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Early Glaucoma Detection Using Naive Bayes Algorithm

Shanmugapriya. A[a] ,Mr. A. Jayakumar[b]

[a] Department of ECE,IFET college of engineering ,Villupuram
[b] Department of ECE,IFET college og engineering ,Viluupuram

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ABSTRACT: Glaucoma arisedue to increased level of intraocular pressure in eye. If they are not detected, it will cause permanent blindness. Symptoms of glaucoma are not accessible. The patients take treatment when the condition reach serious. Glaucoma can be reduced by early detection and analysis.This paper proposes automated glaucoma diagnosis method using feature extracted from Naive bayes and Gabor filter applied on digital fundus images. In this work, images are used to classify into normal and glaucoma classes.

KEYWORDS: *Glaucoma, intraocular pressure, fundus image, naive bayes.*

I. INTRODUCTION

The human eye is the organ that gives us the function of sight. The dimension, shape and color of the object is analysed by processing the light they reflect.Retina places a vital role in the vision system. Glaucoma is a disease by affecting retina which is leading cause for blindness. Open angle is also called as wide and open angle between iris and cornea. It is a normal form of glaucoma and lead to slow clogging in the eye and can be easily cured. And the symptoms are said to be easily identified.This type of glaucoma is commonly widespread affecting disease, mainly for old aged people. Angle closure or closed angle glaucoma is a very rare case and highly dangerous which leads to sudden blindness. Main cause of this glaucoma is due to rise in Intraocular pressure. It occurred in retina affected person has a closed or narrow angle between the iris and cornea. Blood vessels extraction is important for analyzing the blood vessels. Since the eye is the only organ in the body that give the detailed vision of blood vessels which show the body organ health status. To analyze the disease glaucoma, the blood vessel in the fundus image should be segmented.Glaucoma is an eye conditions that damage the optic disc, the health of which is vital for good vision. This damageoccur due to high pressure in eye.Glaucoma is leading causes of blindness for people at the age of 60. It can occur at any age but is more common in olderadults. Glaucoma does not provide any retina to brain the optic disc send signals.These signals are seen as image.in the front part of the eye, a fluid called aqueous (pronounced AY-kwee-us) humor circulates damaging the optic nerve. The optic nerve is connected to the retina a layer of light-sensitive warming stage. This glaucoma effect does not cause a change in vision until the condition is at an advanced stage.

Glaucoma is a disease that damages your eye's optic disc. It happens in the front part of your eye,when fluid secrete. That secreted fluid increases the pressure in your eyeandtissue lining the inside of the eye and is made up of like an electric cable, the optic nerve is made up of many nerves.

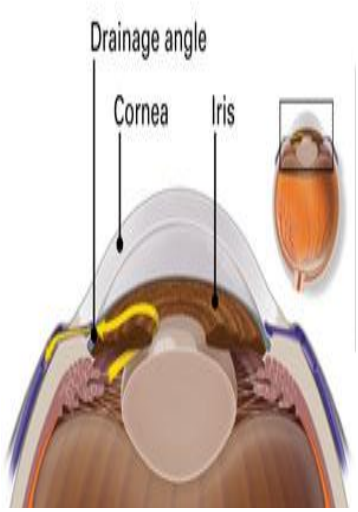

Fig 1: Glaucoma detection

To order to have a healthy eye pressure, your eye continually produces a small amount of aqueous humor while an equal amount of this fluid flows out of your eye. The aqueous humor does not flow out of the eye properly,if you are affected by glaucoma.

