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# IRIS RECOGNITION USING CUMULATIVE SUM BASED CHANGE ANALYSIS

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## ABSTRACT:

Iris recognition has received increasing attention recently. Compared with other biometric features such as fingerprint andface, Iris patterns are more reliable and stable. Iris recognition includes iris imaging, iris segmentation and iris recognition and so on. This paper focus on the iris feature extraction in iris recognition system And this paper proposes novel and efficient iris recognition method that employs cumulative SUM based grey change analysis. Experimental results show that proposed method can be used for human identification in efficient manner.

*Keywords*: Biometrics, Iris recognition

# I INTRODUCTION

### IRIS RECOGNITION SYSTEM

Iris Recognition System is a robust method of a personal identification since the iris pattern is unique and remains unchanged throughout one's life. Also it has various advantages like greater speed, simplicity and accuracy. It consists of major four steps. Image acquisition, Iris preprocessing, Normalization, Feature extraction and verification.

**Iris image acquisition:** Image acquisition is necessary to capture a sequence of iris images from the subject using a specifically designed sensor. Hence one of the important major challenges is to capture high quality images. In designing an image acquisition system.Aspects like the lighting system, the positioning system, and the physical capture system [3] is to be considered. Normally images are captured by high resolution CCD camera from distances up to about 3 feet (one meter). Most of the work has been done on iris Image acquisition that has made noninvasive imaging at a distance possible.

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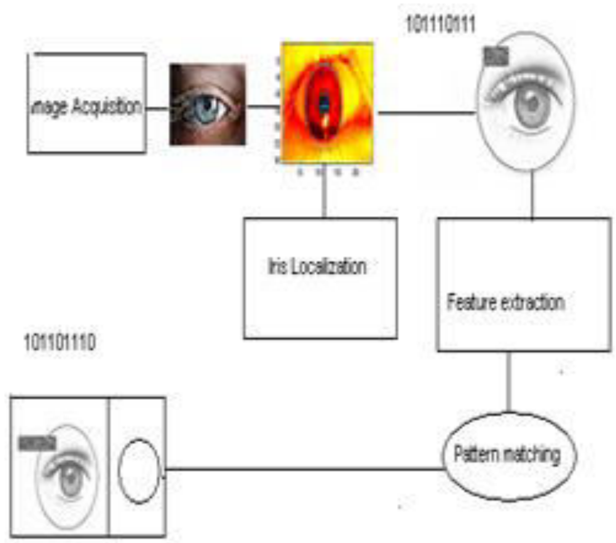


**Fig 1**: Block Diagram of IRIS reorganization

**Iris preprocessing:** To get an iris free of noise, independent of illumination and size one has to detect Iris pupil and Iris circle. Iris Pupil Detection: First read the image for database. Using region of interest according to color, we can detect the pupil but we must know the threshold value of pupil intensity.To find the threshold value of pupil intensity, take the histogram of original image, which gives graphical representation between numbers of pixels vs pixel intensity. As the pupil is black in color, the pupil pixel intensity lies closer to zero. Pupil has moderate size. Determine maximum number of pixels for intensity value, which is closer to zero. That value is threshold value of pupil intensity. Steps to find radius of pupil: Locate four points on pupil circumference,Find out co-ordinates of four points (top, bottom, left, right) , Find centre co-ordinates. After the first step results we have the image with only pupil. That is now our aim to find out the center of the pupil so that the iris can be localized. We first find out the four points (top, bottom, left and right) for localizing the pupil center Figure 3.4 shows the pupil image with four points detection. The image is magnified and the points are painted with larger dots so as to have clear understanding. After finding the co-ordinates of these points the x-coordinate of center pixel can be approximated by x-coordinates of left and right pixels. The y-coordinate of the center pixel can be approximated by y- coordinates of top and bottom pixels. After finding out the center pixel coordinates we can easily find out the radius of the pupil.

## II. LITERATURE SURVEY

Xueyi *et al.* proposed an image watermarking algorithm based on zernike moment. This algorithm resists geometric attacks like rotation and scaling and hence makes watermark more robust. Chittaranjan *et al.* used cross chaos and arnold map to encrypt watermark before embedding it in host image. The behavior of the chaos is unpredictable which makes attacker difficult to decrypt it. The possibility for self synchronization of chaotic oscillations has sparked an avalanche of works on application of chaos in cryptography.

Henry-Ker *et al.* proposed a private key encryption for two dimensional image data. Along with encryption, lossless compression is performed simultaneously. The testing results and analysis demonstrate the characteristics of the proposed scheme. This scheme can be applied for problems of data storage or transmission in a public network.

*Chang-Mok et al.* proposed image encryption using binary phase XOR operation [8]. Since pixels of the image are highly correlated to its neighboring pixels, hence there is need of any technique which can shuffle pixels so as to reduce the correlation among pixels so called transformation of image.

Tapas *et al.* suggested digital watermarking techniques along with encryption of watermark using bitxor with random values. These two technologies are complimenting each other, and the increased security of the digital artifacts can be achieved by using benefits of the both. The experimental results demonstrate the high robustness of the proposed algorithm to various image processing attacks like noise additions, rotations, cropping, filtering.

