ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computerand Communication Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijircce.com

Vol. 7, Issue 11, November 2019

Detection of Glaucoma based on Energy and Cup to Disk Ratio

Prasanthamurthy H G, Pavitra S R, Shwetha D M

Lecturer, Department of Electronics and Communication Engineering, Govt. Polytechnic, Belur, DCTE, Karnataka, India

Lecturer, Department of Electronics and Communication Engineering, Govt. Polytechnic, Kushalnagar, DCTE, Karnataka, India

Lecturer, Department of Electronics and Communication Engineering, Govt. Residential Women Polytechnic, Shimogga, DCTE, Karnataka, India

ABSTRACT: A persistent, permanent eye condition that causes vision loss is glaucoma. Treatments can slow it down, and early disease detection is crucial. Due to the disease's sluggish progression and lack of obvious symptoms, many patients are unaware of it. There is no efficient way to detect or test for glaucoma in the low-cost population. 2D retinal fundus images show promise for screening for glaucoma at a cheap cost. Provide a technique that uses 2D retinal fundus pictures to evaluate the cup to disc ratio (CDR). According to experimental results, a normal person's cup area is 269.25, their disk area is 835.875, and their cup to disk ratio is 0.32212. When a person with glaucoma has a cup area of 569.25 and a disk area of 1134.37.

KEY WORDS: Cup to disc ratio, Glaucoma screening, Sparse dissimilarity-constrained coding

I.INTRODUCTION

Glaucoma is a eye disease which damages the optic nerve of the eye. It causes due to intraocular pressure inside the eye. It tends to be inherited and may not show up until later in life. If the pressure increased,damages the optic nerve, which transmits pictures to the brain.

U. Rajendra Acharya. [1] Automated diagnosis of glaucoma using texture and higher spectra energy features, is proposed higher order spectra (HOS) feature from digital funds images and SVM for classification with accuracy of 91%. Gwenolequellec. [2] Proposed a classification for glaucoma is normal and abnormal based on false negative and false positive for detecting retinal images.Linlin Shen and SenJia. [3]. Proposed a 3-D Gabor wavelet for pixel-classification with maximum accuracies of 96.04% and 95.36%.

Cheng-Hsuan Li. [4] proposed a Spatial–Contextual support vector machine (SVM) for remote sensed image with classification accuracy s is 95.5%. The kappa accuracy is 94.9%, and the average accuracy is 94.2%.Fereidoun A. Mianji. [5]. Proposed for immixing problems with information ignores some statistical properties of the extracted samples and it leads to a suboptimal solution for real situations.

Sumeet Dua. [6] proposed a wavelet based on feature energy for glaucoma classification with accuracy is 93%.N. Annul.[7] proposed a wavelets for Principal component analysis (PCA) and probabilistic neural network (PNN) with accuracy is 90% of PCA-PNN and 95% of DWT-PNN. M. Foracchia [8] proposed a geometrical parametric model To describe the general direction of retinal vessels at a given position in the image.

Adam Hoover [9] proposed an algorithm to call fuzzy convergence to determine the origination of the blood vessel network. Fengshou Yin [10]. Proposed a method that combines edge detection and statistical deformable model is used

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computerand Communication Engineering

