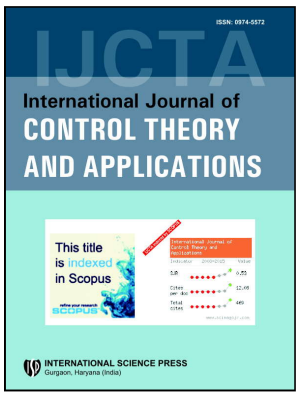

International Journal of Control Theory and Applications

ISSN : 0974-5572

Volume 10 • Number 18 • 2017

New Analysis for Identification of Eye Diseases from the Blood Sample Values

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Abstract: In the present day time many different parcel of ailments that can influence ordinary human life. One such illness is called diabetic. This will impact in two cases one is eating routine and the second one is hereditie. Because of this diabetic malady, 80 % of individuals it will begin impact from the eye and afterward remaining body organs like kidney, liver heart, nerves and so forth. So this proposition needs to separate the element of eye. From this element, it will give the anomaly of the proportion in seriousness level insightful. Because of this approach, it will save the vision in early stage itself furthermore it will give the alarm to the rest of the body organs.

This proposition it will begin gathering the constant pictures from the diagnostic centre. These pictures were taken from the fundus camera. These pictures are full of noise, raw and unprocessed pictures. So that, next stride needs to remove the noise from the pictures. In this venture used all different types of filters to remove noise and performance of all the filters are verified using different parameters like SNR (Signal to Noise Ratio), MSE (Mean Square Error), SSIM Similarity Index), RMSE (Root Mean Square Error), PSNR (Peak Signal to Noise Ratio). And after that next is feature extraction. They are veins, microaneysams, exudates, and optic disk for every element it is utilized best picture preparing calculations and afterward at last will gives gentle, direct, seriousness of the diabetic and this outcome is contrasted and glucose level estimation of similar patients. It was co-equal in both contextual investigations.

On this task subsequent changed into completed such a lot of evaluation like each functions regular and peculiar snap shots with their corresponding blood pattern and evaluation equations table and subsequently it turned into plot the graph blood sugar values Vs all of the functions normal and abnormal values. At last this will give straight forwardly eye ailment from the glucose values. So this proposed evaluation of software program will supply greater advantage for opthamologists to discover eye sickness from blood sugar ranges.

Keywords: New filter, Feature extraction, Blood sample values, Eye diseases detection, Corresponding treatment.

1. INTRODUCTION

Illness in membrane resulted from special diseases square measure verifies by special photos from membrane, that square measure obtained by exploitation optic imaging called bodily structure. The inexperienced

channel is high reactive to the blood vessels. The improved median filter [1] is utilized to urge obviate salt and pepper sound from the wicked image. The World Health Organization (WHO) has calculated the quantity of persons with eye diseases inside the globe would increase staggeringly from 100 thirty 5 million in 1995 to 3 hundred million in 2025[6]. Therefore on reduce the unhealthy. Sound effects associated with the method input

Image was pre-processed by a filter, then, the retinal structure image is assessed in to some primary components like Red Channel (R), inexperienced Channel (G) and Blue Channel (B)[7]. And changed filter is introduced to induce still higher performance of noise. that the output is that the raised image a footing is associate sudden amendment within the brightness (gray scale level) of the pixels. The removal of blood vessels in membrane photos is very important step in designation and treatment of diabetic membrane. For unhealthy persons the diameter of the blood vessels could disagree or otherwise there is a chance for growth of latest vessels once connected with ancient person's blood vessels.[8] The blood vessels get encircled for diabetic patients and it gets narrower for illness unhealthy patients. Exudates are one in every of the first signs of membrane ill health, Automatic exudates detection would be useful for diabetic retinopathy screening methodology. On color and sharp edge decisions to look out the exudates. The yellow objects are detected first. The objects within the picture with extraordinarily sharp edges are then found exploitation Kirsch's mask and diverse rotations of it at the inexperienced component. The mix of outcome of yellow objects with very sharp fringe is used to determine out the exudates. The bushy C-manner (FCM) collecting can be a widely known cluster approach for photo partition, many strategies are executed for exudates commentary, and however they must illness. Then improved FCM is employed for higher extraction. Terrible quality pictures have an impression on the separation outcomes of vivid and darkish damage exploitation thresholding and exudates function extraction. Microaneursyms are the first scientific abnormality to be detected inside the eye for diabetic retinopathy they are crimson lesions. Crimson lesions are the first clinically obtrusive injury indicating diabetic retinopathy. Therefore, their detection is essential for a pre-screening gadget [13]. The motive is that the shining 0.five within the widespread images in an effort to be seen as light, round or vertically memory device is that the rein where blood vessels and cranial nerve fiber enter to the membrane of human eyes. Its miles the shining a place of the standard complicated frame component pictures. Observation of the point (OD) is taken under consideration united of the essential part of examine of virtual color retinal snap shots [19]. In our deliberate gadget watershed rule is hired for the optic discs detection and for this reason the severity of the attention sicknesses is examined. Supported the output results of those 4 extractions we find out the severity of the unwellness as mild, mild or significantly affected.

