OPTIC DISK DETECTION IN FUNDUS IMAGE BASED ON HOUGH TRANSFORM

D.Saranya, A.Vaibhavi prabhu, Mrs J.Priyadharshini

Student, ECE, Prince Shri VenkateshwaraPadmavathy Engineering College, Tamilnadu, India
Student, ECE, Prince Shri VenkateshwaraPadmavathy Engineering College, Tamilnadu, India
Assistant Professor, ECE, Prince Shri Venkateshwara Padmavathy Engineering College, Tamilnadu, India

ABSTRACT

The main reason for the cause of visual impairment and blindness are diabetic retinopathy, glaucoma, hypertension and macular degeneration. These eye diseases exhibit themselves in the retina and all of these diseases can be detected through a direct and regular ophthalmologic examination. Since there are many factors, such as population growth, aging, are contributing to the increase of the patients with these diseases, which makes the number of ophthalmologists needed for evaluation by direct examination becomes a limiting factor. As a result, a computer aided diagnosis system which can significantly reduce the burden of the ophthalmologists and may cause less suffering on the inter and intra observer variability.

Keyword:- *optic disk,hough transform,watershed segmentation,inpainting,fundus image etc*

1.INTRODUCTION

The OD detection plays an important role, which has attracted extensive attention from clinicians and ophthalmologists and researchers. OD detection is often a key step for the detection of other anatomical structures. For example, the OD location helps to prevent false positive detection of exudates incurred by diabetic retinopathy, since both OD and exudates are formed by bright regions in the fundus image. Be-sides, the vessels, which are of direct importance in assessing vascular condition, radiate from the OD, which is the starting point of some algorithms for tracking vessels. Predominantly ,the ratio of the size of the OD over the size of the optic cup has been widely utilized for glaucoma diagnosis. A high cup-to-disc ratio will indicate that a fundus is suspicious of glaucoma However, detecting OD automatically is challenging due to the variations of the OD's shape, size, colour and so on. Many OD detection algorithms have been introduced in the detection od OD.There are three categories, namely template based methods ,deformable model based methods ,morphology based methods .In structured learning noise may occur so the images get affected and also Hough transform is implemented in order to isolate the features

1.1 Morphlogy based methods

For the morphology based methods, the OD can be extracted using watershed transformation based on the assumption that the OD represents a bright region. In, the gray image obtained by PCA is chosen as the input. The stochastic watershed is applied to extract the watershed regions then region discrimination is performed to select the pixels which belong to the OD based on the average intensity of the region. There is an adaptive method for the segmentation of the OD using adaptive morphological approach. These methods introduced above belong to unsupervised methods. They were designed based on some assumptions, such as, the OD appears as a bright region in the fundus image.

2. HOUGH TRANSFORM

In this paper, we propose a method for OD detection based on hough transform which belongs to a supervised method to avoid making assumptions. The proposed method utilizes the edge information of the fundus image to detect the OD. It is different from the traditional method which applied the traditional edge detector, such as Prewitt edge detector to capture the edge information. Since the vascular edges on the fundus image are very strong, when the traditional edge operator is applied to detect the OD edge, many vascular edges are detected besides OD edge. In addition, for the traditional edge operator, using different channels as input may lead to different results, which makes choosing which channels as input is a critical decision. However, due to the variability of the fundus image, any individual method does not guarantee an optimal result . It can be observed that when the Prewitt edge detector is performed on the green channel, only vascular edges are detected. To eliminate these disadvantages, we employ the Hough transform to detect the OD. Because Hough transform belongs to a supervised method, we can train the edge detector to capture the special edge information, such as the OD edge information in this work. Moreover, we can simply take the original fundus image as the input of the edge detector to be trained, thus avoiding the need to consider which channels of the original image should be chosen. The reason for this is because Random Forest is employ such as, the OD appears as a bright region in the fundus image.

2.1 Thresholding

Image thresholding can be used to create a binary image BW. It is a effective way of partitioning an image into a foreground and background. This technique isolates object by converting gray scale into binary images.

2.2 Circle Hough Transform

Circle Hough transform is a popular method which used to find the circle patterns in the image .The rmin and rmax (r-radius)are key parameters which used to limit the search range of the circle Hough transform

(a). A circular approximation of the OD boundary.

(b). The effect of super imposing the circle on the fundus image position and radius obtained by circle Hough transform. Thus the OD boundary detected by circle Hough transform.