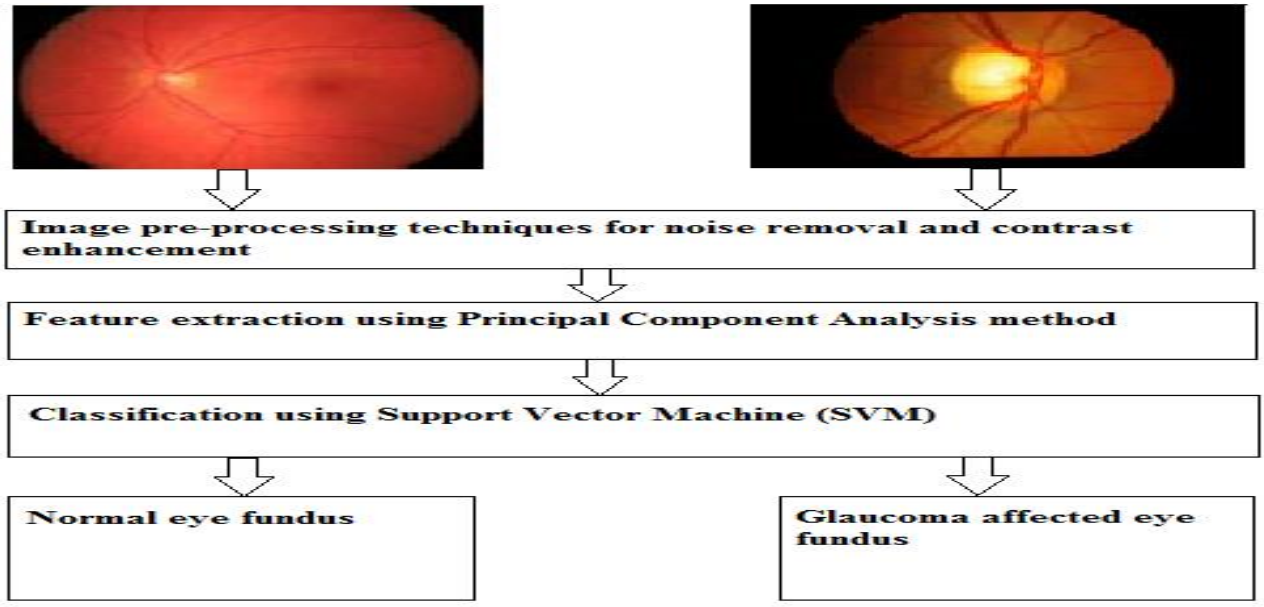
(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijircce.com

Vol. 7, Issue 11, November 2019

to detect the optic disc from retinal fundus image.

II.PROPOSED METHODOLOGY FOR DETECTION OF GLAUCOMA



The proposed methodology of the detection of glaucoma is shown in Figure. The various steps in our proposed method i.e. image pre-processing, feature extraction band dimensionality reduction and image classification are detailed in the following section.

A. Image Pre-processing

Pre-processing is the initial stage of the proposed methodology.in this select a retinal image and then covert into a gray-scale image and the image should be threatened by some noise called salt and pepper noise. The removal of salt and pepper noise carry some parameters called signal to noise ratio(SNR),peak signal to noise ratio(PSNR) and mean square error(MSE).based on this parameters the noise present in the image should be removed and many other parameters are used to removal some other noise present in the particular image. And also filtered image, edge image of the selected retinal image is obtained. If the selected image is noise free then ignore the pre-processing step and directly go to next step.

B. Feature Extraction Using Principal Component Analysis Method

Feature extraction means extract a portion of the image The normalizing features were extracted by using Principal Component Analysis (PCA) method. Principal Component Analysis (PCA) is a mathematical procedure that uses an orthogonal transformation to convert a set of observations of the possibly correlated variables into a set of values of uncorrelated variables. This transformation is defined the first principal component has the largest possible variance (that is, accounts for as much of the variability in the data as possible), and each succeeding component has the highest variance possible under the constraint that it is orthogonal to (i.e., uncorrelated with) the preceding components. The principal components are orthogonal because they are eigenvectors of the covariance matrix. After pre-processing step, get a pre-processed input images with size 256 X 256. These images are basically 256 X 256 matrices with normalized pixel values where rows correspond to observations and columns correspond to samples or data dimensions.
DWT algorithm is used in this step.

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computerand Communication Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijircce.com

Vol. 7, Issue 11, November 2019

C. Classification using Support Vector Machine (SVM)

A classification step usually involves separating data into training and testing sets. In this step by using energy and average value from the vertical component file comparing the accuracy with our proposed algorithm in classification called Support Vector Machine(SVM) to Naïve Bayes algorithm based on ANN.

