IRIS RECOGNITION & PERSONAL AUTHENTICATION SYSTEM IMPROVE EFFICIENCY

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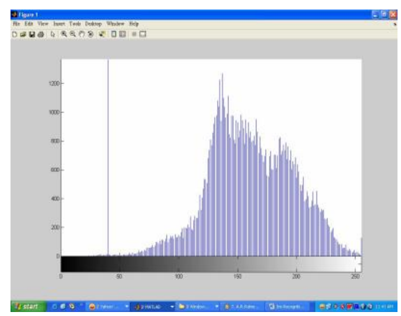
Abstract:**Our objective is to to prepare the system that provide the security for an organization. The system is based on an empirical analysis of the iris image and it is split in several steps using local image properties. The system steps are capturing iris patterns; determine the location of the iris boundaries ; converting the iris boundary to the stretched polar coordinate system ;extracting the iris code based on texture analysis using wavelet transforms; and classification of the iris code. The proposed system use the wavelet transforms for texture analysis, and it depends heavily on knowledge of the general structure of a human iris. The system was implemented and tested using a dataset of 240 samples of iris data with different contrast quality. The classification rate compared with the well known methods discussed**

Keywords: **data mining, AI, information, Neural Network.**

I.IDENTIFICATION OF NEEDS

One must know what problem is before it can be solved. The first step of the system analysis process involves the identification of need. This need leads to a preliminary survey or an initial investigation to determine whether an alternate system can solve the problem. In this phase scope & objective of the problem is determined.

A. *Pupil Detection:*In the initial step we are conducting a histogram analysis on the input grey scale human eye image to extract the separate image of pupil. Later we have applied edge detection operation to get the exact boundary of the pupil.



Histogram analysis result of sample image Here in the above plot we have intensity levels on x axis and on y axis we have frequency level for each corresponding intensity. The line with maximum y-coordinate valuesignifies the pupil region with the maximum intensity. After obtaining a picture of them pupil, we obtain the pupil's center point by finding the largest and smallest values for both x and y axis. Adding the two x-axis value and dividing them by two will give us the X-value of the pupil's center point. Adding the two y-axis value and dividing them by two will give us the Y-value of the pupil's center point.

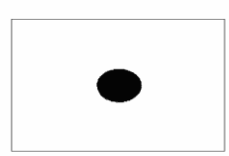
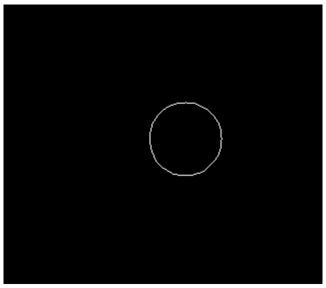


Image obtained after extracting the part with highest intensity. Boundary of the image cannot be obtained exactly in this step. So we have performed edge detection operation.



B. *Iris Pre–Processing*:Eye image edge detection Input eye image I subjected to canny edge detection operation toget gradient and orientation of all pixels in the image. Later we have used Gaussian Smoothing filter to increase the contrast of the darker regions.

II. GAMMA ADJUSTMENT

Now to apply further operations we need to enhance the contrast of the image obtained after edge detection operation. Gamma correction controls the overall brightness of an image. Images which are not properly corrected can look either bleached out, or too dark. Trying to reproduce colors accurately also requires some knowledge of gamma. Varying the amount of gamma correction changes the brightnessand contrast. Here the gamma value in the range 0-1 enhances the contrast of bright regions and values >1 enhances the contrast in dark. We have taken a typical value of 1.9 to get good contrast of iris image.

A. *Non Maxima Suppression*: Using the gradient image, the peaks are localized using no maximum suppression.

We know that the orientation image gives feature normal orientation angles in degrees (0-180).Orientation angles are got during filtering&edge detection of iris boundary. Non-maximum suppression is used along with edge detection algorithms. The image is scanned along the image gradient direction, and if pixels are not part of the local maxima they are set to zero. This has the effect of suppressing all image information that is not part of local maxima. It works in the following manner. For a pixel imgrad(x,y), in the gradient image, and given the orientation theta(x,y), the edge intersects two of its 8 connected neighbors. The point at (x,y) is a maximum if its value is not smaller than the values at the two intersection points.

III. HYSTERESIS THRESHOLDING

In this step we are finding the exact boundaries of iris image the center and radius of it. The Hough transform converts the original spatial information in an image into a parameter space representation. By selecting points that correspond to overlapping parameter space shapes/elements, the equation of the detected shape is rapidly obtained. Practical application of the Hough transform generally involves breaking down the parameter space into discrete accumulator cells that contain a count. This count corresponds to the number of edge pixels in the original image that constitute the desired shape. 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(t)……(A)

y=b+R sin (t)……(B)

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

IV. IRIS NORMALIZATION

Once the iris region is successfully segmented from an eye image, the next stage is to transform the iris region so that it has fixed dimensions in order to allow comparisons. The dimensional inconsistencies between eye images are mainly due to the stretching of the iris caused by pupil dilation from varying levels of illumination. Other sources of Inconsistency include, varying imaging distance, rotation of the camera, head tilt, and Rotation of the eye within the eye socket. The normalization process will produce iris regions, which have the same constant dimensions, so that two photographs of the same iris under different conditions will have characteristic features at the same spatial location.