2.3 Level 0

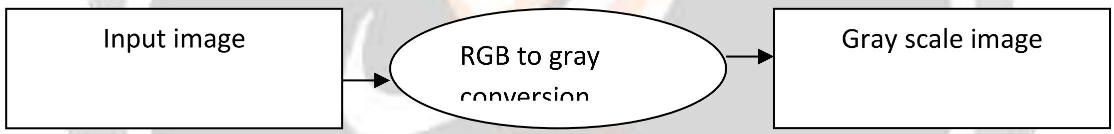

Figure 2.3 coversion of input to grayscale image

In fig 2.3 shows the Conversion of a color image to grayscale is not unique; different weighting of the color channels effectively represent the effect of shooting black-and-white film with different-colored photographic filters on the cameras.

To convert any color to a grayscale representation of its luminance, first one must obtain the values of its red, green, and blue (RGB) primaries in linear intensity encoding, by gamma expansion. Then, add together 30% of the red value, 59% of the green value, and 11% of the blue (these weights depend on the exact choice of the RGB primaries, but are typical). Regardless of the scale employed (0.0 to 1.0, 0 to 255, 0% to 100%, etc.), the resultant number is the desired linear luminance value; it typically needs to gamma compressed get back to a conventional grayscale representation.

2.4 Level 1

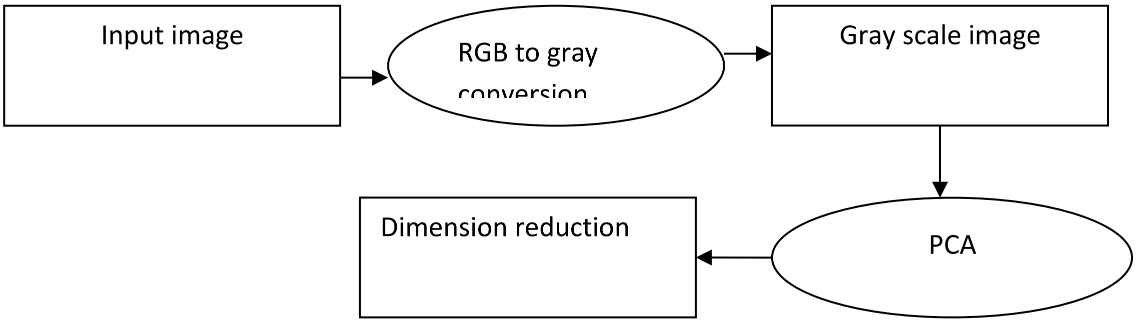

Figure 2.4 Grayscale -PCA

Principal component analysis (PCA) is one of the statistical techniques frequently used in signal processing to the data dimension reduction or to the data decorrelation. It deals with two distinct applications of PCA in image processing. The first application consists in the image colour reduction while the three colour components are reduced into one containing a major part of information. The second use of PCA takes advantage of eigenvectors properties for determination of selected object orientation.

Principal component analysis(PCA) belongs to linear transforms based on the statistical techniques. This method provides a powerful tool for data analysis and pattern recognition which is often used in signal and image processing as a technique for data compression, data dimension reduction or their decorrelation as well. There are various algorithms based on multivariate analysis or neural networks that can perform PCA on a given data set.

