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RECOGNITION OF IRIS FOR BIOMETRIC APPLICATION

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Abstract: A biometric system provides automatic identification of an individual based on a unique feature or characteristic possessed by the individual. is the process of capturing a high-contrast image of a person's iris using visible and near-infrared light. It is a form of biometric technology, like face recognition and fingerprinting. The proponents of iris scanning technology claim that it gives law enforcement officers the ability to compare suspects' iris scans with a database of existing pictures in order to verify or confirm a subjects identify. Since it is easier for someone to conceal or alter their fingers than it is to do the same with their eyes, they also assert that iris scans are quicker and more accurate than fingerprint scans. The iris recognition system consists of an automatic segmentation system that is based on the Hough transform, and is able to localize the circular iris and pupil region. The extracted iris region was then normalized into a rectangular block with constant dimensions to account for imaging inconsistencies. Infrared light is used by biometric iris recognition scanners to illuminate the iris and identify distinct patterns that are invisible to the human eye. Eyelashes, eyelids, and specular reflections—common obscurants of the iris—are identified and removed by iris scanners. The ultimate result is a group of pixels that only include the iris. The bit pattern that encodes the information in the iris is then determined by looking at the pattern of the lines and colours in the eye. Finally, the phase data from 1D Log-Gabor filters was extracted and quantized to four levels to encode the unique pattern of the iris into a bit-wise biometric template. And finally, iris recognition is employed for classification of iris templates, and two templates were found to match if a test of statistical independence was failed. Therefore, irisrecognition is shown to be a reliable and accurate biometric technology.

Keywords: Grid Search, Principle Component Analysis (PCA)

I. INTRODUCTION

Iris recognition, or iris scanning, is the process of capturing a high-contrast image of a person's iris using visible and near-infrared light. It is a form of biometric technology, like face recognition and fingerprinting. The proponents of iris scanning technology claim that it gives law enforcement officers the ability to compare suspects' iris scans with a database of existing pictures in order to verify or confirm a subjects identify. Since it is easier for someone to conceal or alter their fingers than it is to do the same with their eyes, they also assert that iris scans are quicker and more accurate than fingerprint scans.

Iris scanning significantly raises worries about civil rights and privacy. It would be possible to remotely scan people's irises or even scan them while they are moving, enabling the secret capture of data without their knowledge or agreement. In the event that a database containing biometric data is lost or compromised, it is hard to get a new set of eyes in the same manner that a credit card number may be given again. This raises security concerns. The routine collecting and storage of iris biometric data by third parties significantly expands this security concern. The distinctive patterns in people's irises, or coloured circles in their eyes, are found by iris scanning.

Infrared light is used by biometric iris recognition scanners to illuminate the iris and identify distinct patterns that are invisible to the human eye. Eyelashes, eyelids, and specular reflections—common obscurants of the iris—are identified and removed by iris scanners. The ultimate result is a group of pixels that only include the iris. The bit pattern that encodes the information in the iris is then determined by looking at the pattern of the lines and colours in the eye. This bit pattern is digitalized and compared to database templates for identification or verification (one-to-one template matching) (one-to-many template matching). Iris scanning cameras are tiny, portable equipment that may be placed on a wall or other fixed surface or carried about. . According to research being conducted at Carnegie Mellon University, long-range scanners might be used to secretly capture images from up to 40 feet distant.

II. RELATED WORK

Biometric technology research has recently gained a lot of interest due to rising security concerns. Citizens and their governments have responded by taking more initiative in areas of security as a result of the growing crime rate. People's

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need to protect their homes, apartments, and other private property and assets is also a part of this demand for security. With the most widespread applications in security and law enforcement, the most efficient biometric techniques have been developed and are always being improved.

Biometric technologies employ several state-of-the-art techniques. The most reliable security authentication technique at the moment is iris recognition, which is one of these. Sensor technology advancements and an increase in the demand for biometrics are driving the development of new technologies. As a consequence of expanding corporate incentives, several innovative person identification technologies are being developed; each has unique benefits and drawbacks as well as the capacity to satisfy a particular market need.

Sir Francis Galton developed a technique for categorising fingerprints in 1892, and researchers and educators still use it today. Sir Edward Henry contributed to the development of fingerprint identification as a successful technique by using Galton's theory to identify offenders by their fingerprint impressions in 1896. He developed a categorization system that made it straightforward to save, find, and monitor thousands of fingerprints. In that year, he helped build the first fingerprint bureau, and his method of identifying criminals was widely adopted (Scottish Criminal Record Office, 2002).