1.1. Materials & Techniques

All of the 110 pictures are utilized on this paper are received from the govt. health facility real time patients. There are associate in retinal colour complicated frame part pix with a range length of 4 hundred × 600 x 3 pixels, together with the cranial nerve contours derived by 2 specialists.

2. PLANNED SYSTEM

The planned system consists of 4 stages. Initial stage is collection the pictures of patients by fundus camera. This can be raw pictures and contains choked with noise. This noise is detected by filters. Modified filter is employed from the mean, median and improved median filter and modified filter for the removal of error caused whereas taking of the image and to scale back the noise and next stage is the extraction of options of eye like veins, Exudates, Microaneursyms and optic discs by image process algorithms. They are brandy edge detection rule, modified fuzzy cluster rule, morphological distance based rule and watershed rule and at last fourth stage is comparison between blood sample results and segmented results. The planned system for detection of eye diseases is illustrated in Fig. 1.

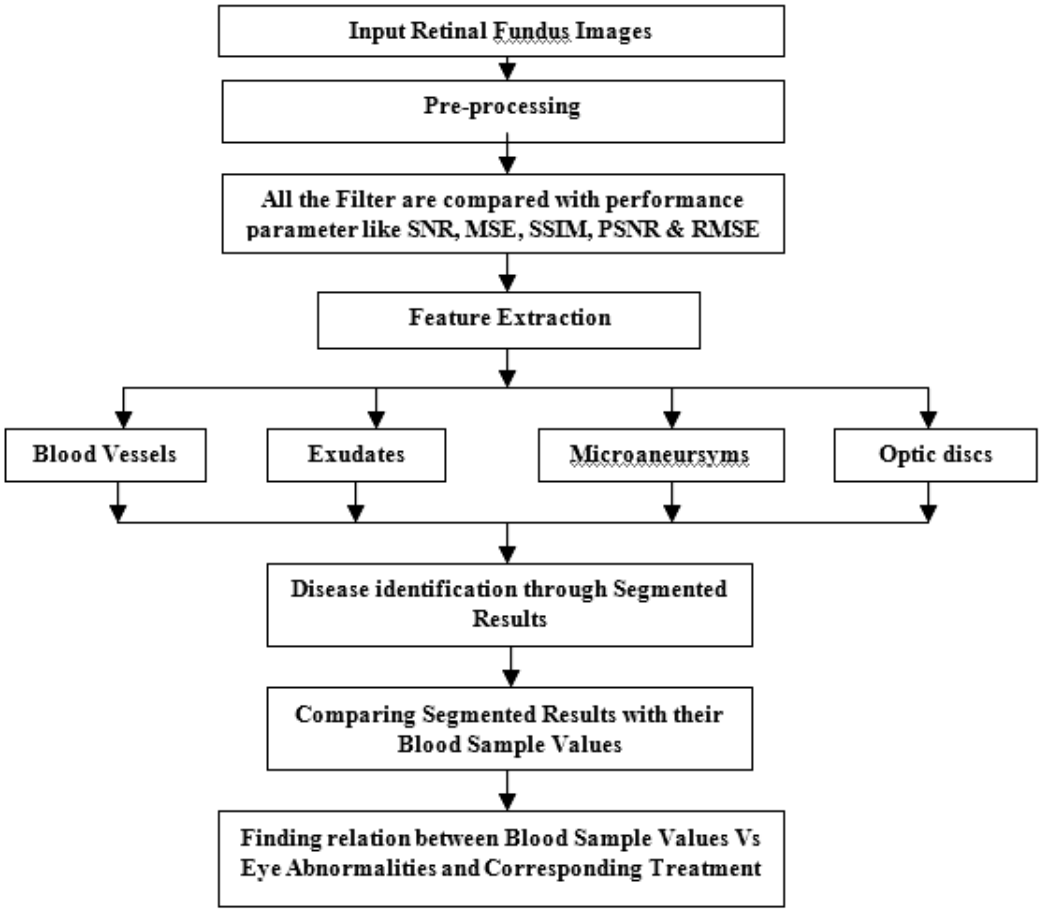


Figure 1: Planned System for eye diseases detection.