2.5 Level 2

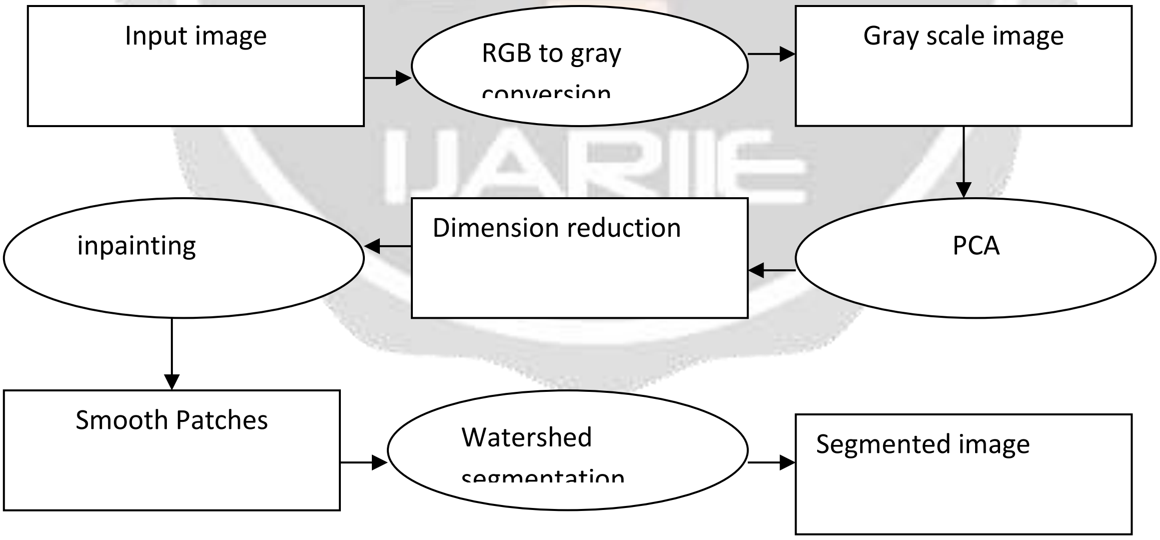

Figure 2.5 PCA-Inpainting-Water shed segmentation

From the output image of PCA is fed into inpainting inorder to provide the constrast of the images.By using watershed segmentation method the output image of inpainting got elaborated in segmentation.

2.6 Level 3

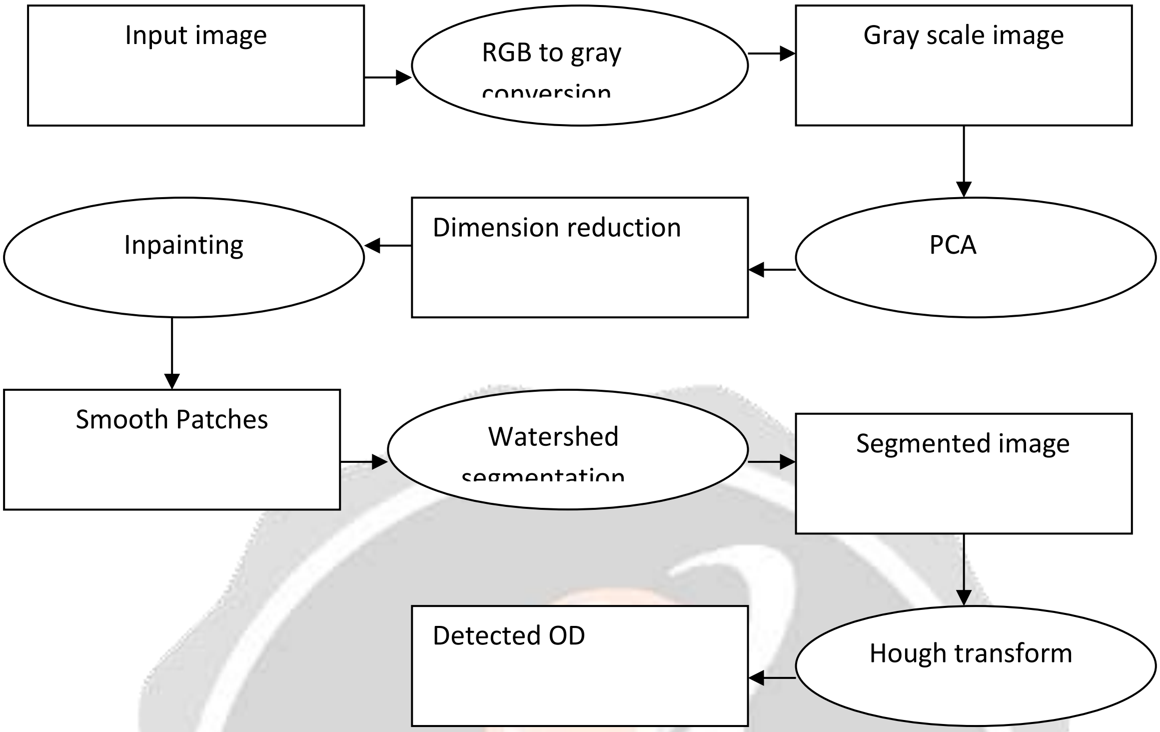

Figure 2.6 Watershed segmentation-Hough transform

Finally Hough transform is implemented in order to obtain the edge mapped optic disc. Then the result is displayed after Hough transform

3. RESULTS AND DISCUSSIONS

3.1 Preprocessing The first preprocessing stage requires the green plane(gray image) of the fundus image and its applied to Pca. It is used to reduce the dimension of images.

