International Journal of Research
Available at https://edupediapublications.org/journals
e-ISSN: 2348-6848
p-ISSN: 2348-795X
Volume 04 Issue 14
November 2017

Efficient Retinal Image Segmentation Using Wavelets and Neural Networks

Mohd Mazhar Hussain
M.Tech Scholar
Vijay Rural Engineering College

Prof. Prakash J.Patil
Head of the Department(ECE)
Vijay Rural Engineering College

Dr.B.R.Vikram
Professor and Principal
Vijay Rural Engineering College

ABSTRACT:-

Retinopathy has turned into a commonly spread disease in the world and it causes many complications. One of the common vision threatening debilitating complexities of Diabetic Retinopathy. It occurs when blood vessels in the patient's retina begin to leak into the macula region of eye. The purpose of this paper is to extricate features from retina digital images based on a further analysis of high frequency components (HH) obtained with the Discrete Wavelet Transform (DWT). In particular, the DWT is applied to the retina photograph to obtain its high-high (HH) image sub band using db1,symlet,biorthogonal wavelet transform. Then, a further decomposition by DWT is applied to the HH image subband of the previous step to obtain HH*. Finally, statistical features are computed from HH* Discrete Wavelet Transform (DWT) based features and Adaptive Neural Inference System is reported. The computational results show that present stage(i.e., normal or abnormal) and gives overall accuracy and sensitivity, specificity.

Keywords:- Discrete wavelet transform, Neural network , Diabetic retina, Hard exudates, fundus.

I-INTRODUCTION

Computer-aided diagnosis (CAD) has been the subject of a considerable measure of research as a tool to help health professionals in medical decision making. Subsequently, numerous, many CAD systems integrate image processing, computer vision, and intelligent and statistical machine learning methods to aid radiologists in the interpretation of medical images and ultimately help improve diagnostic accuracy. The typical process begin with a segmentation stage to recognise one or more regions of interest (ROI) in the image of interest. Then, the ROI(s) is processed for image enhancement and/or feature extraction before classification. Because the segmentation step requires prior knowledge of discriminate image features and its implementation typically calls for numerous parameter settings, recent works have attempted to eliminate it. These methodologies acknowledge feature space reduction by applying one or more transforms to the whole image and extracting the feature vector to classify from one or more of the obtained components. Diabetic Retinopathy is caused because of the increase in intraocular pressure of the eye. The intraocular pressure increases due to malfunction or malformation of the drainage system of the eye. The increased intraocular pressure within the eye damages the optic nerve through which retina sends light to the brain where they are perceived as images and makes vision possible[1]. The objective of this paper is to develop an algorithm which automatically analyze eye ultrasound images and classify normal

eye images and diseased Diabetic Retinopathy eye images. The two central issues to automatic recognition feature extraction from the retinal images and classification based on the chosen feature extracted.Several pathologies affecting the retinal vascular structures due to diabetic retinopathy can be found in retinal images.

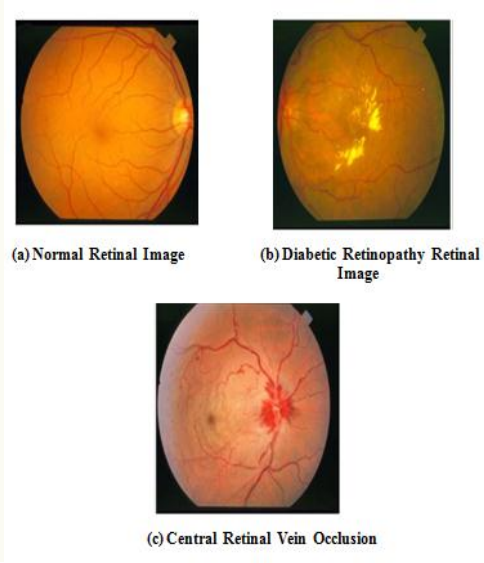


Figure 1: Retinal Images

Ophthalmologists use digital fundus cameras to non-intrusively view the optic nerve, fovea, surrounding vessels and the retinal layer .Since retinal imaging is non-invasive, there is a rapid increase in the number of images which are being collected. Diagnosing these large volumes of images is expensive, tedious and may be prone to human error. To aid the doctors with this diagnostic task, a computer-aided diagnosis scheme could offer an objective, secondary opinion of the images.

II-RELATED PROBLEMS

Dynamic Thresholding

In this method we have applied median filtering onto the input image directly if it is in grayscale, otherwise we have to convert the input image into grayscale before applying median filtering. It corresponds to the boundary between two regions or a set of points in the image where luminous intensity changes very sharply.The presence of an edge within a grayscale image indicates that there is a change in the grayscale from one region to another. This approach is subtraction of median filtered image from input image (in case of the input image is in grayscale form) or subtraction of median filtered image from grayscale form on input image (in case of the input image is in RGB form). Image subtraction is used to find changes between two images of same scene. The algorithm uses the information about color and size of hemorrhages as a tool for classifying hemorrhages from other dark lesions present in the retinal images. The algorithm uses the concepts of contrast enhancement, background estimation and intensity variation at edges that is gradient magnitude information supported by some morphological operations. The algorithm follows a simple approach of step by step removal of unwanted features from targeted images using concepts of thresholding and morphology without compromising with accuracy and time of execution. The experimental results indicate that hemorrhages are detected with good accuracy in the retinal images.

