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HUMAN IRIS RECOGNITION TO BOLSTER SECURITY

Santosh S Patil [1], VinayB.Angadi[2], Vidyadhar S Melkeri[3]

[1,2]*School of Engineering & Technology, VIT, Vellore, Tamil Nadu, (India)*

[3]*Research Scholar,Gulbarga University, Kalaburagi, Karnataka, (India)*

ABSTRACT

This paper provides automatic identification of an individual based on a unique feature or characteristic possessed by the individual. Iris recognition based on elastic graph matching and Gabor wavelets. We have used the circular Hough transform to determine the iris boundaries. Individual segmented irises are represented as labelled graphs. A similarity function is defined to compare two graphs, taking into account the similarities of individual jets and the relative distortion of the graphs. For matching and recognition, only jets referring to corresponding points are compared.

In future work, we will improve the processing method for iris templates to reduce the influence from light, eyelid, and eyelash. In comparison, we use two iris images instead of graph to match two iris templates. Also we are applying this one for automated employee attendance monitoring and payroll system.

Keywords: Encoding and Matching, Hamming Distance, Segmentation, Normalization.

I. INTRODUCTION

The iris is a thin circular diaphragm, which lies between the cornea and the lens of the human eye. A front-on view of the iris is shown in Figure 1. The iris is perforated close to its centre by a circular aperture known as the pupil. The function of the iris is to control the amount of light entering through the pupil, and this is done by the sphincter and the dilator muscles, which adjust the size of the pupil. The average diameter of the iris is 12 mm, and the pupil size can vary from 10% to 80% of the iris diameter.

Formation of the iris begins during the third month of embryonic life. The unique pattern on the surface of the iris is formed during the first year of life, and pigmentation of the stoma takes place for the first few years. Formation of the unique patterns of the iris is random and not related to any genetic factors.

The only characteristic that is dependent on genetics is the pigmentation of the iris, which determines its colour. Due to the epigenetic nature of iris patterns, the two eyes of an individual contain completely independent iris patterns, and identical twins possess uncorrelated iris patterns.

Image processing techniques can be employed to extract the unique iris pattern from a digitized image of the eye, and encode it into a biometric template, which can be stored. This biometric template contains an objective mathematical representation of the unique information stored in the iris, and allows comparisons to be made between templates.

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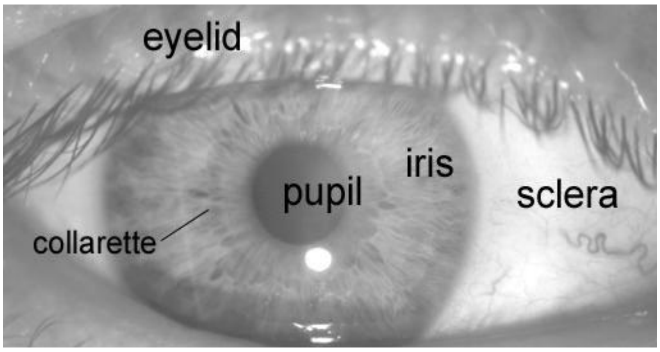

Fig. 1 A front-on view of the iris image

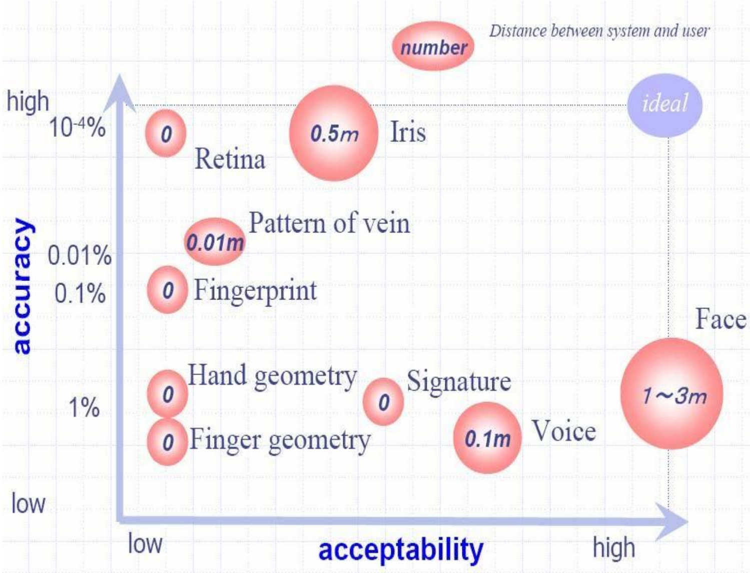

Fig. 2 Comparisons of different biometrics

II.EXISTING SYSTEM

Here the segmented iris is represented in the form of labelled graphs. Matching is done here in the form of graphs. Figure below shows comparison of two irises in the form of graphs. Here before comparing, template number is generated for each iris.