III. EXPERIMENTAL RESULT ANALYSIS

Based on the Image Processing Detection of glaucoma is carried out under this following steps are occurs for detection of glaucoma. The first step is pre-processing in that first we select an colored image from database and convert that colored image into grayscale image, noise image, filtered image, and edge image by using some parameters are Signal to Noise Ratio(SNR),Peak Signal to Noise Ratio(PSNR),Mean Square Error(MSE).calculated values are shown in figure.

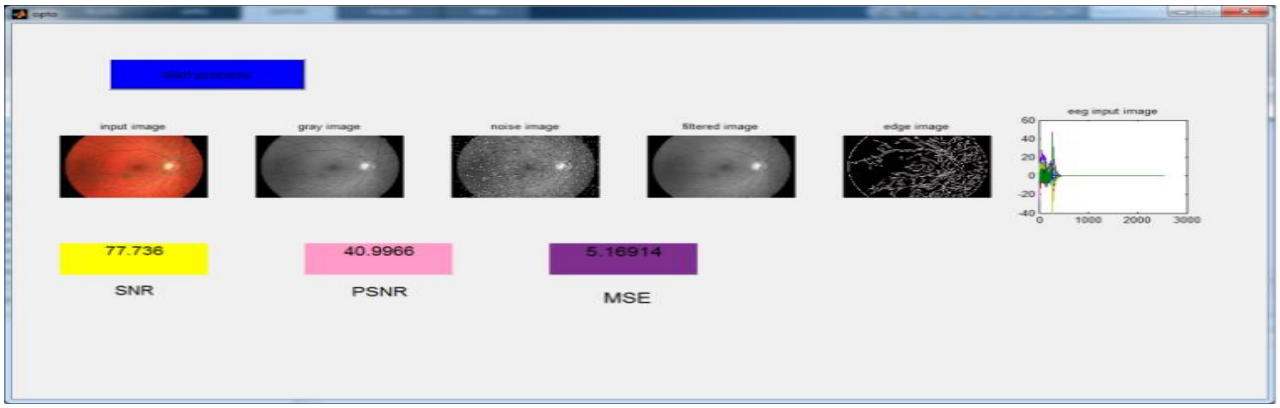


Fig 1. Calculated values for different pre-processing parameters

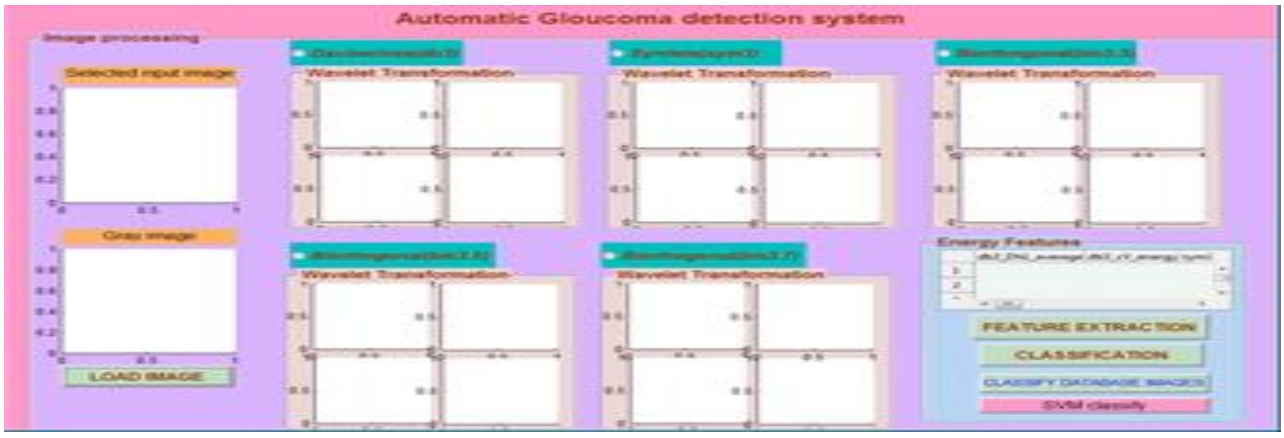


Fig 2.Graphic unit interface of Feature extraction

in this step we select a image as input and load that image then filtered the image by using different filters db3, sym3,and (bio3.3,bio3.5,bio3.7) in DWT and calculate the energy and average for each filters.