III-PROPOSED METHOD

Multi-Level Discrete Wavelet Transform

Discrete Wavelet transform (DWT) is a mathematical tool for hierarchically decomposing an image. The DWT decomposes an input image into four components labeled as LL, HL, LH and HH [9]. The

first letter corresponds to applying either a low pass frequency operation or high pass frequency operation to the rows, and the second letter refers to the filter applied to the columns. The lowest resolution level LL consists of the approximation part of the original image. The remaining three resolution levels consist of the detail parts and give the vertical high (LH), horizontal high (HL) and high (HH) frequencies. Many famous coders have been proposed to effectively compress images or frames processed via DWT.

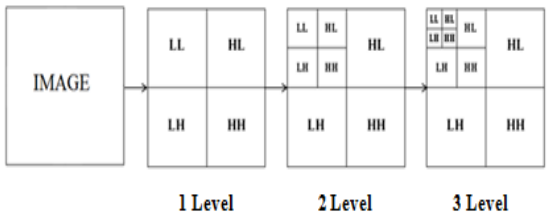


Figure 2: Three-Level Wavelet Decomposition of an Image

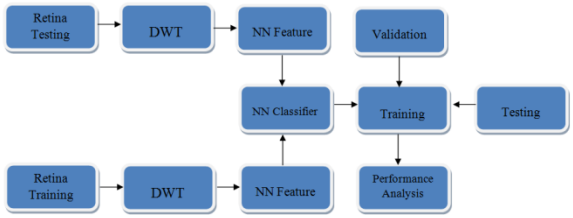


Figure 3: Wavelet-based texture analysis on retina Images

Wavelet-based texture analysis gives a multi determination analytical platform which enable us to characterize a signal (an image) in multiple spatial/frequency spaces. The multi-scale characteristics of wavelet can be extremely useful. The 2D wavelet transform has been broadly applied in image processing applications. There exists two wavelet structure; (1) Pyramid-structured wavelet transform which decomposes a signal into a set of frequency channels with narrower bandwidths in lower frequency channels, useful for signals which their important information lies in low frequency components [8], (2) Tree-structured wavelet analysis which provides low, middle and high frequency decomposition which is done by decomposing both approximate and detail coefficients. In dermoscopy image analysis, the lower frequency components reveal information about the general properties (shape) of the lesion, which is clinically important, and the higher frequency decomposition provides information about the textural detail and internal patterns of the retina which is also significant in the diagnosis. Thus the decomposition of all frequency channels are useful in this application. Therefore, the tree-structured wavelet analysis can be more informative for classification of retina funds.

Neural Networks

Neural networks have been used to solve the image segmentation problem. Generally, the method involves mapping the problem into a neural network by means of an energy function, and enabling the network to converge so as to minimize the engery function. The network classifies input vector into a specific class because that class has the maximum probability to be correct. In this paper, the PNN has three layers: the Input Layer, Radial Basis Layer and the Competitive layer. Radial Basis Layer evaluates vector distances between input vector and row weight vectors in weight matrix. These distances are scaled by Radial Basis Function nonlinearly. Competitive Layer finds the shortest distance among them, and

thus finds the training pattern closest to the input pattern based on their distance.

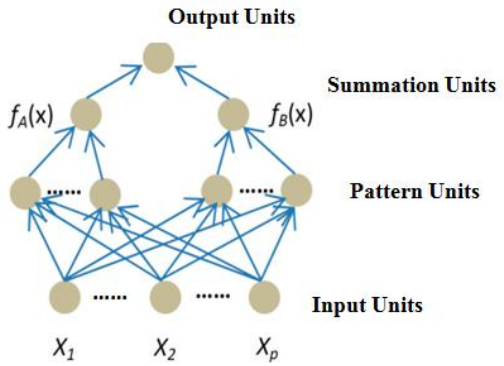


Figure 4: Neural network analysis on retina

.**RESULT Analysis:-**

Accuracy:- Accuracy is also used as a statistical measure of how well a binary classification test correctly identifies or excludes a condition. among the total number of cases examined. To make the context clear by the semantics, it is often referred to as the "rand accuracy. It is a parameter of the test.it shows in the command window..

Acc=(Tp+Tn)/(Tp+Tn+Fp+Fn)

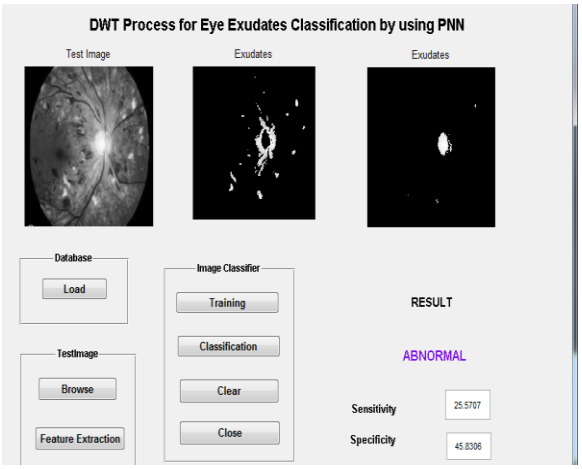
Sensitivity:-In medical diagnosis, test sensitivity is the ability of a test to correctly identify those with the disease (true positive rate).