Rubel Biswas,[1] proposes a system for measuring the e-security. Here, Canny Edge Detection Algorithm used for edge detection part. DNS (Dominant Neighbourhood Structure) GNS (Global Neighbourhood Structure) maps are used to reduce the size of the feature vector and extract the feature vector of our tested IRIS dataset. For the machine learning purpose on recognition phase, single class support vector machine has been used. For validation and comparison of the model, they used CASIA-Iris-Interval dataset V3.0. By this dataset they had used 70% for training and 30% for testing purpose then the final result shows that this p model gives 92% accuracy.

Sushmita Attarawala, [1] proposes a system to improve the accuracy and performance of the present working Iris recognition system for authentication and make it as more reliable. In this paper to scrutinize the performance of the iris recognition system, on the whole, tests were performed to locate the best detachment, so that the false match and false acknowledge rate is limited, and to affirm that iris recognition can perform precisely as a biometric for identification of individuals. And additionally affirming that the framework gives precise recognition, the analysis was also supervised. In order to verify the uniqueness of human iris patterns by reducing the number of connected components present in the iris template portrayal. That the future of the IRS is bright and should encourages researchers to further conduct studies to resolve the challenges mentioned in the paper and provide proper solutions for them.

Jasem Rahman Malgheet, [1] proposes a system to avoid the illegal access to network or devices, and to reduce miss usage of password pin which are used for identification. In this paper it discusses and analysis the significance of the IRS which has been introduced in the literature. Reviews the existing iris recognition systems and applications comprehensively. Discusses current challenges and directions of future studies for iris recognition systems. Hough Transform-Based Segmentation Techniques. Histogram and Contour-Based Segmentation Techniques are used in segmentation phase. It has limitation of imaging the iris is due to the anatomical features of the eye in addition to the noise introduced in the imaging environmental condition.

Omar Medhat Moslhi,[2] proposes a system to represent a new irsi segmentation technique that detects the iris images efficiently with high accuracy using CNN algorithm. In this paper the iris recognition model begins by detection process which tries to find eyes in the images collected by camera then the second process is iris detection in this phase iris inside eyes images are detected to be ensure that the eyes have visible iris that could be segmented in the next steps the third process is iris segmentation that will be used to extract features that will be used in the last process by the convolutional neural network (CNN) model to train and test iris images. The result of this system is the accuracy range on all data sets fron 90% to 92% which indicates that this model is strong as it tested on 4 different dataset like Ubiris Version1, Ubiris Version 2, Casia Iris-Thousand and Casia Iris Interval and environment.

Adam Czajka [2], proposes a system to implement matching of left and right iris of person, using NEXUS system which implements different protocols for matching. In this paper the NEXUS system implements different protocols for matching left and right eyes and fractional Hamming distance algorithm is used. This experiment results in determine if the daily pattern seen in the operational data could be caused by daily patterns in pupil dilation and eyelid aperture for the general population, observed under controlled acquisition conditions. We find that the general answer is no, that the patterns seen in the operational data are not due to general diurnal rhythms in the function of the eye.

The above literatures report certain flaws, as it is manual in nature and involves lot of paper work, It show that iris recognition is most efficient and accurate form of biometric application, the existing biometric system also has many

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drawbacks, the accuracy and efficiency of the existing biometric application is affected by the condition of the skin of the person, it may be damaged or wood etc. This condition effect if authentication process. The renewed process is similar to the old biometric application but here, we are considering iris of the person rather than face or fingerprint. Because the iris of adult remains constant for a long time nearly till old age. So, by this we can archive more accuracy and efficient application with less storage capacity. By this we can conclude that Iris recognition gives high accuracy more than other human characteristics in user authentication like Fingerprint, face recognition and handwriting. The proposed system thus, minimizes these flaws by providing the result with details of the predicted person that is useful for further authentication process.

