A REVIEW ON DETECTION OF MICROANEURYSM IN FUNDUS RETINAL IMAGES USING SVM CLASSIFIER

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Abstract— in this paper a review of different techniques used for detecting Diabetic retinopathy has been done. Diabetes is a rapidly increasing worldwide problem which is characterized by defective metabolism of glucose that causes long-term failure of various organs. The most common complication of diabetes is Diabetic Retinopathy (DR), which is one of the primary causes of blindness and visual impairment in adults. Therefore early detection through regular screening and timely intervention will be highly beneficial in effectively controlling the progress of the disease.

Index Terms— Diabetic Retinopathy, fundus images, micro aneurysm

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I. INTRODUCTION

Diabetes mellitus (DM) also known as simply diabetes, is a group of metabolic diseases in which the person has high blood glucose (blood sugar), either because insulin production is inadequate, or because the body's cells do not respond properly to insulin, or both. Patients with high blood sugar will typically experience polyuria (frequent urination), they will become increasingly thirsty (polydipsia) and hungry (polyphagia). DM has many complications that can affect the eyes and nervous system, as well as the heart, kidneys and other organs. Diabetic retinopathy (DR) is a disorder of the retina that eventually develops to some degree in nearly all patients with long-standing diabetes mellitus. Diabetic retinopathy is a common complication of diabetes which affects the small blood vessels in the lining at the back of the eye. Diabetic retinopathy can cause the blood vessels in the retina to leak or become blocked and damage the sight. When someone has diabetes for long time, the blood vessels in the retina become thicker and the blood flowing in the blood vessels slows down. People with diabetes are 25 times more likely to develop blindness than individuals without diabetes. For any type of diabetes, the prevalence of diabetic retinopathy in people more than 40 years of age was reported to be 40.3%. In the early stages, diabetic retinopathy will not affect the sight, but if the changes get worse, eventually the sight will be affected.

II. LITERATURE SURVEY

Bálint Antal and András Hajdu *et.al* [1] proposed a method for an automatic system for diabetic retinopathy screening. The method comprised of two components: feature extraction from images and ensemble learning system.

Akshatha Rao M.*et.al* [2] proposed a new approach to diagnose DR using Hurst Exponent and Fractal Dimension, and resulted that power spectrum of retinal image helps to visually diagnose disease. It helps ophthalmologist to quickly classify retinal image as DR or Healthy on visual basis.

Nahla H. Barakat *et.al* [3] developed a hybrid system for medical diagnosis. In particular, employed SVMs. for the diagnosis and prediction of diabetes, where an additional rule-based explanation component is utilized to provide comprehensibility.

Jefri Junifer Pangaribuan *et.al* [4] put forward a new method of ANN, namely (ELM) Extreme Learning Machine. ELM is a feed-forward neural network with one hidden layer, or better known as the single hidden layer feed-forward neural network. ELM has a high accuracy and a very good speed in diagnosed diabetes mellitus. In terms of speed, ELM's performance is better than the performance of backpropagation, where the speed obtained when the prediction process start per each data. ELM's performance in terms of accuracy is also better than the performance of back propagation, where the accuracy could be seen from the value of output that has been analyzed by looking at the error rate of MSE.

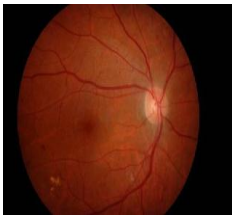
Poonam Undre *et.al* [5] represented combination of fuzzy, neural network and CBR approach for detection of diabetes. Due to use of combination of all these techniques, it is found that prediction rate was improved to great extent.

Mohd Fazli Hashim *et.al* [6] proposed an approach to detect lesion without normal structure segmentation and removal. The stage is replaced by identifying abnormal region using region based approach.

III. METHODOLOGY

1. INPUT IMAGE

[7] A fundus camera or retinal camera is a specialized low power microscope with an attached camera designed to take photograph of the interior surface of the eye, which includes the retina, optic disc, and macula.



Original Fundus Image

Anaswara Chandran *et.al* [8] researcher collected the images from two publically available databases MESSIDOR and STARE, and from Local hospital.

T.Ruba *et.al* [9] the images were collected from MESSIDIOR database that is publicly available from the internet. 50 images were used to train the SVM classifier and 20 images were used for testing.

2. IMAGE PREPROCESSING.

The purpose of this step is for uniformity before next image processing is applied. This is applied because the images tend to have various contrast level. Also, for getting ROI (Range of Interest) of the image preprocessing is done. In other word it is called as "border image"Alan D. Fleming *et.al* [10] suggested that in this stage, only the green image is processed because MAs appear with highest contrast in green channel.[9]The author employed Median filter for filtering process, which normally smoothens and removes the unwanted pixels in the image. Also stated that Median filter identifies the noisy pixels within the regions and replace the noisy pixels with the median of the neighboring pixels within the regions.[2] First the 3D RGB image is read. This image has to be converted into 2D gray image. The aim of pre-processing is to attenuate the noise, to improve the contrast and to correct the non-uniform illumination. K. Zuiderveld *et.al* [11] proposed Contrast limited adaptive histogram equalization (CLAHE), which is a popular technique in biomedical image processing, since it is very effective in making the usually interesting salient parts more visible. The image is split into disjoint regions, and in each region a local histogram equalization is applied. Then, the boundaries between the regions are eliminated with a bilinear interpolation.

