Asian Journal of Applied Science and Technology (AJAST)
Volume 1, Issue 3, Pages 27-30, April 2017

The Segmentation of Age Related Macular Degeneration in Color Fundus Image

J.Jeyasree[1] and K.Bhuvaneshwari[2]

[1]*PG Scholar, Department of Electronics and Communication Engineering, IFET College of Engineering, Villupuram, India.*
[2]*Assistant Professor, Department of Electronics and Communication Engineering, IFET College of Engineering, Villupuram, India.*

Article Received: 21 March 2017 *Article Accepted: 30 March 2017* *Article Published: 02 April 2017*

ABSTRACT

The age related macular degeneration is a deterioration breakdown of the eyes macula. The macula is the small part of the retina it and is responsible for your central vision allowing you to see the fine details clearly. ARMD is a retinal disorder and affects the central vision but not the peripheral vision. To detects and diagnosis the disease helps to cure the earlier stage. In around the world fifteen million people are suffered from the thinning of macular tissues, depositing of macula. These tissues are called abnormalities. The abnormalities are segmented by multistage segmentation process. Here Bradley local thresholding based segmentation along with canny edge detection algorithm is used and intensity based feature extraction is used to extract the abnormalities. The threshold based binary classification is used to classify the abnormal tissues based on threshold value. If the number of abnormal pixels is more than threshold value it is considered as an ARMD disease or less than threshold value means it is considered as a normal eye.

Keywords: Macular degeneration, Tissues and Pixels.

1. INTRODUCTION

The age related macular degeneration is a retinal disorder usually found in above 50 age peoples. In nowadays ARMD occurs above 20 age peoples. ARMD is an eye disease that progressively destroys the macula, central portion of the retina. Macula is a light sensitive tissue it is made up of millions of light sensing cells that provides the sharp and central vision. It is the most sensitive part of the retina, which is located at the back side of the eye. The retina is turns the light signal into electrical signal and sends this electrical signals through the optic nerve to the brain, where they are translated into the images we see.

With normal central vision, we are able to read, drive, and perform other activities that require fine, sharp, straight-ahead vision. Macula is affected we cannot perform these activities. This disease is progress faster and leads to loss of vision in both eyes. In center of retina the block spots are developed and get larger blurry area because of macular degeneration. It is not leads to complete blindness but it affect the day to day life and leads to complete vision loss. The main objective of my project is to detect and segment the age related macular in retinal fundus image. So we can easily identify the disease easily and diagnosis the disease in earlier stages. It is more helpful in medical field to identify the disease and this method is used for more people. Because it affects the both eyes simultaneously.

It mainly targets on macula because it is responsible to read far and near objects. The canny edge detection algorithm is used to detect the macular degeneration. The following processes used to detect the disease are image enhancement, image segmentation, thresholding, edge detection, morphological operations. Macular degeneration has two types are wet and dry macular degeneration. Approximately 10-15% of the macular degeneration is the “wet” (exudative) type. In the “wet” type of macular degeneration, abnormal blood vessels grow under the retina. These new blood vessels may then bleed and leak fluid, causing the macula to bulge or lift up from its normally flat position, thus destroying the central vision. Under these circumstances, vision loss may be rapid and severe. In dry AMD (atrophic), patients have symptomatic central vision loss due to retinal atrophy. Dry AMD occurs when the blood vessels under the macula become thin and brittle. This form is the most common type of clinical AMD, accounting for 80-90% of cases and progresses slowly. In 10-20% of people, it progresses to the wet type.

2. LITERATURE SURVEY

The drusen is affected the area of the retina. Drusen are small yellow deposits in the retina that act like trash cans and collect waste products. They can multiply progress and grow larger, and can overflow. This growth and overflow cause blockage of nutrients to the retina and RPE cells. When RPE cells die, the overlying retina can begin to deteriorate. This is called as atrophic macular degeneration. This can be detected and find the size, area using combined local intensity distribution, adaptive intensity thresholding and edge information [1].