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computerand Communication Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijircce.com

Vol. 7, Issue 11, November 2019

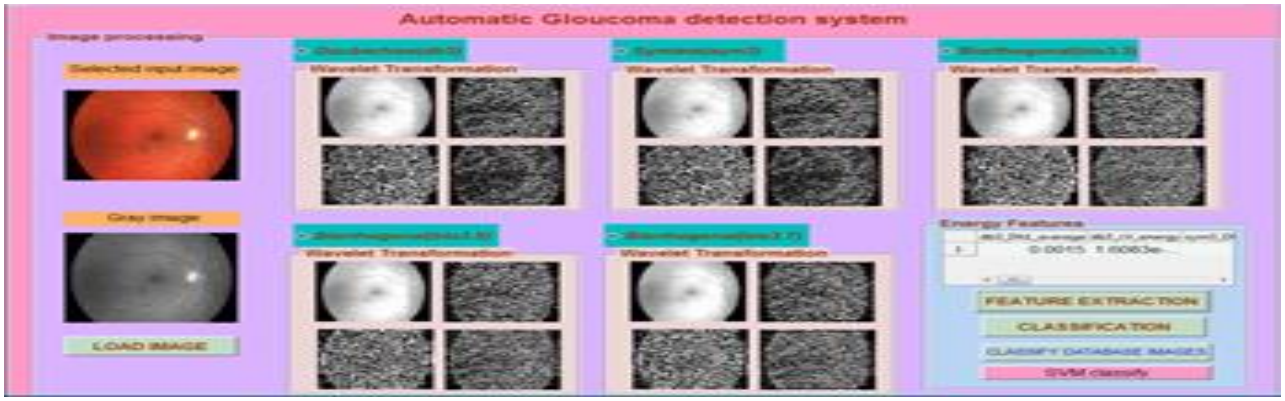


Fig 3. Wavelet Decomposition of Glaucoma detection

Third step in detection of Glaucoma is Segmentation means highlighting the portion in the eye where Glaucoma is effected by using primary colors called RGB (Red,Green,Blue).and also boundary of image should be recognized by using primary color RGB such a disease called Fundus.

