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Human Face, Eye and Iris Detection in Real-Time Using Image Processing

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ABSTRACT
Biometric system plays important role in personal recognition. This system includes face recognition, fingerprint, iris recognition, eye recognition etc. iris recognition has been very popular in security system. This paper described the detection of eyes, face and iris in an image sequence. Web camera is used to detect eye region. face region and iris of dynamic image. Blob analysis is used for detect eye region and face region. In this technique RGB values are already sets and also thresholding is applied. Firstly take the snap shot of image then convert YCbCr in to RGB. After that for noise removing used bilateral filter. next step blob analysis is used. Then finally eye and face part detect. next is to detect iris part lively. for that firstly cropped left and right eye of the image. Circular Hough transform is use for detect iris. It's working on high resolution as well as low resolution image which show good results.
Keywords **-** Biometric system, Blob analysis, circular Hough Transform., face and eye detection, iris detection,

I. INTRODUCTION

Biometric used many method of recognizing a person based on characteristic such as eye, iris, finger print , hand gesture, face detection retina detection and vein. these all part of our body is very important. Generally biometric techniques are use in security purposes. The eye is the most significant features in a human face. Generally eye detection, face detection and iris detection are used in person identification and security system. For eye detection firstly detect face part of human body. face detection and recognitions are also play important role. And they has many application like interface, surveillance, security. in this paper, face, eye and iris part detect in lively image. For that Web came is used to capture images from live video.It is known that eye regions are usually darker than face part. there fore in this we have to set threshold value. Generally human eye is 10% of face part. Recently many eye detection technique have been reported. For the purpose of face detection,Employed size and intensity information to find eye-analog segments from a gray scale image, and exploited the special geometrical relationship to filter out the possible eye-analogy pairs[1].

Iris is a circular part of the eye. it is most sensitive organ of human body. there are many application used based on iris. The function of the iris is to control the amount of light entering through the pupil. The characteristic of iris which can be used in personal identification and security. The average diameter of the iris is 12 mm, and the pupil size can vary from 10% to 80% of the iris diameter [2]. The Iris recognition techniques potentially prevent unauthorised access to ATM, security, personal Identification etc. the

Accuracy of iris is much hither compares to other technique like fingerprint, voiceprint etc. there are several methods like integro differential operator, Hough transform, gradient based edge detection are used to localize the portion of iris and pupil from live eye image. These methods are based on radius, gradient, probability and moments. wildes proposed a circular Hough transform to detect eyelid, upper and lower threshold. this requires an appropriate threshold value[3].Daugman proposed an infero differential operator to find pupil, iris and eyelid[4].

In this paper, we proposed a method for automatic eye and face detection of human and also detect circular pattern i.e Iris of cropped eye image. Blob analysis is used for eye and face part detection in live image.Circular Hough transform is used for detect Iris part of cropped eye image. In this paper, I have used webcame which has 12MP resolution. Blob analysis has many advantages than other eye and face detection method. processing time is very fast. In addition, Circular Hough Transform has many advantages like it is robust again noise and very easily implement.

The paper is organised as follows: section 2 described the face and eye detection process. section 3 described iris detection. Experimental results are presented in section 4.

II. FACE AND EYE DETECTION

2.1 Proposed Flow Chart

Recognition of human face and eye is also challenging in human computer interface. Skin based blob analysis is used for eye and face detection automatically for lively image. Flow chart of our algorithm for detect eye and face part of human is shown below.

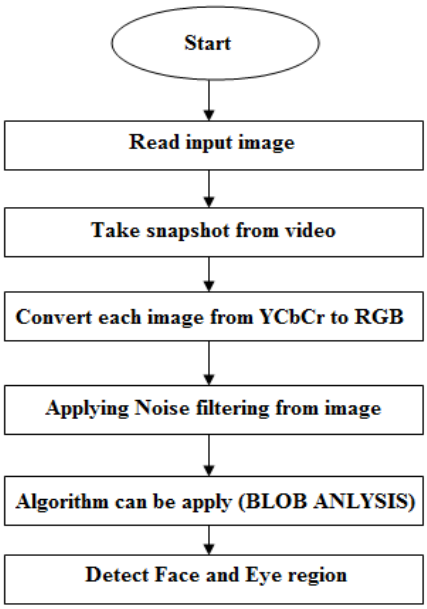


Figure 1 Flow chart of eye and face detection

Step of proposed algorithm are:

1. first step is first we have to start web came, then read the input image. after that take the snap shot from live video.
2. once we take the image from video next step is to convert image in Ycbcr in to RGB. because the web came is work on Ycbcr format. so we have to convert it in to RGB. The YCbCr color space is widely used in digital video, image processing etc.
3. Next step is noise removing using bilateral filter.
4. Then thresholding is applied based on the range of RGB pixels. the range of RGB pixels is R>60. If pixels value is greater than threshold value then background selected and threshold value is 0 otherwise threshold value is 1.
5. In this step skin based detection is applied. I have used blob analysis technique to detect the face and eye image. Blob analysis is very fast way of recognition multiple regions of some types of connected pixel and It requires less processing time.
6. In this last step finally both eyes and face detect automatically and also cropped eyes.