Automated diagnosis of age related macular degeneration from color fundus images. The automated image processing is used to early detection of macular degeneration by detecting changes in blood vessel and patterns in the retina. It’s a gradual loss of vision by oxidation of macula. Detection of ARMD is done by using probabilistic neural network [2].

The retinal images are contains the two main structures of optic disc and fovea. To develop an automatic approach for detection of eye diseases like glaucoma and macular edema. This method is used to detect the fovea. The morphological operations are used to detect the fovea [3]. The automated detection of blood vessels are plays an important role in the many eye diseases as well as systematic diseases. The matched filters are used to detect the blood vessels [4].

3. SCHEMATIC DIAGRAM OF THE PROPOSED METHOD

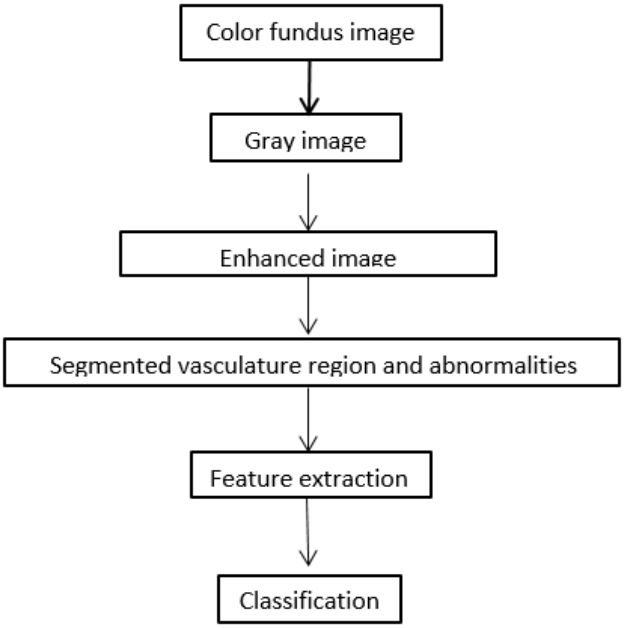

Fig.1a. Block diagram of the proposed method in algorithm

3.1 Retinal fundus image

The input image is taken for processing which is color fundus image where they are stored in the database. The first step in the program is to read the image and continue further process. It is shown in fig.1b.

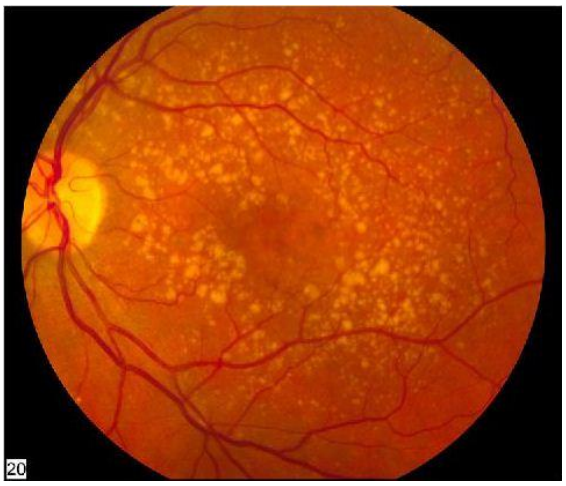

Fig.1b.Input fundus image

3.2 Conversion from color to gray

The input fundus image is a combination of Red, Green, and Blue. For further processing we need to convert the color image into gray image. The process of converting gray image is luminosity method is used.

The formula for luminosity process is given below,

$$0.21R+0.72G+0.07B$$

RGB is 3 color plane, we cannot continue the further processing. So we convert into a single plane shown in fig.2.

3.3 Enhancement process

The purpose of enhancement process is to adjust a contrast of image. The gray image needs the contrast adjustments to make, the edges are more visible, the spatial domain enhancement techniques are used. Here the color map technique is used to increase the contrast of an image shown in fig.4.

