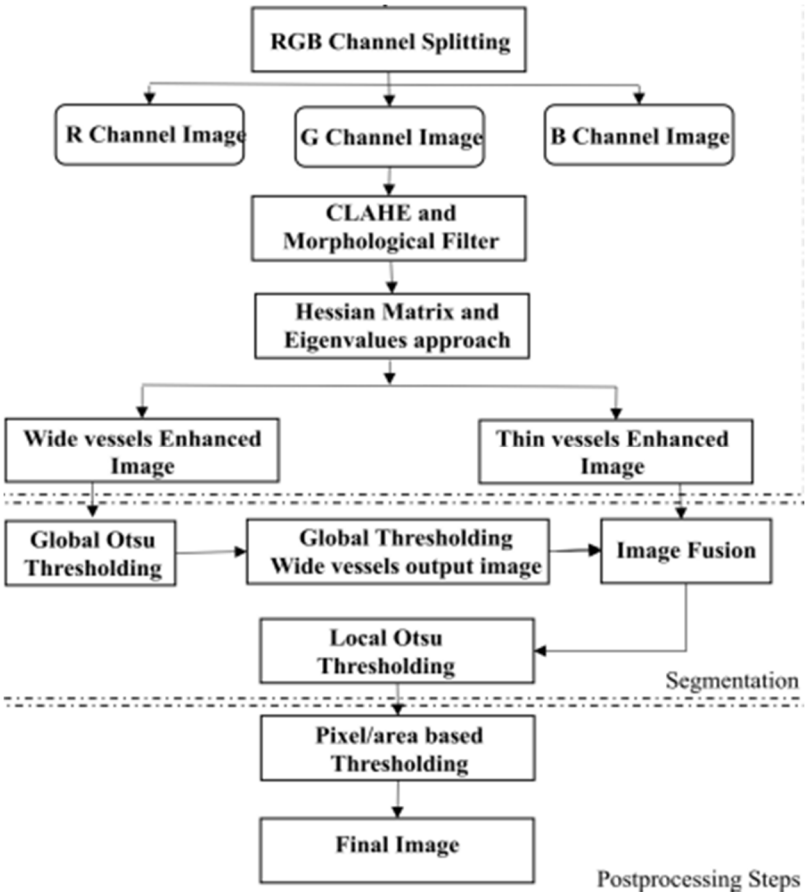

Fig. 1 Proposed System Process Diagram

IV. WORKING

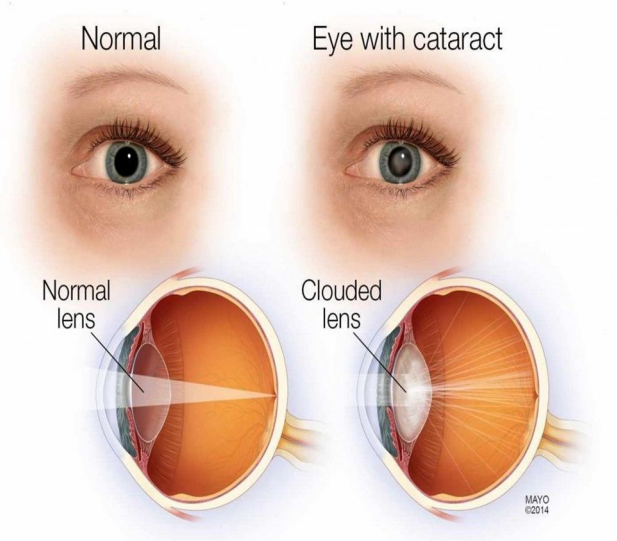

Fig 2. Demonstartion of Normal Eye and a catarct Eye

The first step is capturing of retinal fundus image. Fundus image is captured by a fundus camera .Retinal fundus image documentation that records the appearance of patient's retina. This image allows the Dr. to study a patient's retina, detect retinal changes and review a patient's retinal findings. This fundus image has to be pre processed and preprocessing takes place in four steps.

1) Colour space conversion: This is generally performed for converting an image that is represented in one color space to another color space. In our project RGB (Red Green Blue) color space in the image is converted into HSI (Hue, Saturation, Intensity) space. HIS represents colors similarly how the human eye senses colours.

2) Median filtering: It is used to reduce noise\disturbance present in the image. Basically it reduces 'salt and pepper' noise. This noise is caused by sharp and sudden disturbances in the image signal

3) .Contrast Enhancement: It is the process that makes the image features more clearly by making optimal use of the colors available. Contrast limited adaptive histogram equalization is applied in our project. Contrast limited adaptive histogram equalization is used for adjusting image intensities to enhance contrast.

4) Gaussian filtering: Gaussian filtering is done by Gaussian smoothing filter and these are commonly used to reduce noise present in the image .So for further suppression of noise Gaussian filtering is done.