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II. RELATED WORK

Glaucoma is eye condition that cause permanent blindness when the diseasereach to an serious condition .This occurs due to excess intraocular pressure in the eye, which intern cause damage to the optic nerve. Glaucoma cannot provide any symptoms in its evolving stage and so, it is necessary to diagnose early in order overcome blindness. Fundus photography is widely used by ophthalmologists to assist in diagnosis of glaucoma and is cost-effective. Due to increase of fluid pressure in optic nerve, glaucoma reach to progressive deterioration.The existing methods of glaucoma diagnosis arerequire practiced clinicians to understand the eye problem,expensive and time-consuming. Hence cheap, fast, and more accurate glaucoma diagnosis methods are needed. This paper give a new idea for glaucoma detectionfrom fundus images using third level two-dimensional discrete wavelet transform (2D DWT) and histogram features.The glaucoma and healthy images are decomposed by2D DWT. From 2D DWT decomposed sub band images, histogram features are extracted.For classification,Theleast square support vector machine (LS-SVM) is used, that classifies the glaucoma and healthy images using the extracted features. Local Binary Pattern (LBP) and its variants have powerful discriminating capabilities but most of them just consider BP code independently. In this paper, for image classification and smoke detection,we use LBP sub oriented histogram. To capture LBP code spatial relation, From an image,first extract LBP codes and figure out the gradient of LBP codes, and then calculate sub oriented histograms. Since an LBP code is a label without any numerical meaning,To estimate the gradient of LBP codes we use Hamming distance.To compute two orientations,we use two coordinates systems which are quantized into discrete bins.We generate a sub LBP code map from the original LBP code map, For each pair of the two discrete orientations and compute sub oriented histograms for all sub LBP code maps. Finally, to form a robust feature vector, all the sub oriented histograms are concatenated which is input into SVM for training and classifying.The present day camera systems have the limitation of acquiring the clearer image of a scene having objects at different distances. This drawback can be rectified by using fusion of various images of the scene taken withdifferent camera settings. The fusion of the images comes under the class of multifocus image fusion. In the existing method of image, based on their clarity measure image blocks are fused by pulse coupled neuralnetwork (PCNN). To choose the best-quality image block for fused image,PCNN is used.This plays a major role. Fusion method are time consuming and tedious process because of the inherent complexity of PCNN. In this study, for application in image fusion technique, a modified approach of PCNN is used.This study presents a method for multifocus image fusion by using modified PCNN (MPCNN) with energy of Laplacian (EOL) as clarity measures and spatial frequency (SF). In the proposed method, For better quality of computational time,image is fusion using MPCNNAnd fused image with reduced root mean square error (RMSE) Glaucoma is identified by the variation in the construction of optic cup (OC), optic disk (OD), loss of retinal nerve fibre, diameter and area of OC, OD, and area of rim of ONH. Centre-surround statistics and histograms used for super-pixel classification of the disc as disc and non-disc for glaucoma screening.The features are classified using least square support vector machine classifier.as it suffered from interference and redundancy due to improper segmentation. The performance is consider as less accurate.

III. EXISTING SYSTEM

A.PRE-PROCESSING

Pre-processing is a very important step in image processing. It removes all unwanted variations like non-uniform illumination,noise and low contrast. All images are resized (256 × 256) to make of same dimensions and same resolution for better analysis of results on the same scale. Green image component has more information therefore, only it is used.

B. FEATURE SELECTION

It is a very useful step because it includes or selects onlymost discriminating features from given features set. It removesuncorrelated data and reduces dimensionality of data to increase the performance of the method.

C.QUASI-BIVARIATE VARIATIONAL MODE DECOMPOSITION

The QB-VMD is a non-movable and fully flexible image decomposition technique. The limitations of conventional methods are like lack of mod mixing, boundary distortion, interference and mathematical representation.

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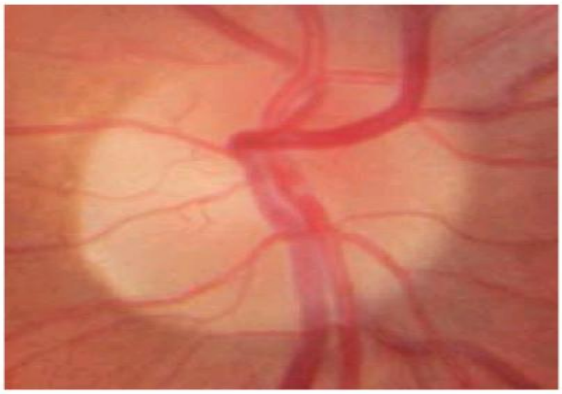

Fig 2: Normal

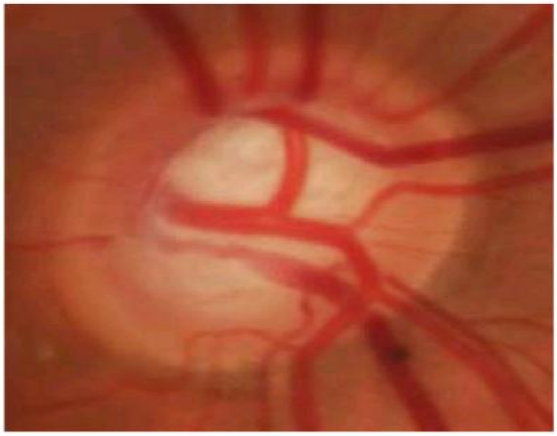

Fig 3: Glaucoma

These limitationssuggested the robust image decomposition technique.QB-VM does not have any mod mixing and edge distortion problems. It is very robust to noise. It gives band limited SBIscentredaround a specific frequency which captured more data of pixel variation.The QB-VMD has two unique features. First, a unique featureis a carrier frequency re-balancing strategy aiming to minimisemode mixing problem in two-dimensional scenarios. The secondunique feature always maintains a high degree of smoothness formodes.It is a very useful step because it includes or selects onlymost discriminating features from given features . It removesanco -ordinate data and reduces dimensionality of data to increasethe performance of the method.

D. SVM CLASSIFIER

SVM stands for support vector machine which is a classifier usedto classify two or many classes.LS-SVM classify efficiently,therefore, it is using currently in medical image classification todetect glaucoma or other diseases. The QB-VMDgave band limited smooth SBIs which are very discrimination toextract the more useful information for the glaucoma detection.QB-VMD SBI captured more information of pixel variation.