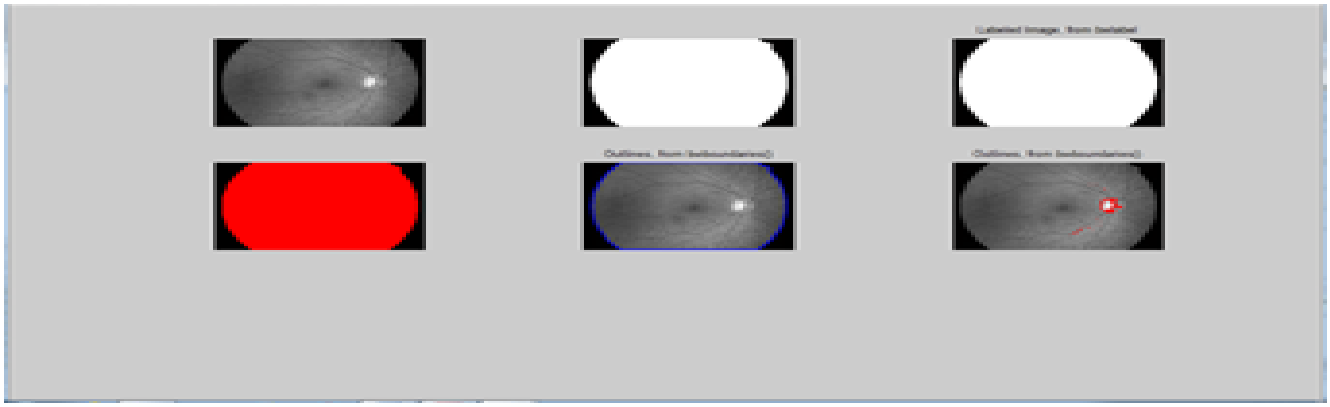


Fig 4.Segmentation of image using primary colors (RGB)

Last step in detection of Glaucoma is classification in this step again divided into two flows verification. The first flow is calculated the values of selected image by using Artificial Neural Network (ANN).

Classification step is basically divided into two types:

- NAÏVE BAYES CLASSIFICATION
- SUPPORT VECTOR MACHINE (SVM)

Naïve Bayes Classifier are mostly used in Artificial Neural Network.by using this classifier we can distinct the image as normal or abnormal and also calculate the accuracy of that image.

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computerand Communication Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijircce.com

Vol. 7, Issue 11, November 2019

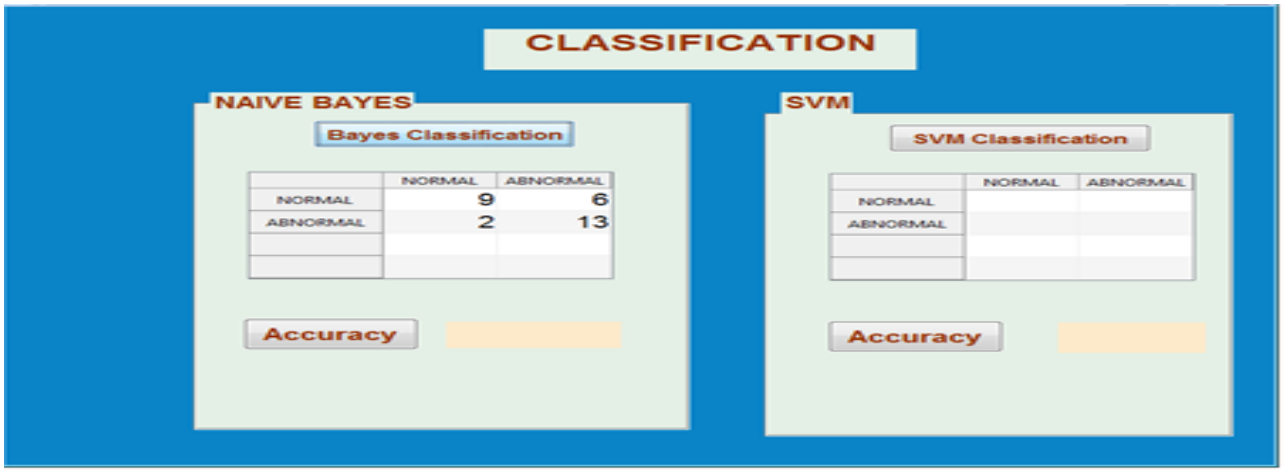


Fig 5.Calculate values for NAÏVE BAYES CLASSIFIER

Support Vector Machine are also used in Artificial Neural Network.by using this classifier again we can distinct the selected image as normal or abnormal and also calculate the accuracy of that image.

