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Edge Detection for Retinal Image Using Superimposing Concept and Curvelet Transform

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***Abstract*- Retinal image analysis plays vital role in many applications, such as finding out ocular fund us and early stage detection of some disease. Even though there is more advanced technologies for human recognition process this retinal image analysis concentrates on the human iris authentication purpose. Since both the similar person can't have the same retinal blood vessels. As per this paper concern in extracting of retinal blood vessels from the retina images as well as finding out disease affected area in the retina image to do this process the methodologies implemented are multi structure elements makes the edge detection effectively. Hence morphology operators using multi structure elements method are used to find out the ridges. Afterwards morphological operators by reconstruction eliminate the ridges which are not belonging to the blood vessels. The algorithm used here is back propagation (BPA) which helps to find out the real retinal blood vessels from the image. The researchers also have more reputed works on this area to produce better result for blood vessel detection.**

Keywords: Morphological operation, back Propagation (BPA)

I. INTRODUCTION

Medical imaging is the core trend now days in the image processing it consists of various areas for processing the image. The main theme here concentrated is Retinal image analysis this has the optimistic study of eliminating the blood vessels from the retinal image it can be done for both real and non real blood vessels from the image, the connected component analysis is the concept which is used to detect the blood vessel to maximum level as possible as much[1], the methodologies implemented here for finding out the early stage disease from the retinal images are Morphology operators, Morphological reconstruction, Decomposition by 2D Curvelet Transform, Thresholding. Even then the new technologies are emerging the above mentioned technologies produce much better result when compared to other transform results. Curvelet Transform is one which is Domain to time domain, since by that the methodologies mentioned above are supported by this transform so we use Curvelet transform. The basic operation for image processing is pre processing, image restoration, image enhancement, representation and description recognition, compression, image acquisition etc. here by proposing the new methodologies we find out the disease affected area from the retinal image by superimposing method which gives the color image to the viewer by marking the disease affected area by white marker.

II. RELATED WORKS

A .Features Of Blood Vessels

An important aspect of diabetic Retinopathy is micro vascular change that causes the detectable appearance in the retinal blood vessel. Some real and fine blood vessels get damaged, since always blood vessel have lower contrast. If the blood vessels are extracted from the image then it can be either the real blood vessel or it may not be the real blood vessels. To know how many blood vessels is real use the matched filter (MF) concept. To find out the real blood vessels convert the image into gray scale level using the above mentioned concept. Various methodologies are implemented such Gaussian shaped curve used to extract the piecewise bold vessels from the image. Since to extract the thin blood vessels we use same concept but the Thresholding valve is changed according to the count of blood vessels, find out the thin layers of blood vessels. Then impose that for finding out the real bold vessels from the retinal image [3][4].

B. Exudates Detection

The main characteristics of Diabetic Retinopathy are exudates these can be done from the large patches to tiny small specks. Hard exudates are bright yellow color with well defined margins. This type of intra retinal deposits is intimately associated with various retinal pathologies and

detection of exudates is quite important for the early diagnosis of diabetic retinopathy . To find out the exudates area, locate the non uniform illumination and various different types of uniformity explain the exudates operations. Techniques used are enhancement and histogram equalization provides the better result for local contrast enhancement. Even then some disadvantage is present in the local contrast enhancement to solve that we use navie bays classifier. After that use the concept of fuzzy clustering to group the uniform exudates and non uniform exudates areas then concentrate on the detection even though it is made automotive not all the exudates areas are concentrated in automotive[5],[6]. Since placing some constant value this automotive detection works, if user wishes to check manually or whether he wants to concentrate on some particular area this automotive detection will not help in such a condition choose exudates detection manually. This exudates are represented with yellowish object with green component are denoted as exudates. Features for exudates detection are denote the pixel value after pre-processing, number of edge pixel around the image, the ratio between the size of the pixel and the intensity cluster, the concept of neural network is also used for exudates detection. This approach is done for pixel-by-pixel basis, by applying pre processing find out the difference between exudates and non exudates regions to reduce the variations of colors in the image apply vessel tracking and optic disc detection and discard associated areas, remaining part of exudates are passed to neural networks as sliding window data extraction mechanism, image was divided into disjoint of 20*20 pixels regions and each region is assigned by an expect either exudates or non- exudates, each pixels of the window is corresponding to the input of back propagation neural network, now segmentation is done to represent the exudates and non exudates region on the basis of clustering, in order to reduce the dimensionality of the data and speed up the process the technique used is training networks, networks then finds out the exudates and non

exudates regions to find out that produce the training data set results. Exudates may also leads

to loss of vision this can also be avoided by using morphological reconstruction technique, which works on the basis of dilation[2][3], this dilation creates two different types of process one is marker and the other one is mask, the dilation process are continued until it reaches the stability.