Feature extraction is carried out it is a process of identification of important features or attributes of the given data or image. The features extracted are blood vessel area, hemorrhage area, bifurcation points, optical distance area, Shannon entropy, micro aneurysms area and exudates area. Quantitative analysis is a broad term that covers a range of techniques that include tasks such as finding shapes, detecting edges, removing noise, counting objects and calculating statistics for texture analysis of an image. Quantitative analysis of the entire feature extracted is then performed. Feature ranking is the process of selecting a subset of relevant features for use in model construction.

V. CONCLUSION

The proposed techniques are very effective for the retinal vessels segmentation. In quantitative terms, the method the usage of the median ranking has superior overall performance than using the weighted suggest technique. Moreover, it affords costs better than the unsupervised techniques, described on these paintings. This method has better accuracy charge than the supervised techniques for the Stare database and overall performance close to the first-class method for the Drive database. The weighted imply approach the usage of FCM has higher effects in phrases of accuracy than the ORSF approach

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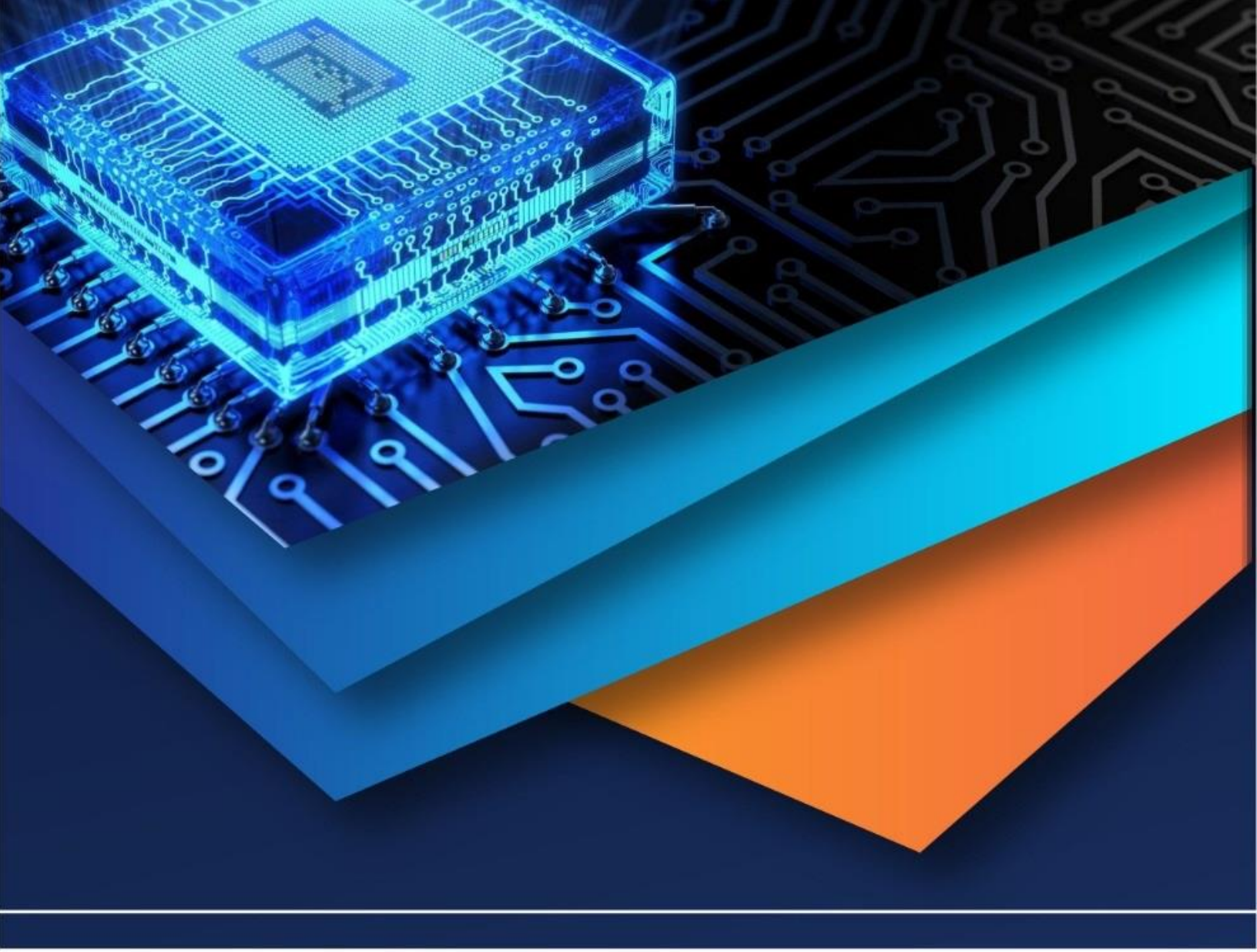

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