ISSN (Online): 2456-5717
International Journal of Advanced Research in Basic Engineering Sciences and Technology (IJARBEST)
Vol.4 Issue.3 March 2018

SVM based Diabetic Retinopthy Classification and Red Lesion Detection based Gabor Features

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Abstract— **Diabetic retinopathy (DR) is the most common form of diabetic eye disease. Diabetic retinopathy occurs when these tiny blood vessels leak blood and other fluids. This causes the retinal tissue to swell, resulting in cloudy or blurred vision. A computer-aided screening and grading system relies on the automatic detection of lesions is needed for Screening of diabetic retinopathy. Fundus images with DR exhibit red lesions, such as microaneurysms (MA) and hemorrhages (HE) and bright lesions such as exudates and cotton-wool spots. The existing system used a dynamic shape features based MA and HE detection. However, it can provide less classification accuracy. In order to avoid this automatic detection of excaudate, micro aneurysms and hemorrhages in color fundus images is described and validated based on features extracted by enhanced Gabor feature extraction technique with local entropy thresholding algorithm. Gabor filters are modulated used for texture analysis. It does not require precise segmentation of the region to be classified. Gabor filters are band pass filters which are used in image preprocessing for feature extraction and stereo disparity estimation. Gabor shows elementary functions to minimize the space time uncertainty product. Finally machine learning technique support vector machine is used to classify the diabetic retinopathy type based on Gabor features.**

Keywords-component; formatting; style; styling; insert (key words).

I. INTRODUCTION

An abnormality which increases the glucose level in the blood and causes damage to the blood vessels is known as diabetes. Diabetes is a dangerous disease which can affect different organs of the body like nervous system, kidneys, heart, lungs, eyes etc. When diabetes damage blood vessels in the retina of the eye then diabetic retinopathy occurs. Diabetic retinopathy is a critical eye disease which damages the blood vessels in the retina and causes blindness. It can lead to micro aneurysms, hemorrhages, hard exudates, cotton wool spots, venous loops, etc. Exudates are primary signs of DR. Hemorrhages occur when retinal blood vessels ruptures and blood escapes. Micro aneurysms appear as small round dark red dots. Micro aneurysms are focal dilatations of retinal capillaries.

Diabetes is a disease which is caused by abnormal increase of the glucose level in the blood. By the increased glucose level the blood vessels are damaged in the retina of the eye. The rate of people who are affected with this disease continues to grow very fast. A huge amount of income has been spent by patients for curing this disease. Diabetes is a disorder that occurs when the pancreas does not secrete enough insulin. Diabetes affects many parts of the human body. It's a

life threatening disease and it can affect the circulatory system, the nervous system, kidneys, heart, lungs, eyes, etc. If the eye sight becomes blur, distorted or any damage caused to the tiny blood vessels inside the eye, then such a disorder is known as Diabetic retinopathy (DR). Early detection is very important to prevent blindness. In this method image processing and support vector machine (SVM) techniques are used for automatic detection and diagnosis of eye health.

II. LITERATURE SURVEY

In [1] a brief discussion about the different stages of Diabetic Retinopathy has been done. It has been stated that DR can be classified into four stages namely these four stages are Mild non-proliferative retinopathy, Moderate nonproliferative retinopathy, Severe non-proliferative retinopathy & Proliferative retinopathy. An image is analyzed by using image processing technique and support vector machine (SVM) techniques. From the raw image four features were extracted by using image processing technique and given to SVM classifier for classification of the image and it was observed that by using such an automated system accuracy of around 82% has been achieved.

Advantage

- Lipid-lowering therapy may be more protective against severe retinopathy such as PDR and DME.

Disadvantage

- It is necessary to better understand the potential role of other risk factors such as apolipoproteins and genetic predisposition to shape public health programs.

In [2] Classification of DR has been done by using Higher Order Spectra (HOS) as feature extraction and SVM classifier. It has been concluded that the accuracy depends upon several factors such as size, quality and rigor of training set. It also depends upon the parameters chosen to represent the input.

Advantage

- It achieved a global score over the FROC curve of 0.393, while previous work with images of similar resolution reported a score of 0.233. The new DSFs are highly efficient in discriminating lesions from other candidate regions.

Disadvantage

- a resolution much smaller than the one provided by most of the up-to-date retinographs

In [3] exudates are explained and a system has been proposed which automatically detects DR exudates by using mathematical morphology methods. Detection of exudates is done from non-dilated retinal images. It helps the ophthalmologists in the screening process for detecting the symptoms easily and fast. In this paper exudates detection technique based on mathematical morphology for low quality images has been proposed which can be remotely accessed on any poor computer system where expert ophthalmologists are rarely available.