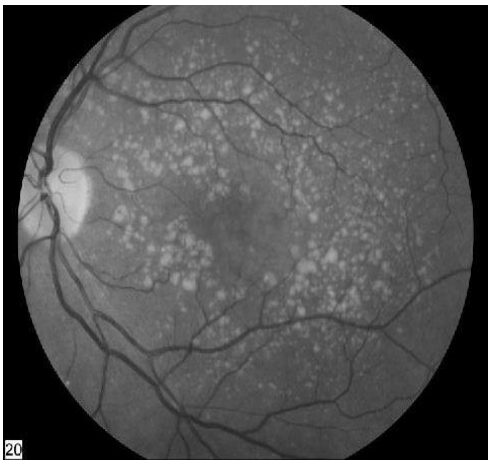

Fig.2. Grayscale image

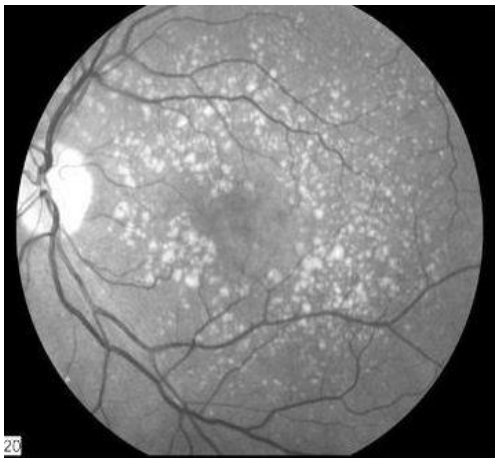

Fig.3. Enhanced image

.

3.4 Segmentation of vasculature region

The retinal blood vessels are containing the major vascular network. The blood vessels are appearing like an orange-red filament. The retinal blood vessels are containing the arteries and veins. The arteries and veins are located closed to optic disc. So it was interfered the detection of disease. So it can be detected and segmented using canny edge detection algorithm.

The image first smoothed by using Gaussian filter. It can be denoted as following equation,

$$S=G\sigma*I$$

Where, G is Gaussian filter and I is input image. The morphological operations applied for eliminate the small false detections. The abnormalities alone will be filtered for further

processing. Because it is used to detect the disease by comparing of the pixels values in the blood vessels. It is shown in fig.4.

3.5 Feature extraction

In feature extraction we have to extract the features of the blood vessels in the retina. Because the purpose of comparing the values of blood vessels. In those blood vessels itself the abnormal tissues are present. So we have extracted the particular blood vessels in the image. Here to extract the blood vessels the edge based extraction method is used. It is shown in fig.4.

Fig.4. Segmented and extracted image

3.6 Classification

In previous step to extract the blood vessels and using that particular extracted image to classify whether it is normal image or affected retinal image. Here the threshold based binary classification is used to classify the disease. In that we have to fix the value and compare the each pixel in an extracted image. If the fixed value is less than pixel value means it is considered as a normal image else the fixed value is greater than pixel value means it is considered as a affected retinal image. It is shown in fig.6.

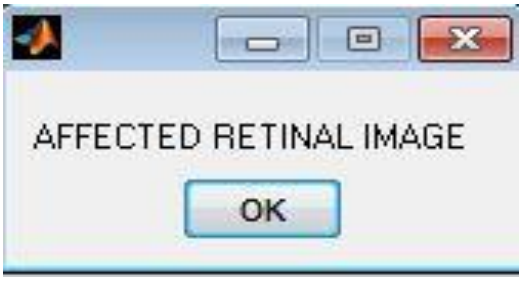

Fig.5. Classification

4. RESULTS AND CONCLUSION

The age related macular degeneration is the one of the main leading vision loss in peoples. Here we are proposed a method to detect and segment the ARMD in color fundus images. In that we have to take 10 affected images and 7 normal images for checking the proposed algorithm. The accuracy of detecting disease is gives 97%, compare to existing system it will be increased.

REFERENCES

[1] Alauddin Bhuiyan; C. Karmakar; Di Xiao; Kotagiri Ramamohanarao; Yogi Kanagasingam" Drusen quantification for early identification of age related macular degeneration (AMD) using color fundus imaging" *2013 35th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*, 2013.