2.2 YCbCr Image

The YCbCr Image is widely used in image processing and video images. In this, Single Y component shows Luminance information. and colour information is stored as two color components i.e. Cb and Cr. In this paper, we have used web camera so we have to first convert in to RGB because every web camera work on YCbCr colour Model. Range of YCbCr is 0 to 255 pixels. YCbCr is a scaled and Offset version of the YUV Colour model. Y is the luma component defined to have a nominal 8- bit range of 16-235. Blob analysis is skin based detection used. it sense the red colour on human body. and detect face and eye region. Chai and ngan have developed an algorithm that shows the spatial characteristics of human skin colour[5]. A skin colour is derived on the chromiance components of input image to detect pixels that appear to be skin.

2.3 Blob Analysis

The Blob Analysis block is used to calculate statistics for labeled regions in a binary image. Blob analysis is generally skin based detection used. blob analysis is very simple method to detect human face and eye part. in blob analyis thresholding technique is used. in this we have to give RGB value for thresholding. the range of RGB is shown below.

120<R<200
100<G<160
80<B<140

Above range is shown that, if our RGB value is between above mention rage then '1' is selected means our skin part is detected and if not in above range then '0' means background is selected. Thresholding algorithm is shown in figure. they gives value of '0' and '1'.

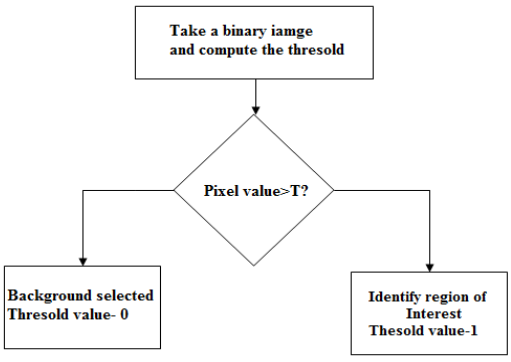


Figure 2 Thresholding Algorithm

III. IRIS DETECTION

3.1 Proposed Flow Chart

Human Iris is very important organ in human body. in this paper iris is detected in all direction (left, right, up, down). in above section we

shown detection of eye and face part in real time. once we detect face and eye part after that we will detect iris in different positions. in this paper circular Hough transform is used to detect iris part in cropped eye images. The proposed flow chart of iris detection is shown below.

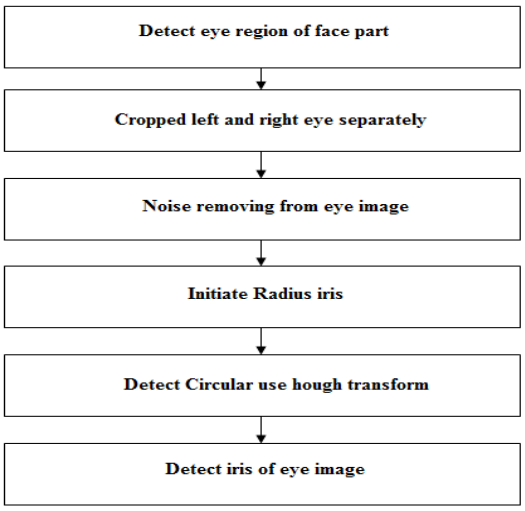


Figure 3 Flow chart of eye region cropped and iris detection

Step of proposed algorithm are:

1. In first step cropped left and right eyes separately in different position (left, right, upward, downward and center) from the detected eye and face part in real time. to detect iris region in eye image I have used 12MP web camera.
2. After cropping left and right eye in different positions, we have to remove noise from cropped eye image.
3. In this steps find the positions of the center of the iris and radius of the circle.
4. Next step, Hough Transform is used to find circle of the iris. the Hough transform is robust against noise. In this improve the speed of the process the center of the circle is limited within the iris region.
5. In last step, finally detect iris region in different position of the eye part.

3.2 Circular Hough Transform

Circular hough transform is to detect the circle of human eye image. this algorithm is very easily implemented. The circular Hough transform can be employed to deduce the radius and centre coordinates of the pupil and iris regions. An automatic segmentation algorithm based on the circular Hough transform is employed by Wildes et al. [6], Kong and Zhang [7], Tisse et al. [8], and Ma et al. [14]. . These parameters are the centre coordinates x_c and y_c, and the radius r, which are able to define any circle according to the equation

$$Xc^2 + Yc^2 = r \quad (1)$$

The Hough transform can be used to determine the parameters of a circle when a number of points that fall on the perimeter are known. A circle with radius R and center (a, b) can be described with the parametric equations

$$X = a + R\cos(\Theta) \quad (2)$$

$$Y = a + R\cos(\Theta) \quad (3)$$

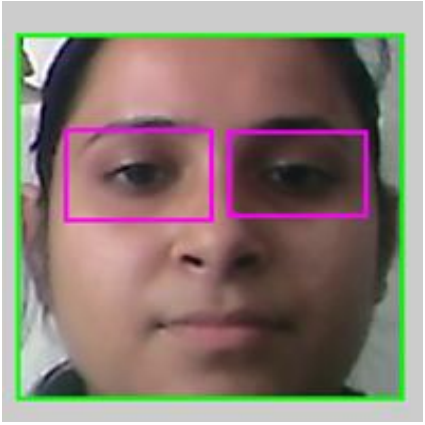
When the angle Θ sweeps through the full 360 degree range the points (x, y) trace the perimeter of a circle.