Advantages

- The framework accomplished a region under the ROC bend of 0.876 for effectively recognizing typical pictures from those with DR with an affectability of 92.2% at a specificity of half. These contrast positively and the two specialists, who accomplished sensitivities of 94.5% and 91.2% at a specificity of half.

Disadvantage

- The performance of the CAD is only compared to a single reading by two experts.
- CAD system does not detect isolated large hemorrhages

In [4] the current status of diabetic retinopathy has been discussed. The causes and effects of diabetes and DR have been discussed. The different types of DR have been discussed. The different feature extraction methods and detection methods has been briefly explained. An ophthalmoscope has been used by an ophthalmologist to detect, analyze and visualize the tiny blood vessels and the different DR stages. A system has been proposed where digital images are taken and analyzed after this screening and DR detection is done using an automated system and few algorithms.

Advantage

- Most effective methods and ideal.

Disadvantage

- Need to overcome these sources of variability before retinal features could be used as a more precise biomarker.

In [5] study levels of early treatment DR have been discussed. Diabetes is a common cause to blindness which leads to DR. Prevention of Diabetic retinopathy has been discussed. The two types of prevention discussed here are primary prevention and secondary prevention. Certain factors that affect or influence diabetic related complications are duration of disease, metabolic control, hypertension, family history hyperlipidemia, smoking and puberty.

Advantage

- Longer diabetes length and poorer glycemic and circulatory strain control are emphatically connected with DR

Disadvantage

- It is limited by data pooled from studies at different time points, with different methodologies and population characteristics.

III. SYSTEM MODEL

The proposed system for classification of different stages of Diabetic Retinopathy. The database is the first block where the images are stored. An image is taken from the database and this image is pre-processed using various image processing techniques. After image processing feature extraction process starts. In feature extraction process the different features are extracted from the image. This image is now sent to the feature classifier where classification is done and based on this process the output is classified. To automatically detect the both micro aneurysms and hemorrhages in color fundus images. To extract Features for the detection of red lesion in diabetic retinopathy using Gabor features. The output is classified further into five different categories. Improved Classification accuracy Removal artifacts present in segmentation image Capable of discriminating between lesions and vessel segments. The major limitation to existing approach is that most of the false positives at the vessel segmentation step are actually lesions. After their removal along with the detected vessels, these lesions are lost and not retrieved in subsequent processing.

Less classification accuracy. Presents of artifacts in the resultant segmentation image.