IV. PROPOSED METHOD

Our proposed method is designed to help the doctors in their decision-making process for detecting glaucoma.The automatic detection and classification method help to improve the overall accuracy of the system and helps to explore the different images used for diabetic retinopathy.Here used Naive Bayes classifier for this purpose. Gabor filter is used to reduce noise and distortion in retinal image.Naive Bayes is advantageous as only a small training set is needed to provide very good results because only are of importance during training. Hence, the computational efficiency of Naive Bayes is great.

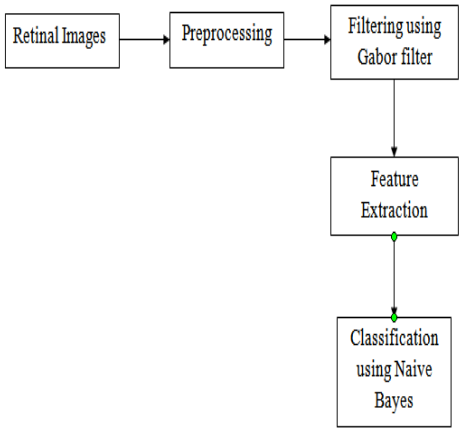

Fig 4: Block diagram of proposed system

A.PRE-PROCESSING

Preprocessing of the fundus image includes the image enhancement to improve the low contrast and dynamic range of the detection. The size, shape, and color of the optic disc help in localization and detection of the ROI. The high-intensity region of the input fundus image is considered as the seed point for the location the ROI. Gabor's filters are a reasonable model of simple cells in the Mammalian vision system. Due to this, Gabor filters are thought to be a good model of how humans distinguish texture, and image for the automated and precise localization and segmentation of the retinal structures. The optic disc region is the ROI for glaucoma are therefore a useful model to use when designing algorithms to recognize texture.

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B.BLOOD VESSEL REMOVAL

The retinal blood vessel emerges out from the optic disc region. The presence of the blood vessel in the extracted ROI may lead to misclassification of the normal and glaucomatous image. For the purpose of feature extraction, it is desirable that blood vessel does not contribute any change in the structure of the optic disc for the detection of glaucoma. Hence, the blood vessels in the ROI are removed using the morphological operator. Dilation operator with ball shaped structuring element is used to remove the blood vessel.

C.FEATURE EXTRACTION

The features are extracted from the localized ROI. The features are invariant to geometric and photo metric transformation, thus used to describe the shape and edge of the structures present within the image. As features are related to edge information, the optic disc deformation due to the presence of Glaucoma can be depicted with these features. Contortion in the Optic disc is one of the key parameters in the detection of Glaucoma. ROI is gamma normalized to enhance the contrast of the image. To compute the HOG features, the gamma normalized image is divided into small cells, and the shape of the objects is obtained by counting the strength and orientation of the spatial gradients in each cell.

D.NAIVE BAYES CLASSIFIER

The Naive Bayes classifier is an efficient and simple probabilistic classifier based on Bayes' theorem. It is a simple model that assigns class labels from a finite set to a vector of feature values. These classifiers assume that the value of a particular feature is independent of any other feature. The advantage of naive Bayes is that it requires only a fewnumber of training data. With the small number of training data, the parameters can be estimated for classification. It classifies the data in two phases namely training phase and prediction phase. In training phase, using training data, the parameters for probability distributions are estimated, and in the prediction phase, for any undetected test data, the method computes the posterior probability of that sample belonging to each class. The method thus classifies the detected data according to the largest posterior probability.

V. IMPLEMENTATION

The processing of the proposed method is, which ishigh accuracy. The morphological method is applied in input image.MATLAB is an integrated development environment, which reduce the time consumption.

Fig 5: Input image

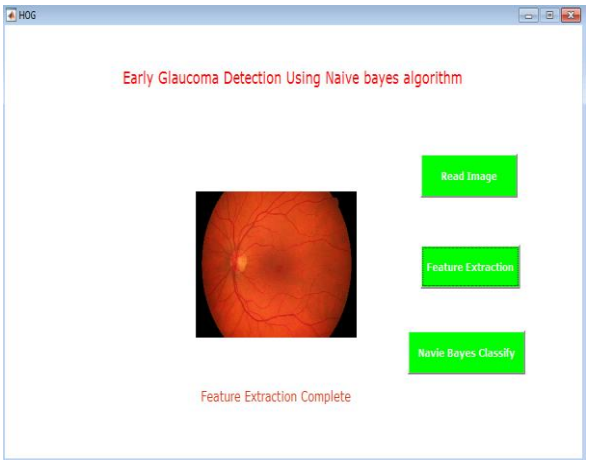

Fig 6: Feature extraction

Fig 7: classification

VI. CONCLUSION

Glaucoma is the optic nerve disease if it remains untreated, it cause permanent blindness. Glaucoma analysis and detection is the most important research topic of medical field nowadays. Various medical devices have come into existence forthe detection and diagnosis of glaucoma but their use is very much expensive. A huge number of people were infected of this serious eye disease.There is a system required that accomplishes high execution by promoting large number of data for making class and blending various detection approaches for the diagnosis of glaucoma.

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