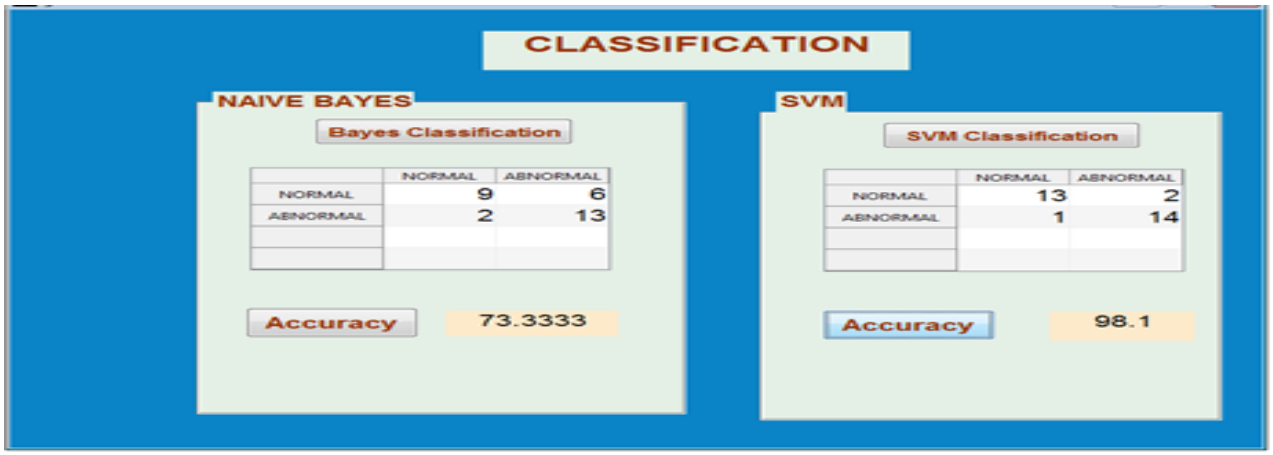


Fig 6. Calculate values for (SVM) Classifier

For each database image should be classified by using features energy and average values and reported each image whether the image is caused by Glaucoma and it represented as '1' or image is not caused by Glaucoma and it is represented as '0'.

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computerand Communication Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijircce.com

Vol. 7, Issue 11, November 2019

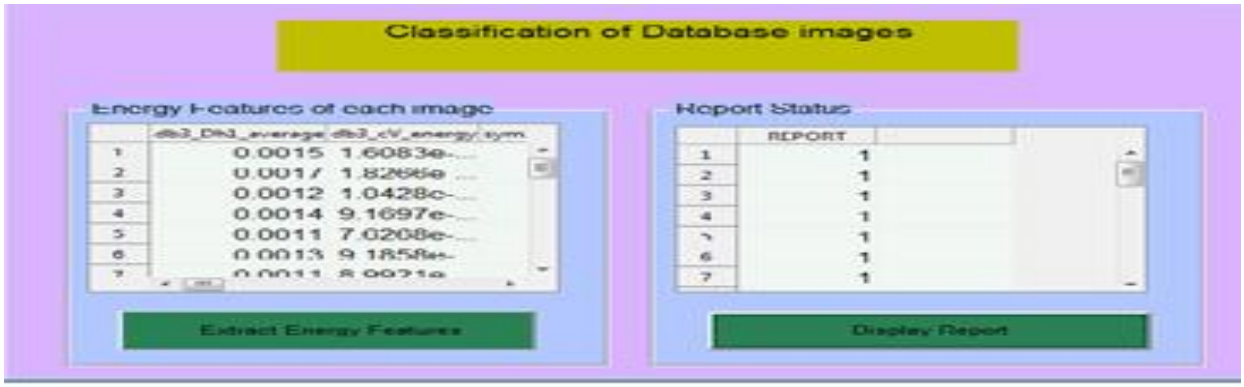


Fig 7. Calculate values for energy and average database

Second flow of classification step is calculate the values of Cup to Disk Ratio.in this step we should identified the patient is normal or Glaucomatous.

Fig 8.Calculate values for Cup to Disk Ratio

First we selected a image from the database to measure the Cup area and Disk area to calculate the Cup to Disk Ratio.after the ratio is obtain select a segmented section in the image and double click on it if the ratio value is 0.3 then the result should be patient is normal.