Tao *et al.* proposed an algorithm on image watermarking using integer to integer wavelet transforms. Watermark is embedded in the significant wavelet coefficients by a simple XOR operation. After the wavelet transform, the significant coefficients are selected and modified according to watermark. Simulation results suggests that watermark is robust to various operations such as JPEG compression, random and gaussian noise and mean filtering. Further the method avoids complicated computations and high computer memory requirement that are the main drawbacks of common frequency based watermarking algorithms.

# III. METHODOLOGY

In order to provide accurate recognition of individuals, the most discriminating information present in an iris pattern must be extracted. Only the significant features of iris must be encoded so that comparisons between templates can be made. Most iris recognition system makes use of a band pass decomposition of iris image to create a biometric template.

The template that is generated in the feature encoding process will also need a corresponding matching metric, which gives a measure of similarity between two iris templates. This metric should give one range of values when comparing templates generated from same eye, known as inter-class comparisons, and another range of values when comparing templates created from different irises, known as inter-class comparisons. These two cases should give distinct and separate values, so that a decision can be made with high confidence as to whether two templates are from the same iris, or from two different irises.

### Verification and matching

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i. Hamming Distance (HD)

ii. Fuzzy Hamming Distance (FHD)

iii. The Euclidean Distance (ED)

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 the bit pattern.

$$HD=\frac{1}{N}\sum_{j=1}^{N} x_j\,(XOR)\,y_j$$

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Since an individual iris region contains features with high degrees of freedom , each iris region will produce a bit pattern which is independent to that produced by another iris , on the other hand , two iris codes produced from the same iris will be highly correlated.

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.

Although the Hamming distance has several applications, the main concern is the assumption that every bit is independent of its neighbors. In other words, it assumes no local correlation. The Fuzzy Hamming Distance (FHD) also measures dissimilarity between bit strings of equal length. However, it is not simply the number of 1s in the result of an XOR operation. The FHD incorporates bit locality. The value of Hamming distances is limited by the fact that it counts only exact matches, whereas in various applications, corresponding bits that are close by, but not exactly matched, can still be considered to be almost identical. We here define a “fuzzy Hamming distance” that extends the Hamming concept to give partial credit for near misses, and suggest a dynamic programming algorithm that permits it to be computed efficiently. The draw back of conventional hamming distance is that it measures absolute differences in bit without giving or indicating credits for ‘close calls’.

$$FHD = \frac{1}{N}\sum_{i=1}^{N}|x_i - y_i|$$

The Euclidean Distance (ED) can be used to compare two templates, especially if the template is composed of integer values. The weighting Euclidean distance gives a measure of how similar a collection of values are between two templates. The Euclidean distance metric is a classically used means of measuring the distance between 2 vectors of n elements.Euclidean distance is especially useful for comparing matching whole word object elements of two vectors. The most commonly used metric for matching the two bit strings generated by query image and template stored in database is the Hamming Distance. It is a simple XOR operation where result equal to zero when both said a string has same bit string.

Although the Hamming distance has several applications, the main concern is the assumption that every bit is independent of its neighbors. In other words, it assumes no local correlation. A fuzzy hamming distance; a new metric is introduced to better deal with bit string patterns which may be locally-correlated. Euclidean distance is especially useful for comparing matching whole word object elements of two vectors. It measures only distance between two iris code vectors.

$$ED = \sqrt{\sum_{i=1}^{N}(x_i - y_i)^2}$$

# IV. RESULTS

In our project we are using human iris for the security purpose such as bank locker open, door open system, information security etc.By using CCD (charge Coupled device) camera, we are capturing the human eye then it is stored in database of computer. After extract the features of the eye and take the iris part of the eye only. Because iris of each person is different even iris of two eyes of the single person is different. That’s why this experiment is more accurate than the face print, finger print etc. In our project we are taking the iris of the human by using CCD camera then is stored in computer or laptop. By using MATLAB we are writing code then process the code which extracts the features and compare the captured eye with the database. If the eye is matched then sends the message to the authorized person.

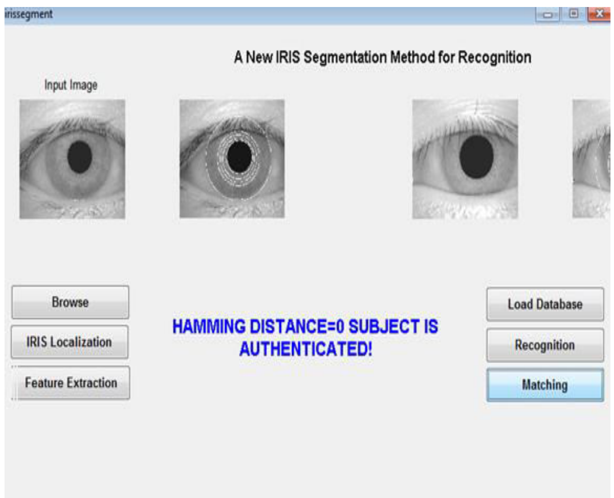


**Fig 2**: Simulation Output

FAR and FRR according to hamming distance is calculated as follows.