CLAHE Image

3. IMAGE SEGMENTATION

Rohan Kandwal *et al*. [12], In this paper, image segmentation is noted as the maximum important part in digital picture processing. Segmentation is nothing however a portion of any photo and object. In image segmentation, digital photo is split into a couple of set of pixels. Image segmentation is commonly required to cut out region of interest (ROI) from a photograph. Currently there are many distinct algorithms to be had for photograph segmentation. Each has their very own benefits and motive. In this paper, the author has reviewed different image segmentation algorithms with their possibilities.

R. V. Patil *et al*. [13] claims that if the number of clusters is estimated in accurate manner, K-means image segmentation will provide better results. They proposed a new method based on edge detection to estimate number of clusters. Phase congruency is used to detect the edges. Then these edges are used to find clusters. Threshold and Euclidean distance is used in order to make clusters. K-means is sued to find the final segmentation of image. MATLAB is used to implement the proposed technique. Experiments are performed on nine different images and results shows that number of clusters is accurate and optimal

Salem Saleh Al-amri *et al*. [14] has applied Mean technique, Pile technique, HDT, and EMT technique on three satellite images in order to select the best segmented image from all above techniques. Experiments and comparative analysis of techniques have shown that HDT (Histogram Dependent Technique) and EMT (Edge Maximization Technique) are the best thresholding techniques which outperform all other thresholding techniques.

I.Karoui *et al*. [15] proposed a new unsupervised image segmentation method using level set methods and texture statistics. They claim that their method is different from other methods since it doesn't assume independent variable, and it doesn't restrict to first order grey features. The implementation includes feature selection step to re-adjust the weights of each feature to get the segmentation. In experiment stage, filter response histogram is used to calculate the number of distributions; haar wavelet is used to compute the energy of image wavelet of each band. PDE is used to re-initialize the level sets. Results have shown for a zebra image as correct segmentation.

Liu Yaju *et al*. [16] have proposed a new fuzzy color image segmentation algorithm based on feature divergence and fuzzy dis-similarity. Their algorithm claims to improve segmentation quality. Their algorithm extracts sub-images feature Eigen-vector using watershed technique. Firstly, color image is transform into gray level image, histogram is created in second step, cluster are created in next step, FCM is applied to each cluster, then they applied erosion, dilation, and region growing on resultant image. After it, the segmented region image is produced at the end. Image is taken with complex background, i.e., photographic images. Results have shown that fuzzy approaches generate better results.

4. FEATURE EXTRACTIONS

Tomasz Kajdanowicz *et al*. [17] developed a new method for feature extraction. In this method the new features are calculated by combining the network structure information and the class label. This method is able to extract the important features and show small improvement in the classification accuracy. Sandya *et al*. [18] developed a new feature extraction method using fuzzy logic. In this method the fuzzy system generates a fuzzy score. This score is used to extract the most relevant features. They found that this method extract the efficient features and shows the better classification accuracy. Many data mining applications generated the dataset with the small sample size and it is very difficult to perform the analysis. Hence, Sitanshu Sekhar Sahu *et al* [19]. Designed a new hybrid feature extraction method. In this method they used F-score to extract the most efficient features with a small amount of data.

5. CLASSIFIER

Selvathi et al. [20] The SVM classifier classifies the input image as normal (not affected by DR) or DR images based on the training done by giving the sample features. The limitation of this approach is that it sometimes fails to detect faint exudates.

[9]The proposed classifier results in 82% of accuracy. The proposed method for OD segmentation results in 99.63% of accuracy and the proposed method for Exudates segmentation results in 99.35% of accuracy. Method is developed to detect exudates from non-dilated, low

contrast retinal images. Since this method is automated and simple,it detects symptoms faster and it works effectively even on a poor computing system.

R.Priya *et.al* [21] stated that SVM is more efficient than PNN from their results.Thus this work has given a successful Diabetic Retinopathy Diagnosing method which helps to diagnose the disease in early stage which mutually reduces the manual work. The DR has been classified into two categories NPDR and PDR

IV. CONCLUSIONS

From the above discussion we can state that lot of advancement and improvements happened in the last few years for detecting Diabetic Retinopathy. The methods got more accurate, more reliable with faster response time. The specificity and sensitivity has increased proportionally with increase in the research work. The system can help the ophthalmologist to detect diabetes retinopathy at the early stage. The method implemented can be used for screening of patients eyeballs for detecting level of DR in a cost effective manner. This technique helps in determining levels of DR in its early stage and thus preventing vision loss.

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