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Review paper on Diagnosis of Diabetic Retinopathy using KNN and SVM Algorithms

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Abstract: ***Diabetic Retinopathy is an eye disease which is caused by changes in blood vessels of retina of diabetes. It is the primary cause of blindness in the universe. To avoid blindness of diabetes detection of diabetic retinopathy as early as possible is the only option as number of persons are becoming blind because of this disease. Exudates are the first symptom of diabetic retinopathy and detection of exudates by ophthalmologist normally requires dilation of pupil by using chemical solution which affects patient and also takes time. In this review paper we focus on automatic detection of diabetic retinopathy through detecting exudates in colour fundus retinal images and also classify the rigorousness of the lesions. We studied various methods available to detect the exudate. Detecting exudates early so that treatment on diabetic retinopathy can be taken and blindness by it can be avoided. Decision making for the severity level of disease was performed by collaborating KNN and SVM algorithm which gives more accuracy and reduces time of diagnosis of diabetic retinopathy. This paper presents review on various technique used for detection and diagnosis of diabetic retinopathy.***

Keyword: Retinopathy, Exudate, Feature extraction, KNN, SVM.

I. INTRODUCTION

Diabetic eye disease is a leading cause of poor vision and blindness. Approximately 10% of patients diagnosed with diabetes have vision problems. According to clinical test results, early detection and treatment may prevent more than 95% of the vision reductions that are observed in diabetic patients. For the patients with diabetes, regular eye examinations will need to obtain proper therapy before it is too late. In biomedical applications, automated retinal image analysis made the detection of retinal pathologies much easier for ophthalmologists, whereas conventional methods, such as dilating the eye pupil, take time and make patients suffer for a while. Diabetic Retinopathy (DR) is caused by the damage to blood vessels of the retina. It occurs when high blood glucose, the characteristic of diabetes, has damaged the small vessels that provide oxygen and nutrients to the retina. This paper also focuses on exudates for the reason that it provides information about earlier diabetic retinopathy. The proteins and lipids getting leaked from the bloodstream into the retina through damaged blood vessels is the chief cause of exudates. The screening process for diabetic retinopathy involves excessive dilation of pupil which affects the patients' eye. So, automated methods are presented in this paper for detection of exudates from the non-dilated colour fundus retinal images using morphological process

II. LITERATURE REVIEW

M. Gandhi and Dr. R. Dhanasekaran[1] proposed method that the exudates were clearly distinguished from optic disc and blood vessels. As the optic disc and blood vessels have similar intensity level of exudates, they are completely removed prior to the detection of exudates. The SVM classifier is used to assess the severity of this disease whether the patient is moderately affected or severely affected. This information from the classifier algorithm improves the clarity in the diagnosis of Diabetic Retinopathy. The earlier diagnosis of this Diabetic Retinopathy helps the patients to take proper treatment to eliminate the disease or decrease this severity of the disease. A.Alaimahal, Dr.S.Vasuki[2] proposed work concentrates on microaneurysms

detection from diabetic retinopathy patient's digital images. The system intends to help the ophthalmologists in the diabetic retinopathy screening process to detect symptoms faster and without doubt. Sensitivity and Predictive value of the proposed method is 98.89% and 89.70%. The algorithm could detect MAs on very poor quality images. The system also provides ophthalmologists with the number of MAs for grading the Diabetic retinopathy stage. In order to apply for a clinical purpose, the proposed method will be combined with an exudates detection system.

Michael Larsen, JannikGodt, Nicolai Larsen, Henrik Lund-Andersen, Anne KatrinSjølie, ElisabetAgardh, HelleKalm, Michael Grunkin, and David R. Owens[3]proposed that detection of diabetic retinopathy by automated detection of single fundus lesions can be achieved with a performance comparable to that of experienced ophthalmologists. The results warrant further investigation of automated fundus image analysis as a tool for diabetic retinopathy screening. Shradha Mirajkar and M. M. Pati[4] proposed system produces edge maps which are based on Kirsch edge detection methods. In addition, the edge map images are relatively free from any noise. The edge-based segmentation using Kirsch compass templates is superior by far to other methods. In this study, the Kirsch template-based implementation is tested on retinal color images. Blood vessel in retinal images can be classified by using knn classifier. The Gabor wavelet shows itself efficient in enhancing vessel contrast while filtering out noise. Information from wavelet responses at different scales is combined through the supervised classification framework, allowing proper segmentation of vessels of various widths. The kNN classifier showed good performance.