Stage 1: Assembling real time patient's pictures from the hospitals. These pictures square measure taken by structure camera. This can be packed with noise and raw pictures. Those noises are often reduced within the second stage victimization filters.

Stage 2: PREPROCESSING: The pre-processing step removes difference due to image gain, such as in homogeny. The illumination Techniques such as morphological operations are trying to the input image. The following session's complex the modified filter developed from the mean, median, improved median and modified filters that can be used in pre-processing stage in this paper.

2.1. Modifed Filter

To remove salt and pepper noise from the corrupted image with additional algorithms is employed. The output of all the filters square measure compared with modified filter for the given input retinal pictures and additionally compared the performance of image with SNR(Signal to Noise Ratio),MSE(Mean Square Error), SSIM(Similarity Index) ,RMSE(Root Mean Square Error), PSNR(Peak Signal to Noise Ratio). Quantitative relation conjointly finally modified filter gave best results compared to different filters. Modified filter is a combination of three filters mean filter, median filter and improved median filter (Gaussian, Speckle, Salt and pepper noise) Each pixels value of the image is replaced by theaverage value of similar patches all over the image. The algorithmic program is given below.

- A color image is taken for experiment purpose.

- The color image is converted into gray image.
- Mixed noise image is obtained by adding three different noises (Gaussian, speckle, salt and pepper noises) at zero mean and different variances.
- Mixed noise is filtered first by mean filter.
- Mean filtered image is filtered by median filter.
- Median filtered image is filtered by improved median filter.
- Each pixels value of improved median filtered image is replaced by the common the average value patches everywhere the image.
- Denoised image may be a gray image therefore its regenerate into color RGB image. This is often the ultimate Denoised image.

Stage 3: FEATURE EXTRACTION- BLOOD VESSELS EXTRACTION: The observation of blood vessels from the retinal pictures may be a tedious method. In our planned algorithmic rule, Kirsch's model is employed for detection the blood vessels from the retinal pictures. For kirsch edge detection, the edge image (i.e., detected edges) is considered the area gradient. The kirsch gradient operator is chosen to extract the contour of the article. The kirsch edge detection uses eight masks (i.e., eight masks for connected eight main directions) that are applied to given image to find edges. Except the outmost row and also the outmost column, each component and its eight neighbourhoods in an exceedingly given image are convolved with these eight templates. Each component has eight outputs. And also the utmost output of the eight templates is chosen to be the value in given position. This can be outlined because of the edge magnitude. The direction of edge is outlined by the connected mask. The ultimate gradient is that the summation of the improved edges by considering all directions for RGB channel instead of any single channel. Here, numerous directional enhanced pictures are presented. This feature extraction is compared with all the algorithms .Finally our planned algorithmic rule given correct results.

2.2. Exudates Extraction

Exudates are tiny yellow white patches with sharp margins and totally different shapes. Exudates are one among the first occurring lesions. Exudates are accumulations of lipoid and macromolecule within the membrane. Generally they are bright, reflective, white or cream coloured lesions.

Fuzzy cluster is Associate in nursing overlapping cluster formula, where each purpose might belong to loads of or two clusters with completely different degrees of membership. The choices with shut similarity in an exceedingly image unit of measurement classified into constant cluster. The similarity is made public by the gap of the choices vector to the cluster middle. Geometrician distance is used to measure this distance Associate in nursing data are attending to be associated to associate degree applicable membership value. The cluster middle is updated until the excellence between adjacent objective perform, is close to zero or abundant however a predefined terribly little and constant. to prevent that our formula gets treed in minima, the MFCM formula is initialized with the upper than quick FCM algorithm. Once the quick FCM is stopped, the MFCM formula follow it with the values for the prototypes and membership values obtained from the short FCM formula. The MFCM formula then iteratively updates its a priority chance, membership and centroids with these values. Once the MFCM formula has converged, another defuzzification technique takes place thus on convert the fuzzy segregation matrix to a crisp segregation matrix.