$$FAR = \frac{Number\ of\ times\ different\ person\ matched \times}{Number\ of\ comparision\ between\ different\ per}$$

False Rejecting Rate:-The fraction of the number of rejected client patterns divided by the total number of client patterns is called False Rejection Rate (FRR).

$$FRR = \frac{Number\ of\ times\ same\ person\ rejected \times 1}{Number\ of\ comparision\ between\ same\ pers}$$

The over all accuracy of algorithm is defined as

$$Accuracy = 100 - \frac{FRR + FAR}{2}$$

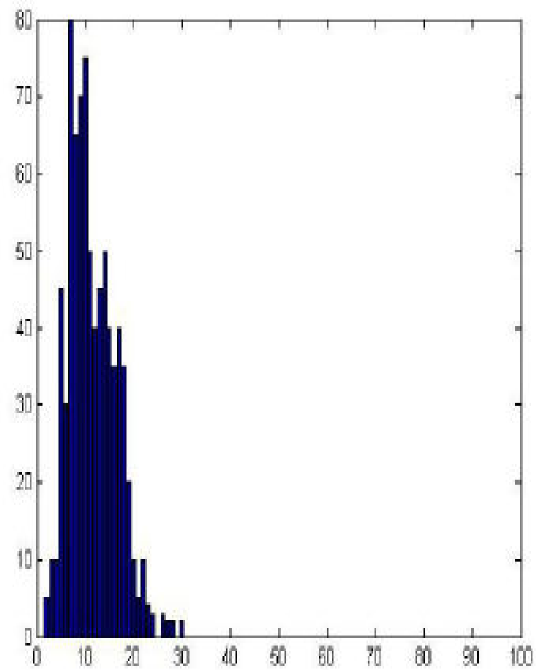


**Fig 3**. Hamming distance for the same persons (Authentic)

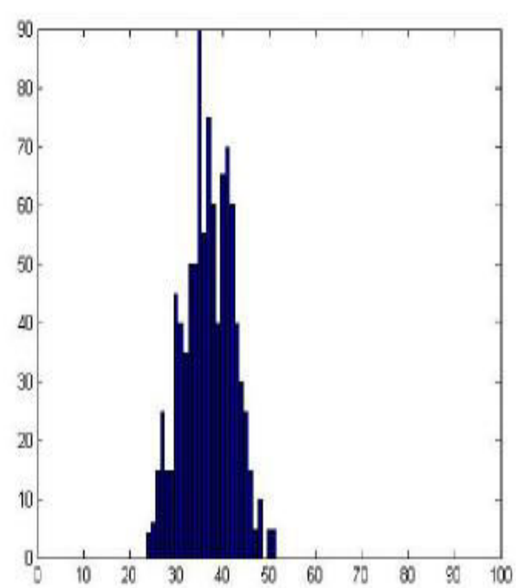


**Fig 4**. Hamming distance for the different persons(Imposter)

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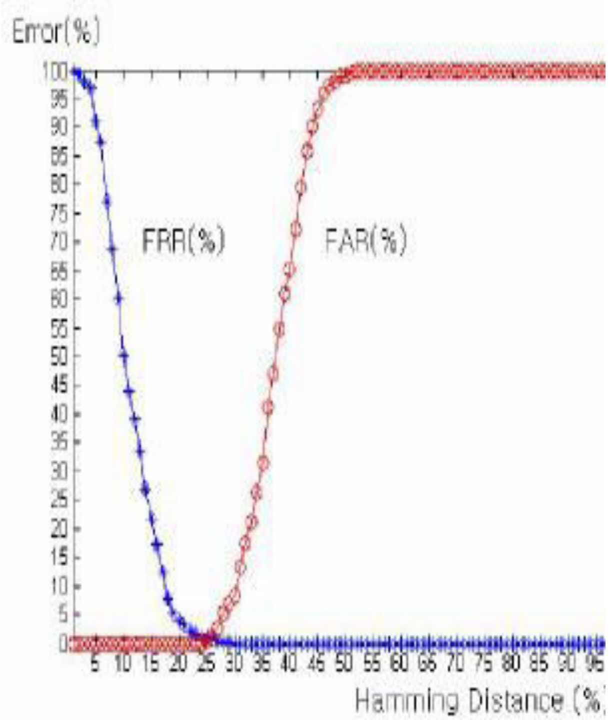


**Fig 5.** FAR/FRR curves according to hamming distance

## V. CONCLUSION

In this paper, a novel iris recognition method was proposed. This method employed iris feature extraction that uses cumulative sum based change analysis. In order to extract iris features, normalized iris image is divided into basic cells. And iris codes of these cells are generated by proposed code generation algorithm which uses cumulative sums of each cell. Proposed iris recognition method is relatively simple and efficient against existing methods.

And the experimental result show that the proposed approach has a good recognition performance. In future work, it is necessary to do experiments on many more iris image data in various environments for iris recognition system to be more reliable.

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