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computerand Communication Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijircce.com

Vol. 7, Issue 11, November 2019

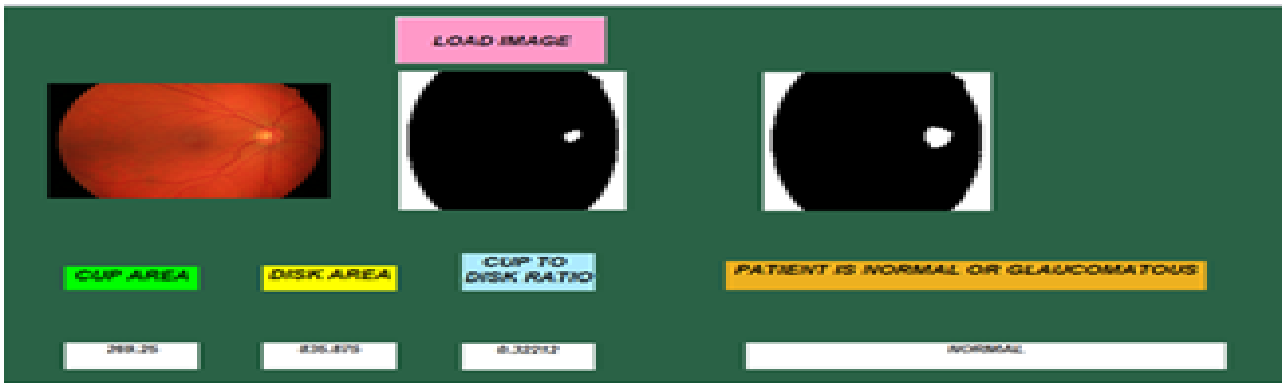


Fig 9.Patient is normal based on Cup to Disk Ratio

Cup to Disk Ratio is calculated for Glaucoma image. if the ratio value is greater than 0.3 then the result should be Glaucomatous.

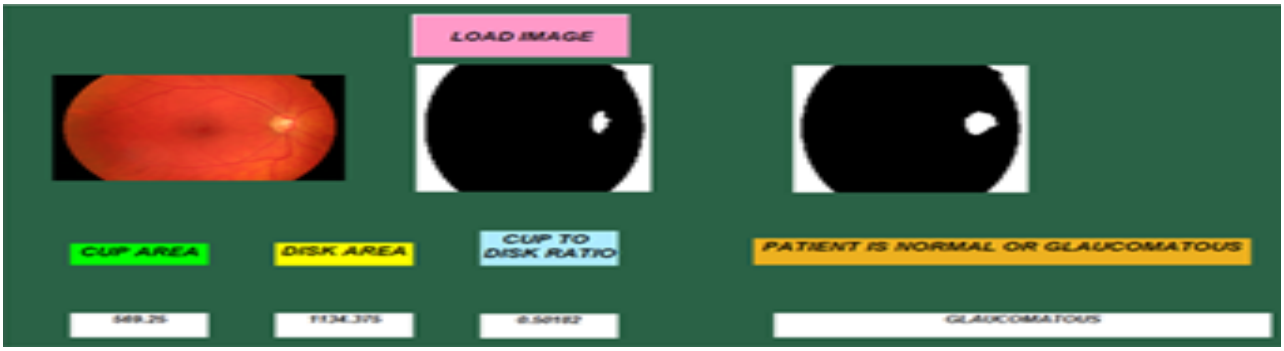


Fig 10. Patient is Glaucomatous based on Cup to Disk Ratio

Table 1. Cup to Disk Value of the Proposed Method

Sl.No	Normal Eye			Glaucoma Eye		
	Optic Disk (height)	Optic Cup (height)	CDR	Optic Disk (height)	Optic Cup (height)	CDR
1	193	87	0.451	201	133	0.6617
2	183	101	0.5534	185	139	0.7534
3	192	119	0.6198	184	131	0.7120
4	168	102	0.6090	166	117	0.7069
5	186	109	0.5860	204	141	0.6912
6	208	95	0.4567	182	132	0.7253
7	188	94	0.5000	199	131	0.6583
8	215	101	0.4698	179	134	0.8045
9	212	123	0.5802	171	116	0.6804
10	200	109	0.5450	192	127	0.6615

