Preprocessing Methods for Enhancing Micro aneurysm in Fundus Images

V.A.Aswale[1], J. A. Shaikh (Associate professor) [2]
Department of Electronics, Padmabhushan Vasantdada Patil Institute of Technology, Budhgaon, Sangli
Department of Electronics, Padmabhushan Vasantdada Patil Institute of Technology, Budhgaon, Sangli

***Abstract*-Diabetic retinopathy is an eye disease caused due to abnormalities in blood vessels. Detection of micro aneurysms in fundus retinal images is the early stage of diagnosis Diabetic Retinopathy (DR). Micro aneurysm is tiny aneurysm or swelling in side of blood vessels. Image processing plays vital role in automatic detection of DR. The initial stage of this, is Preprocessing.**
Therefore in this paper we are going to introduce preprocessing techniques which are useful for feature extraction for detection of microanuerysm in retinal images.
***Index Terms*- Diabetic retinopathy (DR), Micro aneurysm, Preprocessing.**

I. INTRODUCTION

Diabetic retinopathy (DR), eye disease Caused due to diabetes, which degrades retinal blood vessels and it cause blindness. [1] It affects up to 80 % of people who have had diabetes for 20 years or more. At least 90% of new cases can be reduced if there are proper treatment and monitoring of the eyes. The longer a person has diabetes, the higher his or her chances of developing diabetic retinopathy. Each year in the diabetic retinopathy accounts for 12% of all new cases of blindness. It may cause the blindness for people aged 20 to 64 years. The abnormality is caused due to some changes in blood vessels. In some cases of DR, fluid may leak from blood vessels. For other patients, there is growth of some new blood vessels on surface of the retina. For good eye sight healthy retina is required. The early signs of DR are Micro aneurysms (MAs), so there is need of detecting this lesion. The MAs are appearing in small circular dark spots on the surface of the retina. [2] The detection of MAs is hard because, it is not easy to distinguish them from certain parts of the vascular system. Mostly micro aneurysms are appeared near thin vessels. [3] If diagnosis of DR is made early then it can be treated with help of available methods. Diabetic retinopathy doesn't give any symptoms until there is late.

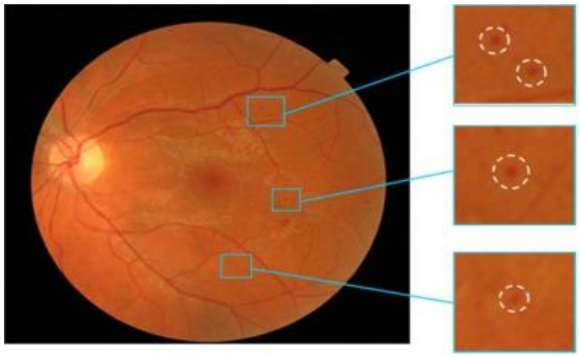

Fig.-1*Fundus image with micro aneurysm*

II.PREVIOUS WORK

Preprocessing is the primary stage in image processing related with diagnosis. Images from database contain noise as well as poor illumination.
M.V. Anifa Jini *et.al* [4]states, preprocessing is necessary to ensure adequate level detection in input image. For extracting very small elements Top-Hat transformation is done. Weiner filter and median filter is used to check the performance. And conclude that median filter gives best result as compared to weiner.
Rukhmini Roy *et.al* [5] proposed a common preprocessing method that is CLAHE. For making the region of interest more clear and visible this method is very effective.
Ardimas Andi Purwita *et.al* [6] used contrast enhancement and Adaptive histogram equalization for enhancement process. For detecting and removing optic disk contrast enhancement is done, AHE is used for enhancing required features. (Vessels and small object)G.NagarjunaReddy*et.al* [7] represents, Gaussi-an mask with variance 1 and conclude that with help of this noise can be reduced.[8]To remove the noise

and to increase the quality of an image median filtering and CLAHE are used.

III. METHODOLOGY

The aim of preprocessing on fundus images is to obtain an image which is noise free and contrast enhanced. In DR the lesion may not be visible with low contrast as well as low brightness, so there is necessary of preprocessing stage. [9,10]. For detecting the abnormalities related with retinal images preprocessing is essential, which helps to improve the visibility of micro aneurysms in the input fundus image. So In this paper we propose a framework which contains preprocessing methods which are applied on input image. The fig.1 shows the flow chart of proposed work.