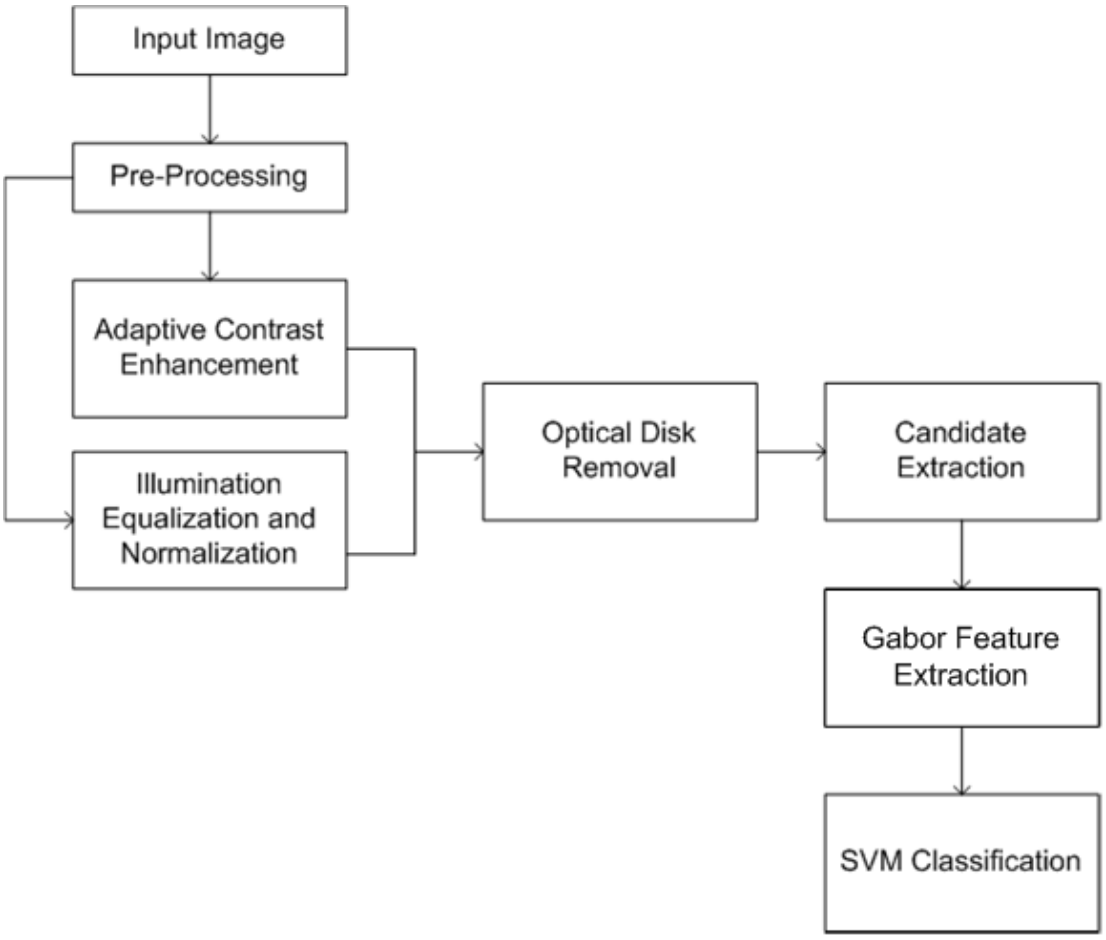

Fig. 1. System Design

Motivation

- The major limitation to existing approach is that most of the false positives at the vessel segmentation step are actually lesions.
- After their removal along with the detected vessels, these lesions are lost and not retrieved in subsequent processing.
- Less classification accuracy
- Presents of artifacts in the resultant segmentation image.

Objective

- To automatically detect the both microaneurysms and hemorrhages in color fundus images.
- To extract Features for the detection of red lesion in diabetic retinopathy using Gabor features.

Modules

1. Preprocessing
2. Gabor features
3. Optic Disc Detection
4. Gradient Segmentation

1. Preprocessing

Preprocessing is done on the parameters like blood vessels, exudates, micro aneurysms, and hemorrhages. To obtain the traces of the blood vessels the green channel of fundus RGB image has been used. In image processing the background is smoothened. Filtering is done using median filter to remove noise. A border has been created to extract blood vessels around the image. The intensity values of the image are subtracted from the image to eliminate edges. Then the pixel values are inverted to obtain the final image with only traces of blood vessels. Detection of exudates is done by obtaining two structural elements i.e. disc shaped and octagon shaped by comparing with the background the detection can be done. Detection of blood vessels with hemorrhage can be done by enhancing the intensity of the image by using large structural elements. Then the original image is dilated and subtracted from the enhanced image. This image is filtered using wiener and median filter. The optical discs are removed from the image and now the image shows hemorrhages. The process is same in micro aneurysms at the end the image will be subtracted with the edge detected micro aneurysms image.

2. Gabor Features

The feature classification has been done using Gabor classifier. Gabor classifiers have shown excellent performance in the field of pattern recognition. Finally the image is classified

into five categories Normal image, mild non-proliferative retinopathy, moderate non-proliferative retinopathy, severe non-proliferative retinopathy & proliferative retinopathy

3. Optic Disc Detection

For detection of optic disc accurately, we create a template for a optic disc. Three histogram, one for each color component is utilized for detection rather than using the image as a template. From the retinal image, the optic disc of size 80 x 80 pixels is extracted. Histogram for each color component is obtained for the extracted optic disc. 80 x 80 - pixel window is moved through the entire retinal image whose optic disc is to be founded. For every window the histogram for three color component is obtained. Correlation between the histogram of the channel in the window and the histogram of the template is calculated.

4. Gradient Segmentation

The gradient segmentation consists of two segmentation steps namely binary and multi region segmentation. In binary segmentation, first the preprocessed image will be converted to binary image by using binary segmentation model. In binary segmentation, the segmentation is done based on Intensity Variation on Segments, Directional Deviation, and Weighted Boundary Length. The multi-region segmentation is done by using semi-color model and full-color model. The multi region segmentation is done using gradient and convexity segmentation. Enhanced Gabor feature extraction method with local entropy thresholding algorithm. Gabor filters are used for texture analysis. Sinusoidal modulated Gabor filter kernels are used in this analysis. Gabor channels are band pass channels which are utilized as a part of picture preparing for highlight extraction, surface examination, and stereo dissimilarity estimation.