Thus the MFCM algorithm is given as follows:

Step 1: Set the cluster centroids vi in line with the bar chart of the image,

Step 2: Calculate the bar chart exploitation

Step 3: Calculate the membership operate exploitation

Step 4: Calculate the cluster centroids

Step 5: Hold to step 3 and repeat until convergence.

Step 6: work out the a priori chance with the obtained results of membership operates and centroids.

Step 7: Recomputed the membership operate and cluster centroids and therefore the possibilities.

Step 8: If the formula is merging, attend step 9; otherwise, attend step half-dozen.

Step 9: Image distribution when defuzzification then a part labelling procedure is performed.

This feature extraction is compared with all the algorithms. Finally our projected formula given correct results.

2.3. Microanerusyms Extraction

Microaneurysms on the membrane seem as tiny red dots of most size to be less than the diameter of the most important optic veins. The recognition of microaneurysms is crucial in the operation of diabetic retinopathy grading, since it forms the premise of deciding whether or not Associate in Nursing image of a patient's eye ought to be thought-about healthy or not.

2.4. Morphological Distance Primarily Based Algorithm

Microaneurysms area unit tiny saccular pocket caused by native distension of capillary walls and seem as tiny red dots. Their walls area unit skinny and rupture simply to cause haemorrhages. To discover visible small aneurysms in membrane exploitation size and form automatic small aneurysms detection and diabetic retinopathy grading and Hough transforms area unit gift however the morphological distance primarily based algorithmic rule for Microaneurysms is effective and also the steps concerned as shown below.

Step 1: The pre-processing step filters the image, will increase the distinction and performs a shading correction so as to balance the non-uniform illumination across the image. The diameter-closing step could be a mathematical morphological transformation that fills all told the black dots with diameters smaller than λ.

Step 2: once acting such closing transformation, the grey-scale worth of the filled-in dots is over within the increased pre-processed image, whereas the vessels and alternative components stay nearly unaffected. The black top-hat step uses size and form criteria to isolate the black elements contrasted against the background.

Step 3: The black top- hat remodel is that the results of the distinction between the photographs obtained by the dimensions closing and pre process steps. The automatic threshold step identifies all components within the black top-hat image that area unit potential μA candidates.

Step 4: Finally a K-nearest neighbours (k -NN) classifier is employed for classification. It uses the Properties calculated for the candidates to seek out them as either true μA or false positives supported the educational set within the tiny information. The classifier acts sort of a human critic by taking into consideration factors like size, contrast, roundness, grey-scale level and color. Then actuality microaneurysms area unit detected.

2.5. Optic Disc Extraction

Optic disc is that the brightest a part of the tissue layer and it's in oval in form and for diabetic retinopathy affected person the oval structure is irregular in structure.

2.6. Watershed Transformation

An implementation of the watershed rework was bestowed by Vincent & Soille. Since we wish to debate this implementation in some detail, we tend to reproduce their rule here in pseudocode, during this rule there area unit 2 steps:

Step 1: Sorting the pixels w.r.t. increasing gray worth, for direct access to pixels at an explicit gray level;

Step 2: A flooding step, continued level by level and ranging from the minima. The implementation uses a accounting queue of pixels, that is, a _rst-in-_rst-out system on it the following operations is performed: CFO add(p; queue) adds element p at the tip of the queue, CFO remove(queue) returns and removes the erstwhile element of the queue, CFO init(queue) initializes associate empty queue, and CFO empty(queue) is also a make certain returns true if the queue is empty and false otherwise.

3. SEGMENTATION AND RESULT

We enforced our planned technique exploitation Matlab and applied more than 50 images of normal and abnormal patients .The modified filter is enforced for denoising of extremely corrupted pictures and edge prevention. The kirsch edge detection rule works well for the pictures having clear distinguish between the foreground and background, since the retinal blood container is thought of as needed foreground data for fundus pictures kirsch rule is effectively register. Exudates are one in every of the foremost factor of diabetic retinopathy and responsible for liable for hazy views and visual defect fuzzy cluster algorithms is employed for the extraction of exudates once this Microaneursyms are first clinical abnormality to be noticed in eye. The red lesion is detected by the morphological distance based mostly algorithms. The bright portion of the anatomical structure image is optic discs that could be a pale, spherical or vertically slightly oval form disk circular region from wherever the blood vessels emanate is known as the blind spot.