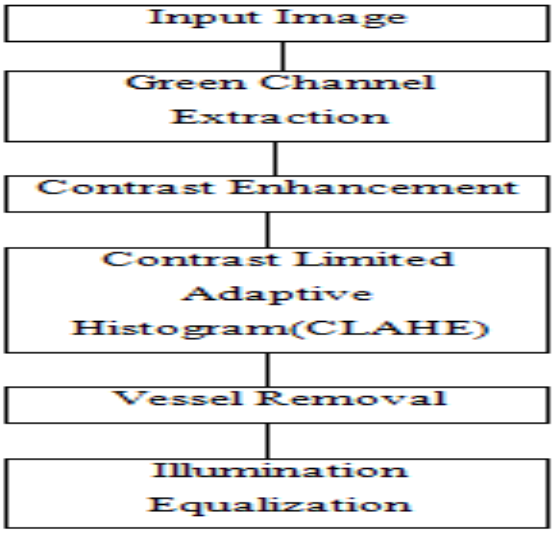

Fig.(A) Flow chart

A. *Material*

The database contains 50 fundus images. The input image taken is of 640*640 pixels

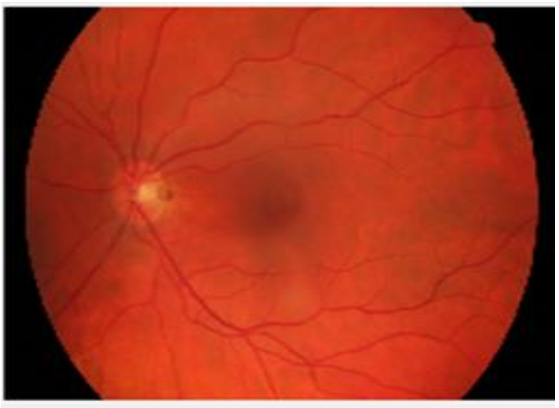

Fig.(b)Input Image

B. *Input image & Green channel Extraction*

The image is taken from database. The initial step is to read 3D RGB image, after reading the RGB image, green channel is extracted, because fundus image absorbed less green light. Thus MAs are represented with highest contrast in green channel. Also in comparison with other two channels green channel is less noisy.[10]Thus green channel is best to represent the MA with highest contrast. The Histogram equalization (HE) method is useful to improve the contrast of an image [11].Contrast of the image is progressed with the help of enhancement function. The images with background and foreground which are either bright or dark HE method are very helpful. [12] Thus the contrast of green channel image is enhanced using Histogram equalization.

C. *Walter*

Klein Contrast Enhancement image:

By applying grey level transformation on input retinal images the contrast of the image is increased with the help of this method. [13]

D. *Contrast limited adaptive histogram equalization (CLAHE)*

Contrast limited adaptive histogram equalization functions on small region contrary to full image.(Tiles).So to increase the clarity of important part of an image and to make it more clear & visible this popular method has been used.[14] Adapthisteq enhances the contrast of images by transforming the values in the intensity image.

E .*Vessel Removal*

Especially for thin and unseeable vessels the clarity of vascular format is not good. So it is essential to intensify the vessels. [15,16]The unnecessary vessels are removed from image with inpainting method, which makes the image more clearly for detecting MA.

F. *Illumination Equalization*

The purpose of this method is to remove the illuminations which are not even.

G. *No preprocessing*

The extraction method is done except the preprocessing.

IV RESULTS

Thus to reduce the imperfections such as poor contrast and noise and to form an image more suitable for extracting pixels features required for classification stage preprocessing is done.

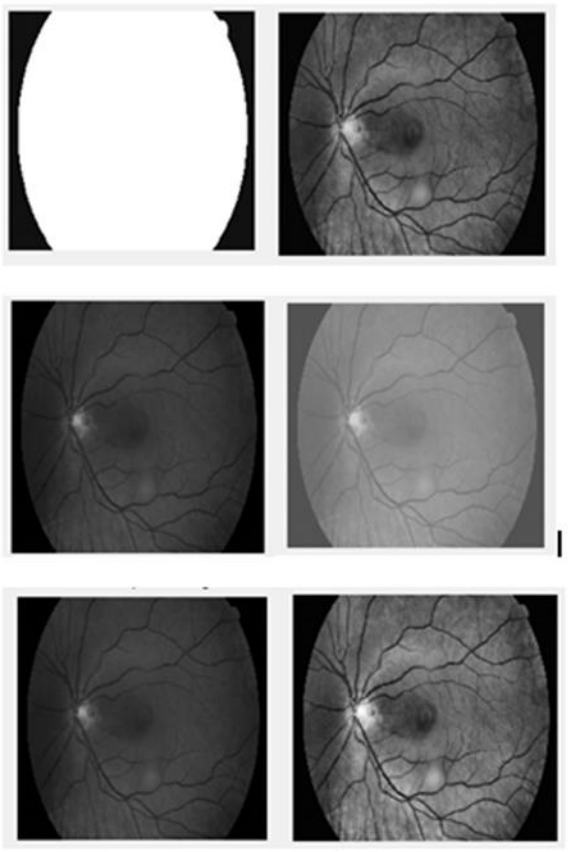

Fig. (3) Contrast enhancement. (4)CLAHE (5) Vessel removal (6) illumination equalization (g) No preprocessing (7) clahe image

V. CONCLUSION

This paper contains preprocessing methods which enhances the contrast of an image. As compared to other methods CLAHE is easy to distinguish the MA from their background. So the output image contains all the required characteristics for further process such as candidate extraction and classification.