Sankaranarayanan.S ,DrPramanandaPerumal.T [5] discussed that the data mining plays an important and decisive role in diabetes research. Data mining tools would be a valuable asset for diabetes researchers because it can uncover and expose hidden knowledge from a huge amount of diabetes related data which significantly help to improve the quality of health care for diabetes patients.Nathan Silberman, Kristy Ahlrich, Rob Fergus and Lakshminarayanan Subramanian[6] explains that diabetic retinopathyis an eye disorder caused by diabetes, is the primary cause of blindness in America and over 99% of cases in India. India and China currently account for over 90 million diabetic patients and are on the verge of an explosion of diabetic populations. The automated diabetic retinopathy problem is a hard computer vision problem whose goal is to detect features of retinopathy, such as hemorrhages and exudates, in retinal colour fundus images. They describe their initial efforts towards building such a system using a range of computer vision techniques and discuss the potential impact on early detection of diabetic retinopathy.DU Ning, LI Yafen[7]explains in their work that they had investigated and proposed a computer-based system to identify normal, NPDR and PDR. The system proposed demonstrated a classification accuracy of 93.3%, sensitivity of 90% and specificity of 100%. The results demonstrated here indicate that the system can help the ophthalmologist to detect diabetes retinopathy at the early stage.Inbarathi.R* and Karthikeyan.R[8] proposed technique elucidates to increase the performance of screening system, that diagnosis the DR at initial stage by detects the retinal hemorrhage. For this purpose, supervised SVM classifier is trained based on the number of relevant, extracted splat and GLCM features to classify the images into hemorrhage affected retina and normal retina from normal and abnormal retinal images to detect the retinal hemorrhage. In their proposed work the KNN classification for hemorrhage detection was used. They also proposed that in future work this classification accuracy is compared with SVM classifier.

Akarasopharak [10] used FCM clustering technique for detecting the exudates pixels, Sai Prasad Ravishankar [11] used morphological process to find exudates and blood vessels but severity level of the diabetic retinopathy was not discussed. J. David Rekha Krishnan [12] proposed thresholding technique to identify the lesions, optic disc and vascular network and neural network classifier was then used to assess the severity level of the disease. DR has two types. First, Earlier stage is Non-Proliferative Diabetic Retinopathy (NPDR) in which symptoms will be mild or non-existent that occur due to small amount of bleeding and fluid leaking into retina. Retinal hemorrhage [13] is useful to find NPDR. Second, advanced (or) severe stage is Proliferative Diabetic Retinopathy (PDR) occur due to new blood vessel starting to grow in the eye that are fragile and can bleed. It becomes Blindness. L. Giancardoet. al. [15] used multiple view retinal fundus images which are registered for detection and quantitative measurement of the disease.

III. PROPOSED WORK

The proposed method makes the collaboration of both KNN and SVM algorithm are used .extracted features are given to the each algorithm first and then collaborated both of these algorithm to more efficiency.

1) Preprocessing:

In this module the input image will be processed in order to get a proper contrast, low noise and effectively scaled image.

2) Exudates Detection:

In this module the red portion of the eye which define damage blood vessels or exudates will be evaluated (segmented) so that we get only portion of the eye which is of our interest.

3) Feature extraction:

In this module features of small damage blood vessel will be selected and evaluated. The feature will shaped, texture, color and morphological features.

4) Development of K nearest neighbour classifier:

In this module features from database and feature of input image will be given to the KNN classifier so that we get the type of diabetic retinopathy.

5) Development of SVM:

In this module features from database and feature of input image will be given to the KNN classifier so that we get the type of diabetic retinopathy.

6) Fusion of KNN and SVM Algorithm:

In this module the output of KNN and SVM will be fused together to achieve higher accuracy and faster output.

7) Result evaluation and optimization:

In this module results will be evaluated and optimized if required. Results will be in a form of accuracy and delay.

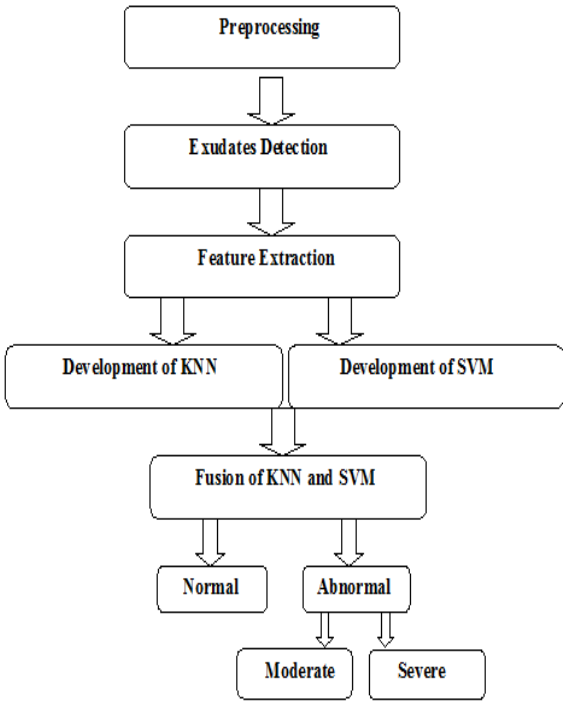

Fig. Block Diagram of Proposed Methodology

IV. Conclusion

This paper proposed the overall methods developed to detect exudates from retinal digital images of retinopathy patients and it is intended to help the ophthalmologists in the diabetic retinopathy screening process to detect symptoms faster and more easily. And proposed systems working idea can be understood by this paper and proposed methodology importance is given. This paper presents review on various technique used for detection and diagnosis of diabetic retinopathy

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