Based on the top of the results, here we tend to get the formula. That may offer the relation between blood glucose level Vs retinal diagnosing options

ie. Only 1 Feature = 90 to 130 mg/dl

2 Features= higher than 130 to 180 mg/dl

Any 3 Feature = above a hundred and eighty to two hundred mg/dl

All four features = on top of two hundred mg/dl

During this step compared the patient retinal image segmental results with the patient blood glucose values exploitation blood glucose machine. This can provides the severity of the sickness and additionally performance of the segmental results. This comparison is illustrated only for nine patients in the table1 which table represents patient name, blood glucose values, retinal image, segmental results of retinal image and severity. Finally so much case study was done on individually each eye features in terms of the blood sample values. That relationship between each feature normal and abnormal ranges interns of the blood sample values is illustrated in the table and same thing is represented in the graphical way also. All the results related table2 to 6, graph1 to 5 and all illustrated in the last column of this paper

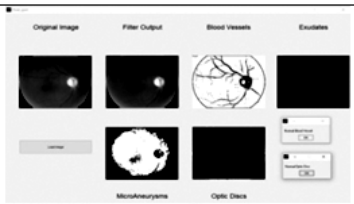
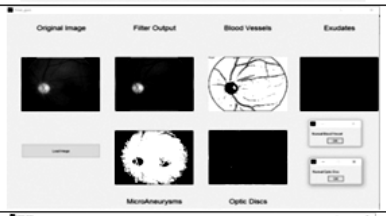
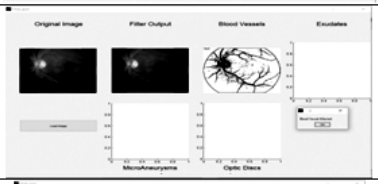
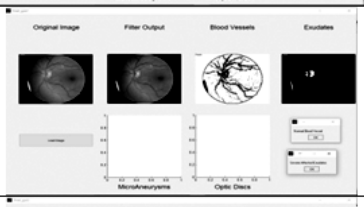
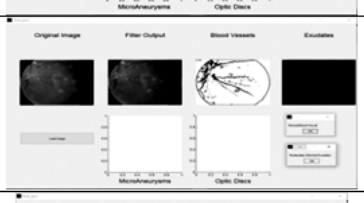
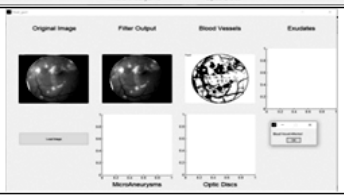
4. CONCLUSION

Retinal pictures play very important role in many applications like sickness diagnosing and human recognition. The segmental blood vessels are used for diagnosing of diseases like diabetic, eye disease and blind spot. In our planned methodology the retinal image as the input to mean, median and also the improved median and new filter is applied for pre-processing The segmented result shows that the modified filter rule will had best with relationship between the results of noise reduction and time quality of algorithmic program, the kirsch edge

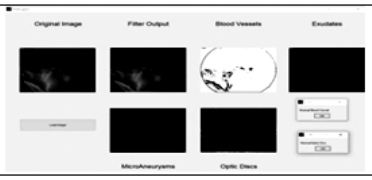
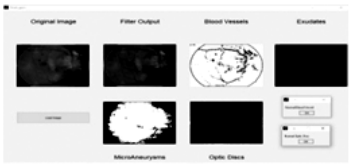
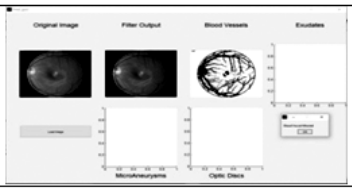
detection rule will set and reset the edge to get the foremost appropriate edge of the image for the holding the image details higher. The segmental results show that the studied technique is applied to different types of image and supply very satisfying results. The results of every segmentation and improvement steps show that our technique effectively detects the skinny blood vessels. From then on prime of research it's going to provide the affiliation between glucose values in terms of eye choices. In each feature ancient and abnormal ranges in terms of glucose values and eventually from the on prime of 4 results concludes the severity like delicate, moderate and severe of the diabetic. Throughout this proposal it provides new technique or methodology to identify the attention choices from the glucose values itself. This could cut back the opthamologists time for characteristic eye functions.

5. FUTURE SWEETENING

Table 1
Segmentation Results of Retinal Images with Blood Samples.