[2] R. Priya; P. Aruna" Automated diagnosis of Age-related macular degeneration from color retinal fundus images" *2011 3rd International Conference on Electronics Computer Technology*, 2011, Volume: 2.

[3] Khawaja Muhammad Asim; A. Basit; Abdul Jalil" Detection and localization of fovea in human retinal fundus images" *International Conference on Emerging Technologies*, 2011.

[4] Jan Odstrcilik; Radim Kolar; Attila Budai; Joachim Hornegger; Jiri Jan; Jiri Gazarek; Tomas Kubena; Pavel Cernosek; Ondrej Svoboda; Elli Angelopoulou" Retinal vessel segmentation by improved matched filtering: evaluation on a new high-resolution fundus image database" Volume: 7, Issue: 4, 2013.

[5] R. Theodore Smith; Noah Lee; Jian Chen; Mihai Busuioc; Andrew F. Laine" Interactive image analysis in age-related macular degeneration (AMD) and Stargardt disease (STGD)" *42nd Asilomar Conference on Signals, Systems and Computers*, 2008.

[6] Ziyang Liang; Damon W. K. Wong; Jiang Liu; Kap Luk Chan; Tien Yin Wong" Towards automatic detection of age-related macular degeneration in retinal fundus images" *2010 Annual International Conference of the IEEE Engineering in Medicine and Biology*, 2010.

[7] M. Niemeijer; M. D. Abramoff; B. van Ginneken" Automated localization of the optic disc and the fovea" *2008 30th Annual International Conference of the IEEE Engineering in Medicine and Biology Society*, 2008.

[8] Vyshakh Asokan; S Albert Jerome" Computer aided approach for detection of age related macular degeneration from retinal fundus images" *2016 International Conference on Circuit, Power and Computing Technologies (ICCPCT)*, 2016.

[9] Frederic Zana and Jean-Claude Klein "Segmentation of Vessel-Like Patterns Using Mathematical Morphology and Curvature Evaluation" *IEEE transactions on image processing*, vol. 10, no.7, July 2001.

[10] D. Jayanthi, N. Devi, S. Swarna Parvathi, "Automatic Diagnosis of Retinal Diseases from Color Retinal Images", *International Journal of Computer Science and Information Security*, Vol. 7, Pp. 1, 2010.

[11] Jan Odstrcilik, Radim Kolar, Attila Budai, Joachim Hornegger, Jiri Jan, Jiri Gazarek, Tomas Kubena, Pavel

Cernosek, Ondrej Svoboda, Elli Angelopoulou "Retinal vessel segmentation by improved matched filtering: evaluation on a new high-resolution fundus image database "*The Institution of Engineering and Technology*, 2013.

[12] Cinsdikici, M.G., Aydin, D.: 'Detection of blood vessels in ophthalmoscope images using MF/ant (matched filter/ant colony) algorithm', *Comput. Methods Programs Biomed.*, 2009, 96, (2), pp. 85–95.

[13] R.D. Jager, W.F. Mieler, J.W. Miller, "Age-related macular degeneration," *NEJM*, 358, 2606-17, 2008.

[14] S.Y. Shen, T.Y. Wong, P.J. Foster, J.L. Loo, M. Rosman, S.C. Loon, W.L. Wong, S.M. Saw, T. Aung, "The prevalence and types of glaucoma in malay people: the Singapore Malay eye study,". *Invest. Ophth. Vis. Sci.*, vol. 49, 3846-51, 2008.

[15] C. Kose, U. Sevik, O. Genalio, C. Ikibas and T. Kayikicioglu, A Statistical Segmentation Method for Measuring Age-Related Macular Degeneration in Retinal Fundus Images, *J Med Sys*, vol. 34, pp. 1-13, 2010.

[16] *https://www.mathworks.com*

[17] *http://www.bogotobogo*

[18] *http://stackoverflow.com*