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Face Identification and Verification using Histogram Based Approach in Spatial Domain

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Abstract

The present paper relates to "Face Identification and Verification". Histogram based image feature extraction approach is used for the system implementation. The database taken for the work comprises of 40×10 size images from forty different objects, that're limited to 92×112 pixels. Firstly the eyes and face are detected and then cropped for the recognition purpose. The histogram approach performs cumulative distribution to identify the images of eye and face. Therefore a non-linear change that reflects the "accumulative distribution" of the test image produces an image having uniform histogram. Euclidean distance is also calculated for the processing to make the comparison between the test and database image. Some of the difficulties are found in the work excessive changeability in head revolution and slope, intensity and angle of light, facial characteristics, etc. It is observed that the method is best suitable in case of eye recognition.

Keywords: *Euclidean distance, Eye Recognition, Viola Jones Detector, Face Recognition, Image Histogram.*

INTRODUCTION

To distinguish one person from other person, one of the best feature is face of the person. Today for security purpose "Face recognition" gained so much attention and became a field of research. Previously the security systems are only based on ID cards, numbers and passwords, resulting in faults, corruption, and increased hacking and disturbed system. Various computer application today are available that helps in detecting and authenticating a person from an image in the form of digital image automatically from a source. The security system based on feature extraction is rising in both private and govt. sectors, today person's face is the major part, trusting its individuality. Face recognition system have some advantages of their applications in both "law-enforcement and non-law enforcement". From various years of analysis of biometric system it is observed that face recognition is different and has some advantages than the use of fingerprint, palm print, because it's a non-contact recognition procedure and also provides safety.

METHODOLOGY

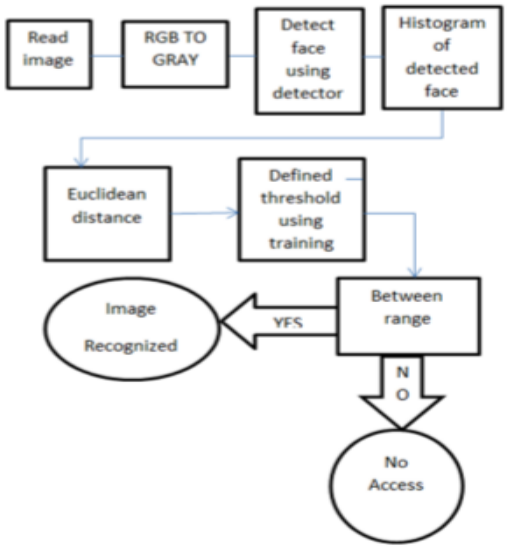

Fig. 1.1: Block Diagram for face recognition

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Figure 1.1 illustrates a block diagram for face identification.
Figure 1.2 illustrates a picture of face and eyes detection.
Total 50 images are taken for the analysis purpose as test images.
Procedure:

1. Reading captured image;
2. Converting this image into gray scale to make the next step easy;
3. Detecting the face and eyes using "viola Jones Detector", this detector has great accuracy and provides fast procedure of detection.
4. Identifying the eyes and face, this portion of image is collected and then processed to histogram;
5. Comparing the images with images of datyabase and then detecting the image by using histogram;
6. Finding the distance between test image and image of database ("ORL" database with sixty images has been considered in the system) termed as euclidean distance, Formula for finding Euclidean distance is given by:

$$D(p,q) = d(p,q) = \sqrt{(q1 - p1)2 + (q2 - p2)2 + \cdots \ldots (qn - pn)2}$$

q, p- 2 different ponits of 2 different images i.e one for test image and other image is from database.

7. Training the system and then defining the threshold value;
8. If the value is in between definite range image is recognized otherwise not.

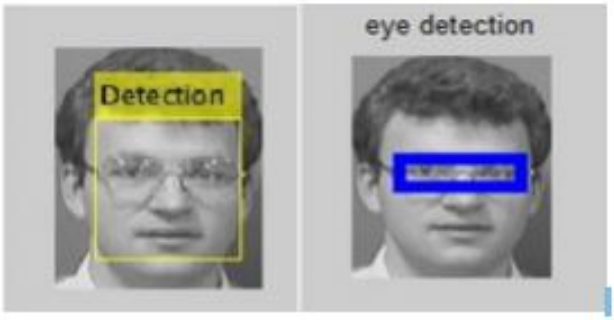

Fig. 1.2: Face and eyes detection using detector

Histogram:

The command in MATLAB for finding histogram is:

```
A=imhist (f);
```

Where f is the input image and given below is equation which is used to find histogram of an image

$$h(v) = round\left(\frac{cdf(v) - cdf_{min}}{(M \times N) - cdf_{min}} \times (L-1)\right)$$

"Where cdfmin is the minimum non-zero value of the cumulative distribution function (in this case 1), M × N gives the image's number of pixels (for example above 64, where M is width and N the is height) and L is the number of grey levels used (in most of the cases, like this one, 256)."

RESULTS

The error rates in face and eye recognition is mentioned individually in two different tables A and B.

(A). Face recognition (error rate) has been tabulated below:-

	Face recognition (error rate)
Samples used in training	7.7%
Samples not used in training	11.11%

(B). Eyes recognition (error rate) has been tabulated as follows:-

	Eye recognition (error rate)
Samples used in training	5.6%
Samples used in training	9.1%

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CONCLUSION

Face and eyes recognition model has been implemented and it is observed from the work that when eyes are considered for recognition purpose less rate of error is obtained in comparison to the face recognition. Also there is a difficulty in face recognition system as facial appearances also varies with increasing ageing number. The main aim of this paper is to improve the security of the system with reducing rate of error by providing transformation in the existing methodology and it's been achieved successfully.

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