S. No.	Patent Name	Age (Years)	Blood Sugar Values (mg/dL)	Segmented Results	Disease Severity
1	Lakshmi. P	45	80		Normal
2	Latha. S	48	90		Normal
3	Aruna kumari. S	34	100		Blood Vessels Effected
4	B. Babu	20	140		Exudates Effected
5	T. Esupadam	60	130		Exudates Effected
6	A. Ishwarya	25	110		Blood Vessels Effected

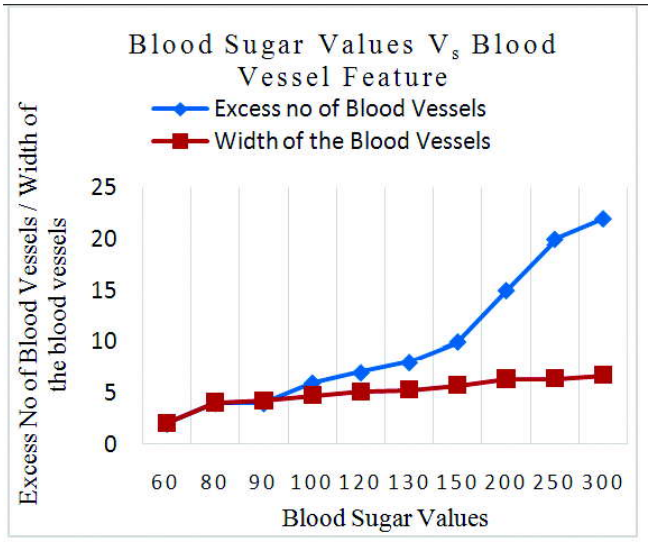
(*contd...Table 1*)

7	B. Nageswara Rao	70	70		Normal
8	P. Pushpavathi	67	180		Exudates and Microanesyms effected
9	B. Parvathi	64	100		Blood Vessels Effected

This work determines the presence of Pro-liferative diabetic retinopathy and Non- proliferative diabetic retinopathy or otherwise in a patient by applying techniques of digital image process on anatomical structure pictures taken by the use of medical image camera by a medical personnel in the hospital . during this work , we've got investigated and planned a pc based system to establish traditional , No proliferative diabetic retinopathy and Pro-liferative retinopathy. The kirsch's operator can observe the blood vessels however the output vessels detected has a lot of dimension than the first blood vessels thus sweetening is needed during this operator. This work indicates that support vector machines will be effectively used for image classification. albeit by currently some progress has been achieved , there area unit still remaining challenges and directions for any analysis, such as , extracting totally different options and developing higher classification algorithms and integration of classifiers to give better performance and reduce the classification errors.

Table 2
Blood Sugar Level Vs Excess no of Blood Vessels and Width of the Blood Vessels.

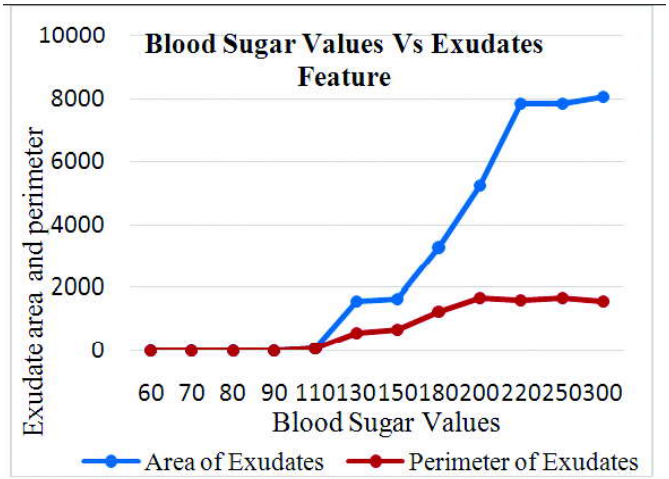
S. No.	*Blood Sugar Level (mg/dl)*	*Excess no of the Blood Vessel*	*Width of the blood vessels (μm)*
1	60	2	2.02
2	80	4	4.04
3	90	4	4.23
4	100	6	4.7
5	120	7	5.1
6	130	8	5.3
7	150	10	5.76
8	200	15	6.32
9	250	20	6.4
10	300	22	6.7



Graph 1: Blood Sugar Value Vs Width of the Blood Vessels.

Table 3
Blood Sugar Level Vs Area of the Exudates vessels and Perimeter of Exudates.