IV. FUTURE SCOPE

Future work uses fisher linear discriminant classifier for classification of diabetic retinopathy and compare the results of Gabor and FLDC. Most of the real-world applications such as text categorization, optical character recognition, and speech recognition and intrusion detection are essentially multi class classification problems. Gabor developed by vapnik based on statistical learning theory was originally designed for binary classifications. Extending SVM for multi class classification is a challenging problem.

V. CONCLUSION

Gabor wavelet is an effective device to separate surface highlights. Gabor capacities are Gaussians balanced by complex sinusoids. Gabor sifted yield of the picture is gotten by the convolution of the picture with Gabor work for every one of the introduction/spatial recurrence (scale) introduction Diabetic Retinopathy is a sickness which causes vision misfortune quickly. The information shading retinal pictures are of low quality. So they were pre-handled utilizing Grayscale change, Adaptive Histogram Equalization, Discrete Wavelet Transform, Matched channel and Fuzzy C-implies division. From the pre-handled pictures highlights were extricated for grouping process. As an accomplishment of this work, the DR has been ordered into two classifications NPDR and PDR utilizing PNN and SVM. The two procedures utilized for the order

were great in execution, however SVM is more productive than PNN from the got comes about. In this manner this work has given an effective Diabetic Retinopathy Diagnosing technique which analyze the illness in beginning period which commonly diminishes the manual work.

REFERENCES

[1] J. Odstrcilik et al., "Retinal vessel segmentation by improved matched filtering: evaluation on a new high-resolution fundus image database," IET Image Processing, vol. 7, no. 4, pp. 373–383, 2013.
[2] X. Zhang et al., "Exudate detection in color retinal images for mass screening of diabetic retinopathy." Medical image analysis, vol. 18, no. 7, pp. 1026–1043, 2014.
[3] Mendonc¸a, A. Sousa, L. Mendonc¸a, and A. Campilho, "Automatic localization of the optic disc by combining vascular and intensity information." Computerized medical imaging and graphics, vol. 37, no. 5-6, pp. 409–17, 2013
[4] Agurto et al., "Multiscale AM-FM methods for diabetic retinopathy lesion detection." IEEE transactions on medical imaging, vol. 29, no. 2, pp. 502–12, 2010
[5] Antal and A. Hajdu, "Improving microaneurysm detection using an optimally selected subset of candidate extractors and preprocessing methods," Pattern Recognition, vol. 45, no. 1, pp. 264–270, 2012.
[6] J.Ding and T.Y.Wong Current epidemiology of diabetic retinopathy. "Current diabetes report, vol.12, no.4, pp. 346-54, 2012.
[7] W.Y. Yau et al,"Global Prevalence and major risk factors of diabetic retinopathy."Diabetic care, vol. 35, no. 3, pp. 556-64, 2012.
[8] M. Niemeyer, B. van Ginneken, S. R. Russell, M. S. A. Suttorp-Schulten,ands M. D. Abramoff, "Automated detection and differentiation of drusen,exudates, and cotton-wool spots in digital color fundus photographs fordiabetic retinopathy diagnosis," Investigative ophthalmology & visualscience, vol. 48, no. 5, pp. 2260–2267, 2007.
[9] S. Ravishankar, A. Jain, and A. Mittal, "Automated feature extraction for early detection of diabetic retinopathy in fundus images," 2009 IEEEConference on Computer Vision and Pattern Recognition, pp. 2017.
[10] L. Seoud, T. Faucon, T. Hurtut, J. Chelbi, F. Cheriet, and J. M. P. Langlois, "Automatic detection of microaneurysms and haemorrhages in fundus images using dynamic shape features," in IEEE 11th International Symposium on Biomedical Imaging, Beijing, 2014, pp. 101–104.
[11] E. Trucco et al., "Validating retinal fundus image analysis algorithms: issues and a proposal," Investigative Ophthalmology & Visual Science, vol. 54, no. 5, pp. 3546–3559, 2013.
[12] J. W. Y. Yau et al., "Global prevalence and major risk factors of diabetic retinopathy." Diabetes care, vol. 35, no. 3, pp. 556–64, 2012.
[13] B. Zhang, X. Wu, J. You, Q. Li, and F. Karray, "Detection of microaneurysms using multi-scale correlation coefficients," Pattern recognition, vol. 43, no. 6, pp. 2237–2248, 2010.