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computerand Communication Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijircce.com

Vol. 7, Issue 11, November 2019

11	197	121	0.6158	180	136	0.7556
12	207	111	0.5362	204	136	0.6667
13	184	119	0.6467	193	130	0.6753
14	187	78	0.4171	162	143	0.8827
15	213	132	0.6197	190	125	0.6597

IV. CONCLUSION

In this paper first select a image from the given database and the image should be convert to grayscale. Here use different steps of image processing to detect a disease. The pre-processing step should be neglected because whole database images are noise free and feature extraction step is used to extract a section of the image by using DWT algorithm. Segmentation step are use to calculated the segmented portion of the image by using primary colors RGB and calculate the Cup to Disk Ratio of the image. Check the person is normal or abnormal based on CDR values if the CDR value is less than 0.3 person is normal if the CDR value is greater than 0.3 person is abnormal. Classification steps gives high accuracy by using SVM algorithm than the Naïve Bayes.

REFERENCES

[1] U. Rajendra Acharya, Sunmeet Due, Xian Du and Chua Kuang,"Automated diagnosis of glaucoma using texture and higher spectra features", IEEE Transanction on information technology in biomedicine, Vol. 15, No.3, May 2011, 1089-7771.
[2] Gwenole quellec, Stephen R. Russell and Michael D. Abramoff, senior Member, IEEE, "Optimal filter framework for automated, instantaneous detection of lesions in retinal images", IEEE Transanction on medical imaging, Vol.30, N0.2, February 2011, 0278-0062.
[3] Linlin Shen and Sen Jia, "Three-Dimensional gobar wavelets for pixel based hyperspectra imahery classification", IEEE Transanction on Geoscinece and remote sensing, Vol.49, N0.12, December 2011, 0196-2892.
[4] Cheng-Hsuan Li, Bor-Chen Kuo, Member, IEEE, "A Spatial-contextual Support vector machine for remotely sensed image classification", IEEE Transanction on Geoscinece and remote sensing, Vol.50,No.3, March 2012, 0196-2892.
[5] Fereidoun A and Mianji, Member, IEEE, "SVM-Based Unmixing-to-ClassificationConversion for Hyperspectral Abundance Quantification", IEEE Transanction on Geoscinece and remote sensing, Vol.49,No.11, Novenber 2011, 0196-2892.
[6] Sumeet Dua, Senior Member, IEEE, "Wavelet-based energy features for glaucomatous image classification", IEEE Transanction on information technology in biomedicine, Vol. 16, No.1, January 2012, 1089-7771.
[7] N.Annu, "Classification of Glaucoma Images using Wavelet based Energy Features and PCA". International Journal of Scientific & Engineering Research, Volume 4, Issue 5, May-2013 ISSN 2229-5518.
[8] M. Foracchia, E. Grisan, and A. Ruggeri, "Detection of optic disc in retinal images by means of a geometrical model of vessel structure, IEEE Trans. Med. Imag., vol. 23, no. 10, pp. 1189–1195, 2004.
[9] A. Hoover and M. Goldbaum, "Locating the optic nerve in a retinalimage using the fuzzy convergence of the blood vessels," IEEE Trans.Med. Imag., vol. 22, pp. 951–958, 2003.
[10] F. Yin, J. Liu, S. H. Ong, Y. Sun, D. W. K. Wong, N. M. Tan, C. Cheung, M. Baskaran, T. Aung, and T. Y.Wong, "Model-based optic nerve head segmentation on retinal fundus images," Int. Conf. of IEEE Eng. in Med.and Bio. Soc., pp. 2626–2629, 2011.