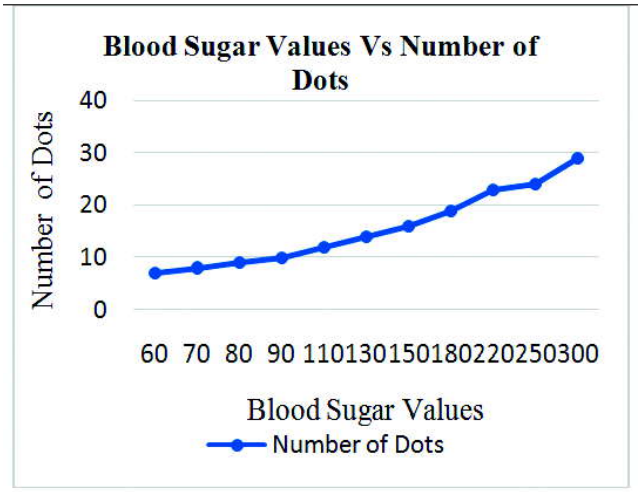
S. No.	*Blood Sugar Value (x)*	*Area of Exudates (y)*	*Perimeter of Excudates*
1	60	0	0
2	80	0	0
3	90	0	0
4	100	4	04.8484
5	120	79	63.0122
6	130	1567	574.6589
7	150	1640	683.5706
8	200	3286	1238.2
9	250	5243	1668.5
10	300	7836	1597



Graph 2: Blood Sugar Value Vs Area of the Exudates and Perimeter of Exudates.

Table 4
Blood Sugar Level Vs No of Dots.

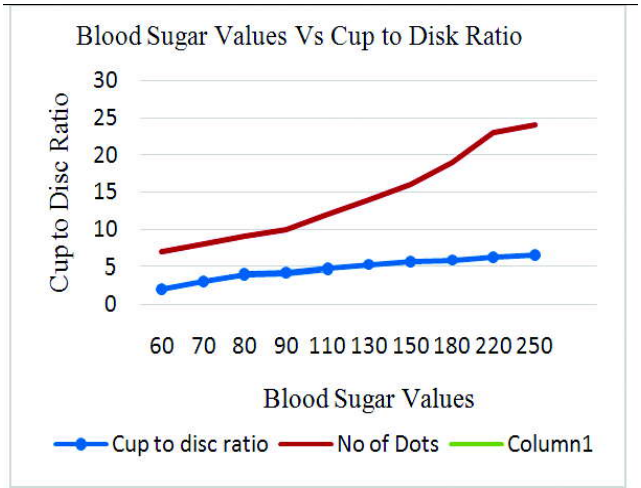
Sl No.	*Blood Sugar Value (x)*	*Number of Dots (y)*	*Severity*
1	60	7	Normal
2	80	8	Normal
3	90	9	Normal
4	100	10	Normal
5	120	12	Mild
6	130	14	Mild
7	150	16	Medium
8	200	19	Medium
9	250	23	Severe
10	300	24	Severe



Graph 3: Blood Sugar Value Vs Number of Dots.

Table 5
Blood Sugar Level Vs Cup to Disk Ratio.

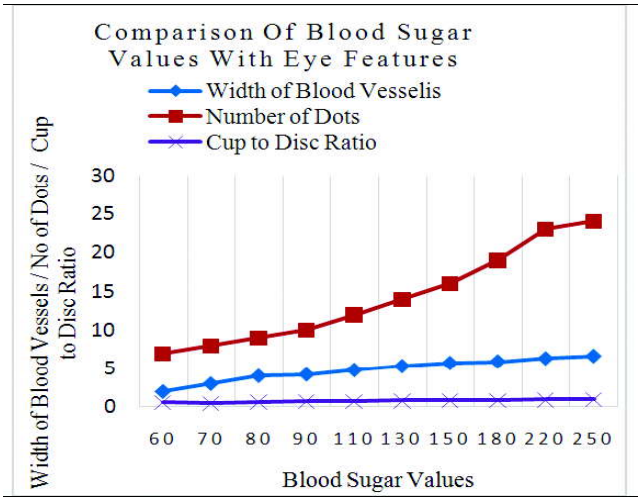
Sl No.	*Blood Sugar Value (x)*	*Cup to Disc Ratio (y)*	*Severity*
1	60	0.6	Normal
2	80	0.5	Normal
3	90	0.65	Normal
4	100	0.7	Mild
5	120	0.75	Mild
6	130	0.8	Medium
7	150	0.85	Medium
8	200	0.87	Medium
9	250	0.9	Severe
10	300	0.95	Severe



Graph 4: Blood Sugar Value Vs Cup to disk ratio.

