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AN HYBRID APPROACH TOWARDS DIABETIC RETINOPATHY CLASSIFICATION USING KNN AND SVM

MS. SHRADDHA JALAN[1], PROF. A. A. TAYADE[2]

1. Department of Computer Science and Engineering, P. R. Patil COET, Amravati, India.
2. Department of Computer Science and Engineering, P. R. Patil COET, Amravati, India.

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Abstract: An eye disease which is caused by Changes in blood vessels of retina of diabetes is called Diabetic Retinopathy. It is the primary cause of blindness in the universe. In this paper we focus on automatic detection of diabetic retinopathy through detecting exudates from gray scale image of retina and also classify the image as normal and abnormal. Decision making on image is taken first by both SVM and KNN algorithms in matlab and the final decision is taken by collaborating these two algorithms by Logistic Regression which gives more accurate result and also reduce the time in detection of diabetic retinopathy disease.

Keywords: Diabetic Retinopathy, Exudate, Feature extraction, KNN, SVM, Logistic Regression

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Corresponding Author: MS. SHRADDHA JALAN

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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

I. 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.

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.

ankaranarayanan.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. 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.

II. PROPOSED SYSTEM

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 give more efficiency.

Firstly it uses training data for making this decision. In training stage we give label to many images that the image is normal(without diabetic retinopathy)or abnormal(with diabetic retinopathy).This trained dataset is use now for decision making.

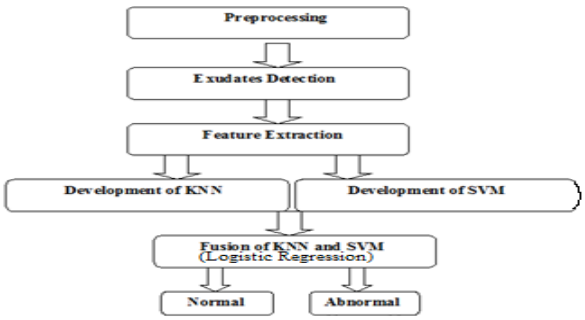

Fig1: Block diagram of proposed system

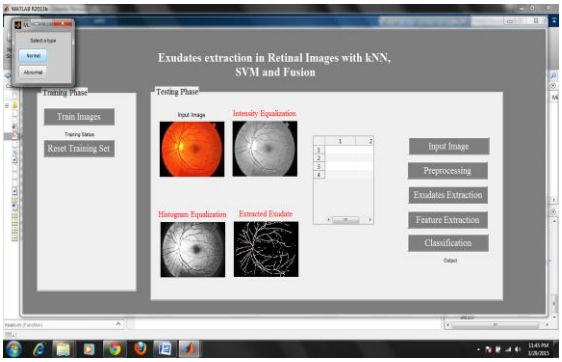

Fig 2. Train images option

We can reset the training set by pressing reset button. Which will delete all sets values of image and again we can train images.

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. Edges are removed and we got a portion of retina which is of our interest. In feature extraction image features like mean,

entropy and standard deviation are calculated on the difference of these features image is normal or abnormal is decided. In matlab readymade functions like mean, entropy, std are available we used this functions in coding.

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.

Extracted features gives values as shown in figure and while classification it ask for three different methods for classifying input image which is our test image.

We can choose either SVM or KNN for first classification. It will show us the result analysis for particular selection. Logistic regression gives probability approach between SVM and KNN.

The final output will look like following with computing time calculation. In this way it will give more accuracy and sensitivity in detection of diabetic retinopathy process

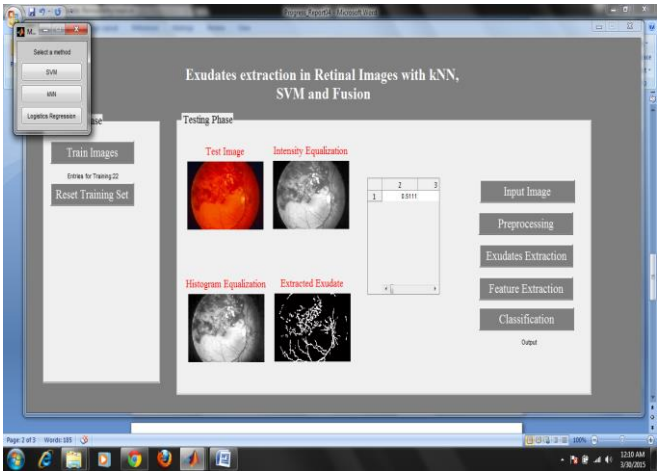

Fig 3: Classification option

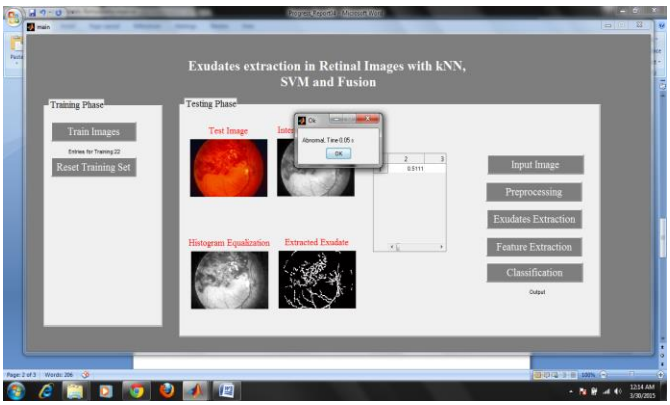

Fig 4: Classified result displayed

III. RESULT EVOLUTION AND COMPARISON

Here in this paper we proposed a system which is used to detect diabetic retinopathy from diabetic patients retina by using KNN and SVM algorithms, the proposed system provides efficient and accurate result as both of these algorithms are again collaborated using Logistic Regression.

Previously proposed systems uses either of this algorithm which takes more time from proposed system here and proposed system also gives more accurate result

IV. CONCLUSION

This paper gives idea of 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 system in this paper uses SVM, KNN and Logistic Regression algorithms which gives accurate result in detecting diabetic retinopathy disease. In working of proposed system this paper explains its accuracy. The system proposed also takes less time as compare to previous systems proposed.

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