IV. EXPERIMENTAL RESULTS

5.1 Face and Eye detection result

For our Experimental Result we have use intel core i5 CPU and Windows 7 operating system. we have uses 12 MP of Web Camera for images. automatic eye and face are detected automatic in real time images.

(a)



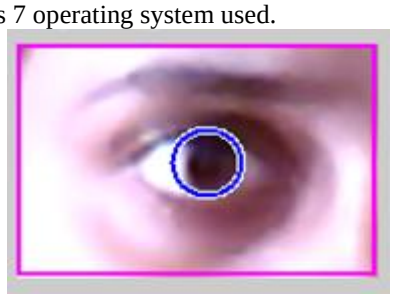
(b)

Figure 4 (a)- detect eye and face part, (b)- Cropped eye and face part

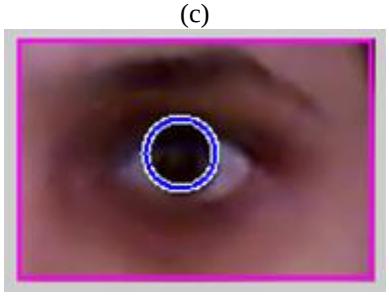
5.2 Iris detection result

Above section shows eye and face part detection. In this part shows iris detection in different positions. The experimental result shown below.

Here, we use web camera to detect iris in different positions. In this section again intel core i5 CPU and windows 7 operating system used.

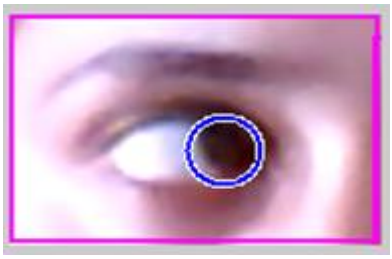


(c)



(d)

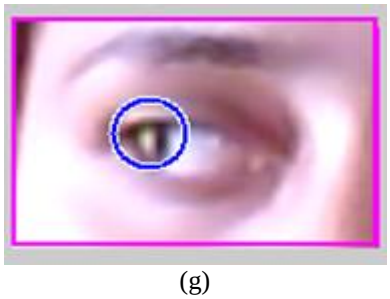
Figure 5- (c)- detect left eye in centre
(d)- Detect right in centre



(e)

(f)

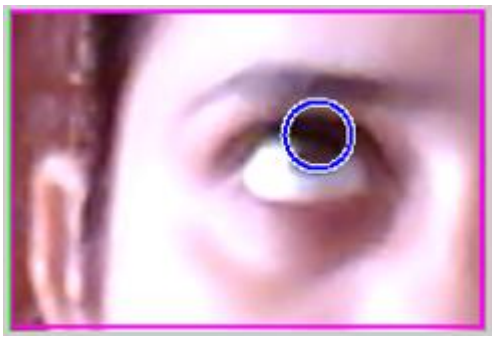
Figure 6 (e)- detect left eye in right position
(f)- Detect right in right position



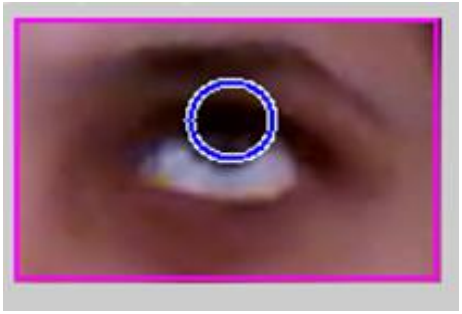
(g)

(h)

Figure 7- (g)- detect left eye in left position
(h)- Detect right in left position



(i)



(j)

Figure 8- (i)- detect left eye in up position
(j)- Detect right in up position

V. CONCLUSION

we have concluded that it can be automatic detect face and eye regions and also iris detection. we have used blob analysis and Hough transform for eye and iris detection resp. Blob analysis is based on skin detection. Blob analysis is very fast way to recognition faces and eye region. And it processing time is fast than other recognitions technique.

we proposed an iris detection method using the circular Hough transform that adapts to various eye positions. Firstly detected the eyes in different position and cropped automatically. Then the positions of irises were detected by circular Hough transform. So I have concluded that Hough transform is very easily implement and also conceptually simple.

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