III. PROPOSED WORK

As of medical imaging area the concept here concentrated are retinal image analysis basically for each and every image the following process should be done.

A. Image Pre-Processing

Normally images are captured by using the canon CF-60udi with digital camera canonD20 device, initial stage is pre processing image will be in the format of (RGB) color image, that image must be separated into channels, now noise will there in the image it must be removed the methodologies and the algorithm used to remove noise are vessel segmentation algorithm and methodologies implemented are median filter, adaptive filter, Gaussian filter, linear filtering Median filtering is the method which is used to remove noise from the image in this method an extra noise can also be added after that use the median filter concept and remove the noise from the image; it concentrates on the pixel ratio of the image even then the sharpness will not be reduced, here output pixel will be determined as median for the neighbourhood pixels, Adaptive filtering which works on the basis of wiener filter concept this preserves edge and other high frequency parts of an image[1], if the variance is large it performs the little smooth process the simple formula for this filtering

$$T=\mu-\alpha\sigma$$

Where μ and σ stands for mean and standard deviation of the constant value α denotes the constant value it must be kept small where α must be always less than one($\alpha<1$) Linear filtering removes only the certain type of noise Gaussian filter or averaging filter are appropriate for this purpose, if local variations are caused by grain it can also be reduced, apart from this the techniques carried out for pre processing is histogram equalization which increase the dynamic range of histogram of an image, assign the intensity value for the input image of pixels such that output contains the uniform distribution of intensities, In all the stages of diabetic retinopathy shows the defects of micro aneurysms and hemorrhages, this must be distinguished from the noisy background image, two types structuring elements(SE) are diamond shape and disk shape[4][5], Diamond shape (SE) is used to make the veins clear from the image, disk shape are used to remove the noise from the image, kernel are generated by using P[xy] is a point in the kernel where θi is the orientation of the point, kernel is centered around the origin p=[0,0], converting the image to gray scale level is also one step of

Pre processing which can also be done by using the median filter.

Decomposition by 2D Curvelet transform

Blood vessel extraction using 2D Curvelet transform works on the basis of bank of filter process which corresponds to specific type of Curvelet, this algorithm uses reversed BI orthogonal (RBIO) Curvelet; the shape of this Curvelet almost corresponds to the shape of blood vessels in the retinal image. The Curvelet transform decompose the image to levels, where each level represents the specific frequency band of Curvelet, where this 2D Curvelet transform is sufficient for in detecting retinal vasculature, each level is then decomposed into three directions such as vertical, horizontal, diagonal. Decomposition is done by using scaling function; low pass filter, high pass filter can also be decomposed, the major

concept of Curvelet transform is well adapted to represent images containing the edges, this also used to enhance the edges of image, the coefficients are denoted by following formula

$Yc(x) = L$ if $x < Tmin$
$Yc(x) = L$ if $x \geq Tmax$

Curvelet coefficients can be modified in order to enhance edges in an image, the idea is to modify Curvelet coefficients which are either at noise level, largest coefficients have strong edges, hence it is not in need to amplify the image, for decomposing the single element the steps are carried out are down sampling for columns and the rows, down sampling the columns are denoted as in the format of Down sampling the rows of pixel or segment are represented in the format of Both high and low decomposition is done for the pixel and for the segment. Decomposition by vertical is measured as cD(v)j+1, Decomposition by horizontal is measured as cD(h)j+1, Decomposition by diagonal measured as cD(d)j+1,

Thresholding

Thresholding is done for all the three levels of direction of decomposition which is vertical, horizontal, diagonal, passing some values to the parameters is Thresholding, the task is to highlight the highest maximum value to the Curvelet coefficients, which is almost equal to the blood vessels, after that it suppress the small value which is correspond to the noise, else it also suppress the unimportant structure in the image, key parameters in this process is the threshold value, better performance of the threshold process is given by histogram equalization, 88% of pixel Curvelet coefficients seems to have unimportant structure only 12% belongs to the blood vessels, the brightness value is kept at 30, because 88% pixels are below this value, now to remove the unimportant structure from the image, it must be converted to the binary format and the threshold value must be chosen carefully, Thresholding is done by using canny edge detection, this detection concentrates all parts and edges of the image,