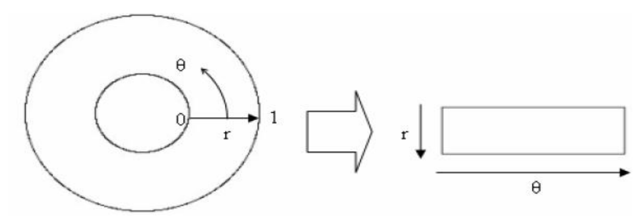
$$\theta \in [0 \quad 2\pi], \rho \in [0 \quad 1], \; I(x(\rho,\theta), y(\rho,\theta)) \rightarrow I(\rho,\theta)$$

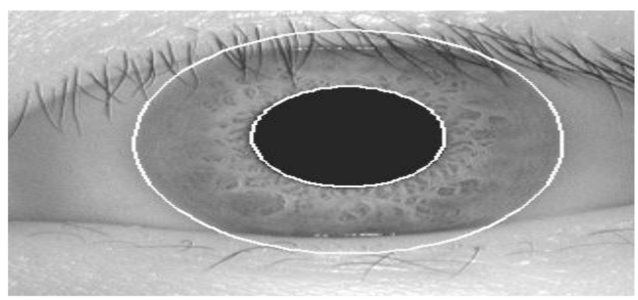
$$x(\rho,\theta) = (1-\rho)x_p(\theta) + \rho x_i(\theta) \qquad (1)$$
$$y(\rho,\theta) = (1-\rho)y_p(\theta) + \rho y_i(\theta)$$

$$x_p(\theta) = x_{p0}(\theta) + r_p \cos(\theta) \qquad (2)$$
$$y_p(\theta) = y_{p0}(\theta) + r_p \sin(\theta)$$

$$x_i(\theta) = x_{i0}(\theta) + r_i \cos(\theta) \qquad (3)$$
$$y_i(\theta) = x_{i0}(\theta) + r_i \sin(\theta)$$

where $I(x, y)$ is the iris region, (x, y) and (ρ, θ) are the Cartesian and normalized polar coordinates respectively, (x_p, y_p) and (x_i, y_i) are coordinates on pupil and limbos boundaries along the θ direction, (x_{p0}, y_{p0}), (x_{i0}, y_{i0}) are the coordinates of pupil and iris centers. We selected the size of unwrapped iris 512 × 64 and used 87.5% of unwrapped iris as shown in below figure. We know the upper portion of normalized iris (closer to the pupil) provides most useful texture information for recognition and this region (under dotted line) seldom contains the occlusion of eyelids. These zones are truncated to avoid other patterns not including in the iris texture.





CONCLUSION

To evaluate the performance of the proposed algorithm, we tested our algorithm on CASIA ver.1 Database with a using Pentium IV 3.0 GHz processor and 512 RAM. Total of 100 different eyes (i.e. different iris classes) were tested and for each iris three images were used. This makes up a total of 300 experiments. Unlike fingerprints and face, there is no reasonably sized public-domain iris database. Images from each class are taken from two sessions with one month interval between sessions. Due to specialize imaging conditions using near infra-red light, features in the iris region are highly visible and there is good contrast between pupil, iris and sclera regions. The system was trained to one image and remaining two images of each class were used as test images. This is also consistent with the widely accepted standard for biometrics algorithm testing. Experimental analysis showed that time taken to process each image is 6.0989 sacs(approx).If the input test pattern exactly matches with any pattern present it he database , then the Euclidean distance is coming out to be 0.But as we have used 3test images , we have got ED less than 20(approx) are corresponding to same eye image. With the 100 images (taken randomly from the CASIA database) we have a success of 95.92%. However the error is due to some distortion while capturing the images.

FUTURE SCOPE

For more efficient detection of the person, Cryptographic analysis of iris codes can be done. For removing the noise due to eyelids ,eye lashes we can usethe other filters to get maximum part of iris pattern in the normalized ima Animprovement could also be made in the speed of the system.The most computation intensive stages include performing theHough transform, and calculating Hamming distance values between templates to searchfor a match. Since the system is implemented in MATLAB, which is an interpretedlanguage, speed benefits could be made by implementing computationally intensive partswould have to be considered if using the system for real-time recognition.Another extension to the system would be to interface it to aniris acquisition camera. Now rather than having a fixed set of iris images from a database,a frame grabber can be used to capture a number of images, possibility improving therecognition rate.An optimization whose feasibility could be examined withuse of an acquisition camera would be the use of both eyes to improve the recognitionrate. In this case, two templates would be created for each individual, one for the left eyeand one for the right eye. This configuration would only accept an individual if both eyesmatch to corresponding templates stored in the database. The recognition rates producedfor this optimization would need to be balanced with the increased imaging difficultly.

CHALLLENGES

Below are few challenges that are to be taken care of.

- If there are any secular reflection in the image
- If shape of pupil & iris are not well approximated as circles
- unlike fingerprints, iris features are very subtle and irregular
- capturing a good quality image can be difficult
- Eyelid/Eyelash segmentation
- Can iris cooler be utilized?
- testing with larger database

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