Table 6
Blood Sugar level Vs all feature abnormalities of retinal image.

S. No.	*Blood Sugar Value (x)*	*Width of the Blood Vessels (μm)*	*Number of Dots*
1	60	2.02	7
2	70	3.03	8
3	80	4.04	9
4	90	4.23	10
5	110	4.8	12
6	130	5.3	14
7	150	5.7	16
8	180	5.9	19
9	220	6.3	23
10	250	6.6	24



Graph 5: Blood Sugar Value Vs all feature abnormalities of retinal image.

REFERENCES

[1] Gajanand Gupta,"Algorithm for Image Processing Using Improved Median Filter and Comparison of Mean, Median and Improved Median Filter", International Journal of Soft Computing and Engineering (IJSCE) ISSN: 2231-2307, Volume-1, Issue-5, Pp.304-311, November 2011.

[2] Jafar Ramadhan Mohammed, "An Improved Median Filter Based on Efficient Noise Detection for High Quality Image Restoration," IEEE Int. Conf, PP. 327 – 331, May 2008.

[3] Muthukrishnan, R., Radha, M, "Edge Detection Techniques for Image Segmentation", International Journal of Computer Science & Information Technology (IJCSIT), Vol. 3, No. 6, pp. 259 - 267, DOI: 10.5121/ijcsit.2011.3620, 2011.

[4] Gao, P., Sun, X., Wang, W., "Moving Object Detection Based on Kirsch Operator Combined with Optical Flow", International Conference on Image Analysis and Signal Processing (IASP), pp. 620-624. DOI: 10.1109/IASP.2010.5476045, April 2010.

[5] Pei-Eng Ng and Kai-Kuang Ma, "A Switching Median Filter with BDND for Extremely Corrupted Images", IEEE Trans Image Processing, Vol. 15, No. 6, PP. 1506-1516, June 2006.

[6] Ardizzone, R. Pirrone, O. Gambino, and S Radosta, "Blood vessels and feature points detection on retinal images," in Proc. 30th Annu. Int. IEEE EMBS Conf., pp. 2246–2249, Aug. 2008.

[7] Vijayakumari V., Suriyanarayanan N., "Survey on the Detection Methods of Blood Vessel in Retinal Images", European Journal of Scientific Research, Vol. 68, No. 1, pp. 83-92, ISSN 1450-216X, 2012.

[8] Daniel Welfer, Jacob Schacanski, Cleyson M.K., Melissa M.D.P., Laura W.B.L., Diane Ruschel Marinho, "Segmentation of the optic disc in color eye fundus images using an adaptive morphological approach", Journal on Computers in Biology and Medicine, Vol. 40, pp. 124-137, 2010.

[9] Cemal Kose, Ugur Sevik, Okyay Gencalioglu, "Automatic segmentation of age-related macular degeneration in retinal fundus images", Computers in Biology and Medicine, Vol.38, pp. 611-619, 2008.

[10] Dietrich Paulus and Serge Chastel and Tobias Feldmann, "Vessel segmentation in retinal images", Proceedings of SPIE, Vol. 5746, No.696, 2005.

[11] Ana Maria Mendonca and Aurelio Campilho, "Segmentation of Retinal Blood Vessels by Combining the Detection of centerlines and Morphological Reconstruction", IEEE Transaction on Medical Imaging, Vol. 25, No. 9, pp. 1200-1213, 2006.

[12] Jagadish Nayak, Subbanna Bhat, "Automated identification of diabetic retinopathy stages using digital fundus images", Journal of medical systems, Vol.32, pp. 107-115, 2008.

[13] Akara Sopharak, Bunyarit Uyyanonvara, Sarah Barman, Thomas H.Williamson, "Automatic detection of diabetic retinopathy exudates from non-dilated retinal images using mathematical morphology methods", Computerized Medical Imaging and Graphics, Vol. 32, pp. 720-727, 2008.

[14] ANOVA test for severity of disease. http://afni.nimh.nih.gov/pub/dist/howto/ht05_group/html/background_ANOVA.shtml

[15] "Save function in matlab. http://www.mathworks.in/help/techdoc/ref/save.html

[16] "Load function in matlab. http://www.mathworks.in/help/techdoc/ref/load.html