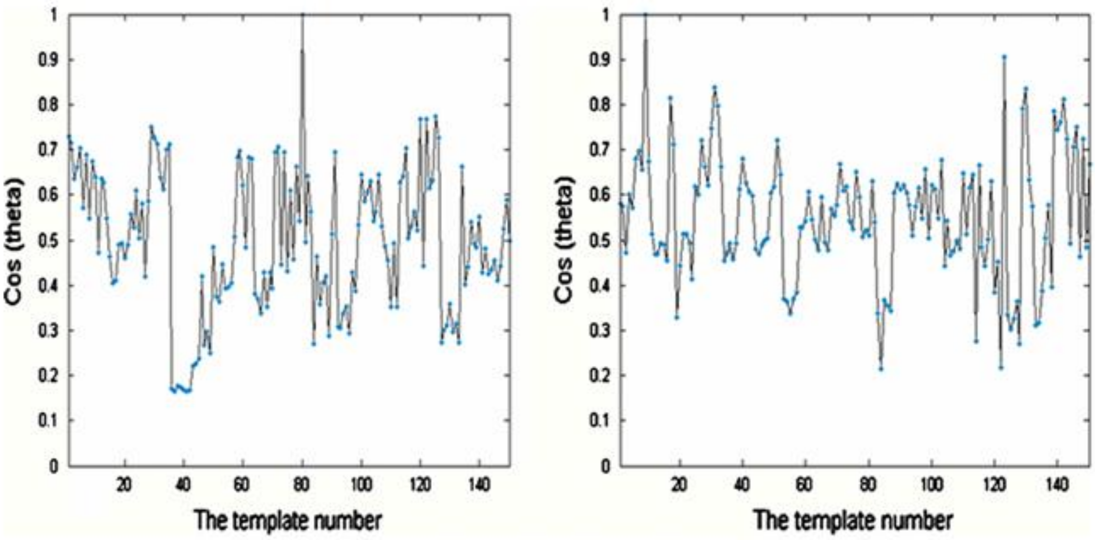

Fig. 3 Comparison of two images using graph

III. PROPOSED SYSTEM

Here we compare iris images in the form of templates and also look more on accuracy of the image. Generated template will be in the form of zeros and ones which will be helpful for hamming distance to match irises of an individual.

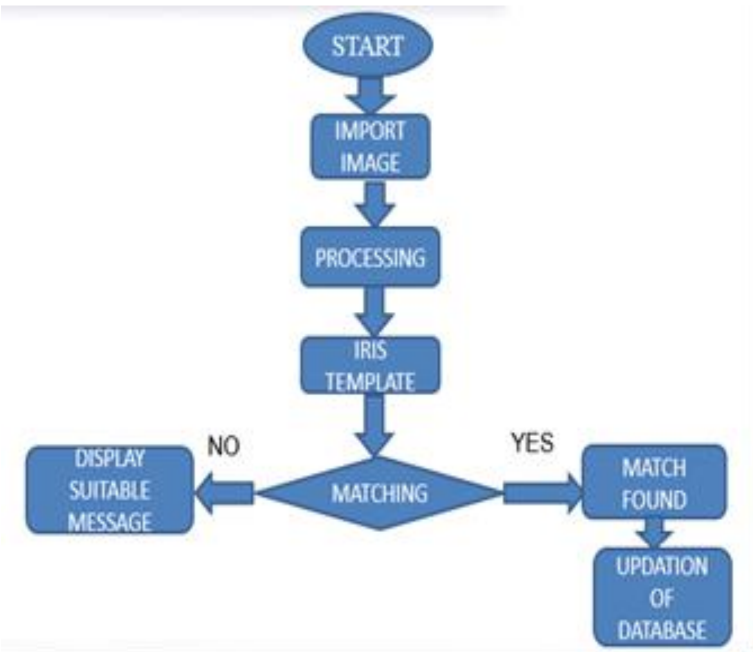

Fig. 4Flow Chart

3.1 Methodology

It involves 4 stages:

1. Segmentation: This is an initial stage where we detect the edges of an eye using Canny-edge detector, also we detect noise using linear transform and we locate centre & radius by circular Hough transform.
2. Normalization: Noise that are detected in previous stage are normalized using rubber sheet model.
3. Feature Encoding: Cartesian products are converted into polar co-ordinates and are encoded in the form of templates.
4. Matching: If the number of different bits is less than that of one-third of the total number of bits, the two irises are matching.