Steps:
1. Loading the data.
2. Subracting the original data from the mean dataset.
3. Finding the covariance matrix of the dataset.
4. Finding the greatest eigenvector(s) from the greatest eigenvalue(s)
5. Projecting the original dataset on the eigenvector(s).

Fig 3.1 input image

Fig 3.1.1 gray scale image

3.2 Segmentation

X=pca output,INPAINT(X) replaces the missing data in X by extra/interpolating the non-missing elements. The non finite values (NaN or Inf) in X are considered as missing data. X can be any N-D array.in watershed segmentation Use the Sobel edge masks, imfilter, and some simple arithmetic to compute the gradient magnitude. The gradient is high at the borders of the objects and low (mostly) inside the objects

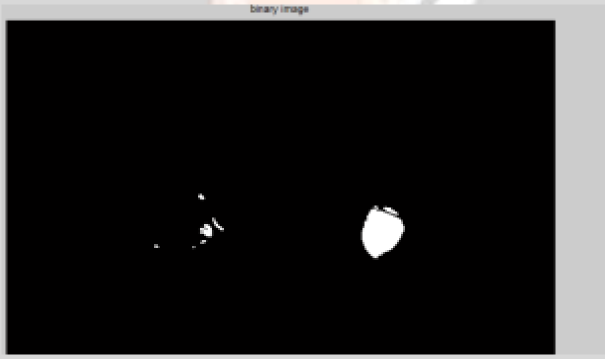

Fig 3.2 binary image

Fig 3.2 showas that the binary image as it name states, contain only two pixel values 0 and 1.Here 0 refers to black color and 1 refers to white color. It is also known as Monochrome.

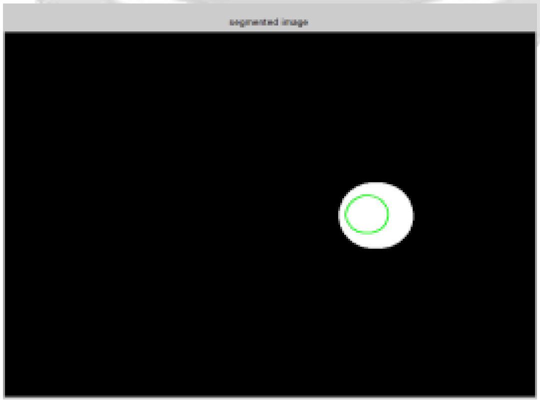

Fig 3.2.1 segmented image

Fig 3.2.1 undergoes a variety of procedures could be applied to find the foreground markers, which must be connected blobs of pixels inside each of the foreground objects. By using morphological techniques called "opening-by-reconstruction" and "closing-by-reconstruction" to "clean" up the image.

3.3 Hough transform

It is performed on the edge map to obtain a binary image. Finally, circle Hough transform is applied to approximate the boundary of OD.

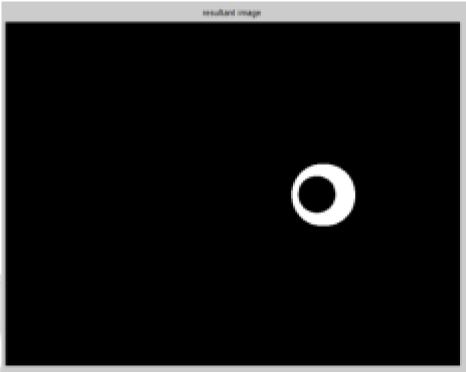

Fig 3.3 resultant image

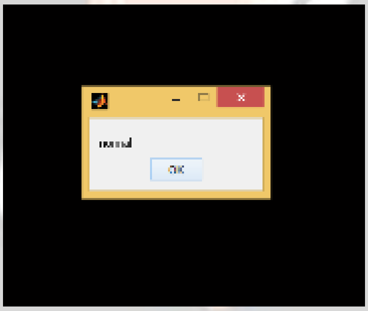

Fig 3.3.1 final image

Thus from this final image we can determine whether the person's eye is normal eye or abnormal eye.

4. CONCLUSION

Optic disc detection is achieved by performing Hough transform and from the various techniques involved Hough transform has the advantage of tolerance of gaps in feature boundary descriptions and also to avoid image noise. The image can be undergone with noise free such that the infected area can be easily determined and especially when it comes to working with data sets that are noisy and also hough transform has the big advantage is that level of detail can be defined. So by using hough transform the infected area can be detected easily for the further optimization of eye whether it is normal or abnormal

5. REFERENCES

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