B.RECONSTRUCTION WITH SUMMATION

Reconstruction is done for the binary image, it is done by adding all the three threshold value of an image by using the concept of bilinear interpolation check whether the images are in same size, hence the final image will also be in the format of binary image further each image

will have some noise, to remove that add the threshold values to the image and remove the layers from the image this will be considered as the final binary image, reconstruction for the

vertical direction will produce the output image as binary image by passing Threshold value to an image. The same procedure is done for other two directions such as horizontal, vertical. Retinal image can also be reconstructed by using morphological operators here the image consists of opening and closing leaves of features of structuring element remains unchanged. Since it doesn't provide the convenient result which does not concentrate on the edges of the information morphological concentrates on the size, shape and direction of the edges of image. Algorithm used for concentrating on the edges is M-and N- sieves represent the image of the marker and mask by g and f, geodesic dilation is represented by $\delta f(1)(g)$ and is determined as point wise minimum between the marker and mask of image.

$$\delta f(g) = \delta (g)\hat{}f$$

MORPHOLOGICAL IMAGE PROCESSING

All the stages of retinopathy shows the defects of hemorrhages and diabetic retinopathy so it must be distinguished from the noisy background, algorithm developed uses a morphological operation to smooth the image background as a result of veins, hemorrhages and micro aneurysms can be seen clearly. Identification of objects is very difficult to simplify that convert the image form gray scale to binary image, each pixel is restricted to a value of 1 or 0, techniques used on binary image is connectivity analysis each pixel in the image will be displayed as white and the objects are displayed as black, if the pixels value is greater than the threshold set the value as 1, else if the pixels value is smaller than the threshold set the value as o, most important concept in morphological image processing is erosion and dilation erosion makes the object smaller and breaks the smaller object into multiple objects, dilation makes the object larger and can merge multiple objects into one. Some pixels have wrong binary values, images cannot contain a hole and objects border must be smooth. A common step in these algorithms is an operation called skeletonization; this simplifies image by removing white redundant pixels, which changes approximate pixel from black to white, since because of using erosion all the objects are completely destroyed it cannot be recovered, this is very basis filtering properties of opening operator, all the foreground image structures do not contain the structuring elements (SE)[4][5] that may be removed by opening. Shape and size of SE are structured by the image structure it can be represented as

$\cup\{ \mid \subseteq \}$

Where B= structuring elements, X= set of pixels that make up image, the opened set .

IV. RESULTS AND DISCUSSION

Data set consists of 35 to 40 sample images captured by retinal camera; images will be in the gray scale level format of (RGB). Tabular column consists of various attributes which exhibits the red layer, red perimeter, green layer, green perimeter. As per of pre processing the image must be converted into gray scale level and finding out the intensity of the image as well as histogram equalization. Import the original image then resizes that original image so that it may be convenient to change the image to This enhancement processed out by cumulative adaptive histogram equalization method (CLAHE). Morphological operation is carried out here the process done are image erosion, image dilation, binary image operation. Edge detection for an image are done

by using two methods canny edge detection and logical AND between two images Blood vessel detection in the retinal image is the task where blood vessels are first eroded from the image then the blood vessels are detected. Disease detection is the process where each and every image is converted into gray scale, since it is easy to find out the red and green layer, this layer shows that which part is affected by disease, image is represented in the format of binary. Exudates detection is process which is used to detect the disease affected area in the image that.

V. CONCLUSION

In this paper the methodologies proposed are used to extract the blood vessels as well as Exudates the detection by using morphological operation and the image contrast is increased by using CLAHE enhanced method. Gray scale intensity is also predicated by morphological operation here the images are divided into two layers one is red and the other one is green extract the blood vessels from the image for both red and green layers now the superimposing image is displayed with the threshold parameter.

VI. REFERENCES

[1] Miri M.S. Mahloojifar A., (2011), "Retinal image analysis using curvelet transform and multi structure elements morphology by reconstruction", Bio medical Engineering IEEE Transaction on vol.58, pp. 1183-1192.

[2] Ravishankar S., jain A., mittal A., (2008),"Automated feature extraction for early detection of diabetic retinopathy in fundus images", proceedings on computer vision and pattern recognition IEEE conference on digital object identifier, pp. 210-217.

[3] Estabridis and Defigueiredo, R. (2008), "Blood vessel detection via Multi window parameter transform", proceedings in 19th IEEE symposium computer based Med system(CBMS), pp. 424-429.

[4] Shijian Lu kwee Lim (2011), "Automatic optic disc detection from retinal images by line operator", Biomedical Engineering IEEE transaction on vol.58, pp 88-94.

[5] Chaudhuri, S. and Chatterjee, (1989), "Detection of blood vessels in retinal images using two dimensional matched filters," Medical imaging, IEEE Transactions on vol.8, pp. 263- 269.

[6] akarasopharakS. ,bunyarit uyyanonvara B., saran barman s., (2010), "fine exudates detection using Morphologicalreconstruction enhancement"