Sensitivity =Tp/(Tp+Fn).

Specificity:-Whereas testspecificity is the ability of the test to correctly identify those without the disease (true negative rate).

Specificity =Tn/(Tn+Fp).

Output image:-



CONCLUSION:-

This project implemented an retina fund effected on image classification using texture features and it will be classified effectively based on neural network. Here, probabilistic neural network was used for classification based on unsupervised learning using wavelet and curve let statistical features and target vectors. The clustering was estimated from smoothing details of images accurately for effective retina disease affected part on segmentation.

REFERENCES:-

[1]. R. Varma et al., "Disease progression and the need for neuroprotection in glaucoma management," Am. J. Manage Care, vol. 14, pp. S15–S19, 2008.

[2]. R. George, R. S. Ve, and L. Vijaya, "Glaucoma in India: Estimated burden of disease," J. Glaucoma, vol. 19, pp. 391–397, Aug. 2010.

[3]. K. R. Sung et al., "Imaging of the retinal nerve fiber layer with spectral domain optical coherence tomography for glaucoma diagnosis," Br. J. Ophthalmol., 2010.

[4]. J. M. Miquel-Jimenez et al., "Glaucoma detection by wavelet-based anal-ysis of the global flash multifocal electroretinogram," Med. Eng. Phys., vol. 32, pp. 617–622, 2010.

[5]. B. Brown, "Structural and functional imaging of the retina: New ways to diagnose and assess retinal disease," Clin. Exp. Optometry, vol. 91, pp. 504–514, 2008.

[6]. S. Weiss, C. A. Kulikowski, and A. Safir, "Glaucoma consultation by computer," Comp. Biol. Med., vol. 8, pp. 24–40, 1978.

[7]. S. Weiss et al., "A model-based method for computer-aided medical decision-making," Artif. Intell., vol. 11, pp. 145–172, 1978.

[8]. R. O. Duncan et al., "Retinotopic organization of primary visual cortex in glaucoma: A method for comparing cortical function with damage to the optic disk," Invest. Ophthalmol. Vis. Sci., vol. 48, pp. 733–744, Feb. 2007.

[9]. M. Balasubramanian et al., "Clinical evaluation of the proper orthagonal decomposition framework for detecting glaucomatous changes in human subjects," Invest. Ophthalmol. Vis. Sci., vol. 51, pp. 264–271, 2010.

[10]. U. R. Acharya, S. Dua, X. Du, V. S. Sree, and C. K. Chua, "Automated diagnosis of glaucoma using texture and higher order spectra features," IEEE Trans. Inf. Technol. Biomed., vol. 15, no. 3, pp. 449–455, May 2011.

[11]. S. Dua, U. R. Acharya, and E. Y. K. Ng, Computational Analysis of the Human Eye With Applications. World Scientific Press, 2011.

[12]. E. A. Essock, Y. Zheng, and P. Gunvant, "Analysis of GDx-VCC polarime-try data by wavelet-Fourier analysis across glaucoma stages," Invest. Ophthalmol. Vis. Sci., vol. 46, pp. 2838–2847, Aug. 2005.

[13]. K. Huang and S. Aviyente, "Wavelet feature selection for image classifi-cation," IEEE Trans. Image Process., vol. 17, no. 9, pp. 1709–1720, Sep. 2008.

[14]. A. Arivazhagan and L. Ganesan, "Texture classification using wavelet transform," Pattern Recog. Lett., vol. 24, pp. 1513–1521, 2003.

[15]. I. Daubechies, Ten Lectures on Wavelets. Philadelphia, PA: Society for Industrial and Applied Mathematics, 1992.

[16]. R. C. Gonzalez and R. E. Woods, Digital Image Processing. NJ: Prentice Hall, 2001.

[17]. M. H. Dunham, Data Mining Introductory and Advance Topics. NJ: Pren-tice Hall, 2002.

[18]. H. Liu and R. Setiono, "Chi2: Feature selection and discretization of numeric attributes," in Proc. IEEE 7th Int. Conf. Tools WithArtif. Intell., 1995, pp. 338–391.

[19]. J. R. Quinlan, "Induction of desion trees," Mach. Learning, vol. 1, pp. 81– 106, 1986.

[20]. J. R. Quinlan, C4.5 Programs for Machine Learning. San Mateo: Morgan Kaufmann, 1993.

[21]. K. Kira and L. A. Rendell, "A practical approach to feature selection," in Proc. 9th Int. Workshop Mach. Learning, San Francisco, CA, 1992, PP.249–256.