REFERANCES

[1] Akshatha Rao M. and Dharmanna Lamani, Rekha Bhandarkar T. C. ManjunathAutomated Detection of Diabetic Retinopathy through Image Feature Extraction, 2014 International Conference on Advances in Electronics, Computers and Communications (ICAECC).

[2] Istvan Lazar* and Andras Hajdu," Retinal Microaneurysm Detection through Local Rotating Cross-Section Profile Analysis IEEE TRANSACTIONS ON MEDICAL IMAGING, VOL. 32, NO. 2, FEBRUARY 2013

[3] Miss. Pooja G.shetty Dr. Shrinivas A. Patil Mr.Avadhoot R.Telepatil Detection of Micro aneurysm and Diabetic Retinopathy Grading in Fundus Retinal Images, International Journal of Engineering Trends and Technology (IJETT) – Volume 13 Number 7 – Jul 2014

[4] M. V. Anifa Jini, Karunya, "Automated Detection of Microaneurysms to assess DiabeticsRetinopathy",International Conference On Electronics And Communication Systems(ICECS-20 14)

[5] Rukhmini Roy, Srinivasan Aruchamy, Partha Bhattacharjee," Detection of Retinal Microaneurysms using Fractal Analysis and Feature Extraction Technique" International conference on Communication and Signal Processing, April 3-5, 2013, India

[6] ArdimasAndiPurwita,KresnoAdityowibo,Ashlih Dameitry,MadeWidhiSuryaAtman,"Automated MicroaneurysmDetectionUsingMathematicalMorphology",2011InternationalConferenceonInstrumentation,Communicati-on,Information Technology and Biomedical Engineering8-9 November 2011, Bandung, Indonesia

[7] G.Nagarjuna Reddy K.Durga Ganga Rao,"Microaneurysm Identification using Cross Sectional Profile Analysis with Optic Disc Removal".

[8] Syna Sreng, Noppadol Maneerat, Don IsarakornRonakorn,"AutomaticHemorrhages Detection Based on Fundus Images "2015 7th International Conference on Information Technology and Electrical Engineering (ICITEE), Chiang Mai, Thailand.

[9] Ms. SheetalMarutiChougule Prof. A. L. Renke "New Preprocessing approach for Images in Diabetic Retinopathy Screening." International Journal of Engineering Research and Technology. ISSN 0974-3154 Volume 10, Number 1 (2017) © International Research Publication House http://www.irphouse.com

[10] C Aravind M.PonniBala S. Vijayachitra, "Automatic Detection of Microaneurysms and Classification of Diabetic Retinopathy Images using SVM Technique**",** International Journal of Computer Applications (0975 – 8887) International Conference on Innovations In Intelligent Instrumentation, Optimization And Signal Processing "ICIIIOSP-2013"

[11] Husna Ab Rahim, Ahmad Syahir Ibrahim, W Mimi Diyana W Zaki, Aini Hussain" Methods to Enhance Digital Fundus Image for Diabetic Retinopathy Detection" 2014 IEEE 10th International Colloquium on Signal Processing & its Applications (CSPA2014), 7 - 9 Mac. 2014, Kuala Lumpur, Malaysia

[12] Ritika Sandeep Kaur "Contrast Enhancement Techniques for Images–A Visual Analysis", International Journal of Computer Applications (0975 –8887) Volume 64–No.17, February 2013

[13] M.Kavitha, Dr.S.Palani," Hierarchical Classifier for Microaneurysm Detection ", International Journal of Applied Engineering Research ISSN 0973-4562 Volume 10, Number 1 (2015) pp. 1449-1458© Research India Publications

[14] B´alint Antal and Andr´as Hajdu, "An Ensemble-Based System for Microaneurysm Detection and Diabetic Retinopathy Grading", IEEE TRANSACTIONS ON BIOMEDICAL ENGINEERING, VOL. 59, NO. 6, JUNE 2012

[15] Christy.R.Joseph,JewelAlexander,"Micro aneurysm Detection and Diabetic Retinopathy Grading Using Candidate Extraction Algorithm." IJREAT International Journal of Research in Engineering & Advanced Technology, Volume 1, Issue 1, March, 2013 ISSN: 2320 - 8791 www.ijreat.org

[16] A.Criminisi,P.PerezandK.Toyama,"Objectremov albyexemplarbasedinpainting,"inProc.IEEEConf. Comput.Vision Pattern Recog., vol.2, 2003, pp.II-721-II-728.