The Hamming distance gives a measure of how many bits are the same between two bit patterns. Using the Hamming distance of two bit patterns, a decision can be made as to whether the two patterns were generated from different irises or from the same one. In comparing the bit patterns X and Y, the Hamming distance, HD, is defined as the sum of disagreeing bits (sum of the exclusive-OR between X and Y) over N, the total number of bits in the bit pattern.

$$HD = \frac{1}{N}\sum_{j=1}^{N} X_j (XOR) Y_j$$

If two bits patterns are completely independent, such as iris templates generated from different irises, the Hamming distance between the two patterns should equal 0.5. This occurs because independence implies the two bit patterns will be totally random, so there is 0.5 chance of setting any bit to 1, and vice versa. Therefore, half of the bits will agree and half will disagree between the two patterns.

If two patterns are derived from the same iris, the Hamming distance between them will be close to 0.0, since they are highly correlated and the bits should agree between the two iris codes.

The Hamming distance is the matching metric employed by Daugman, and calculation of the Hamming distance is taken only with bits that are generated from the actual iris region.

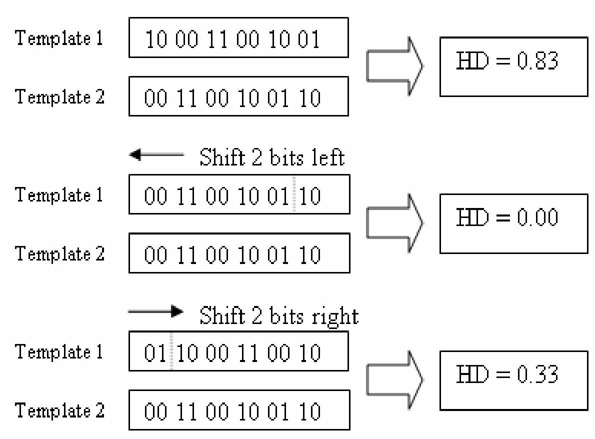

Fig. 5 Hamming Distance Calculation

Now when taking the Hamming distance, only those bits in the iris pattern that corresponds to ‘0’ bits in noise masks of both iris patterns will be used in the calculation. The Hamming distance will be calculated using only the bits generated from the true iris region, and this modified Hamming distance formula is given as

$$HD = \frac{1}{N - \sum_{k=1}^{N} Xn_k (OR) Yn_k} \sum_{j=1}^{N} X_j (XOR) Y_j (AND) Xn'_j (AND) Yn'_j$$

Where Xj and Yj are the two bit-wise templates to compare, Xnj and Ynj are the corresponding noise masks for Xj and Yj, and N is the number of bits represented by each template.

Coding: Main Function

```
clc;
clear all;
close all;
[namefiler,pathnamer]=uigetfile({'*.bmp;*.tif;*.tiff;*.jpg;*.jpeg;*.gif;*.pgm','IMAGE Files (*.bmp,*.tif,*.tiff,*.jpg,*.jpeg,*.gif)'},'Chose GrayScale Image');
figure;imshow(namefiler);title('1st iris image');
 [template1,mask1]=createiristemplate(namefiler,pathnamer);
figure,imshow(template1);
figure,imshow(mask1);
[namefiled,pathnamed]=uigetfile({'*.bmp;*.tif;*.tiff;*.jpg;*.jpeg;*.gif;*.pgm','IMAGE Files (*.bmp,*.tif,*.tiff,*.jpg,*.jpeg,*.gif)'},'Chose GrayScale Image');
figure;imshow(namefiled);
 [template2,mask2]=createiristemplate(namefiled,pathnamed);
figure,imshow(template2);
figure,imshow(mask2);
scales=1;
hd=gethammingdistance(template1,mask1,template2,mask2,scales);
if (hd==0)
disp('iris are matching')
else
disp('iris are not matching')
end
```

Hamming Distance:

```
functionhd = gethammingdistance(template1, mask1, template2, mask2, scales)
template1 = logical(template1);
mask1 = logical(mask1);
template2 = logical(template2);
```

```
mask2 = logical(mask2);
hd = NaN;
% shift template left and right, use the lowest Hamming distance
for shifts=-8:8
   template1s = shiftbits(template1, shifts,scales);
   mask1s = shiftbits(mask1, shifts,scales);
mask = mask1s | mask2;
nummaskbits = sum(sum(mask == 1));
totalbits = (size(template1s,1)*size(template1s,2)) - nummaskbits;
   C = xor(template1s,template2);
   C = C & ~mask;
bitsdiff = sum(sum(C==1));
%      if totalbits == 0
%
%        hd = NaN;
%
%     else
       hd1 = bitsdiff / totalbits;
if  hd1<hd || isnan(hd)
hd = hd1;
end
end
end
```

IV. CONCLUSION

The automatic segmentation model proved to be successful. The CASIA database providedgood segmentation, since those eye images had been taken specifically for iris recognition research and boundaries of iris pupil and sclera were clearly distinguished. By using this system presented in this paper for iris recognition resulted into higher accuracy rate. And also we reduced the noise intensities like light, eyelids and eyelashes.

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