III. SYSTEM ARCHITECTURE

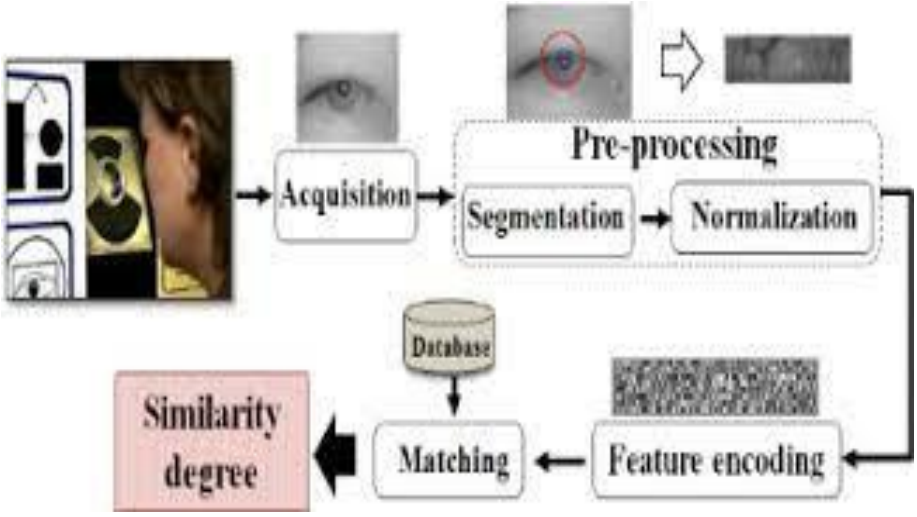

Figure 3.1 System Architecture

This application involves four steps acquisition, pre-processing, feature extraction and matching and recognition. In acquisition stage the iris images which should be rich in iris texture as the feature extraction stage depends upon the image quality. Then it comes to pre-processing, in this stage in includes two sub stages namely, segmentation and normalization. Segmentation is the first stage of iris recognition is to isolate the actual iris region in a digital eye image. Once the iris region is segmented, the next stage is to normalize this part, to enable generation of the iris code and their comparisons. Normalization process involves unwrapping the iris and converting it into its polar equivalent. Then it comes to feature extraction we attempt to extract only significant information, and those features are compared with the iris images which are already stored in the database and provide the result.

FLOWCHART IMPLEMENTATION

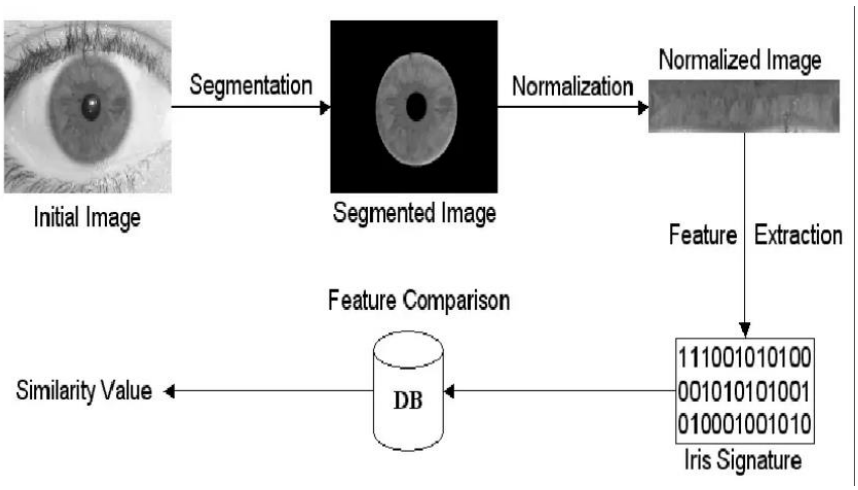

Figure 3.1 Flow Chart

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The figure 3.1 depicts flow control of the application, it starts with Iris Image Pre-processing at this stage The iris is surrounded by the various non relevant regions such as the pupil, the sclera, the eyelids, and also noise caused by the eyelashes, the eyebrows, the reflections, and the surrounding skin. We need to remove this noise from the iris image to improve the iris recognition accuracy. Then it comes to Iris / Pupil Localization at this phrase The iris is an annular portion of the eye situated between the pupil (inner boundary) and the sclera (outer boundary). Both the inner boundary and the outer boundary of a typical iris can be taken as approximate circles. However, the two circles are usually not concentric. After segmentation it comes to Iris normalization here, we use the rubber sheet model for the normalization of the isolated collarette area. The center value of the pupil is considered as the reference point, and the radial vectors are passed through the collarette region. We select a number of data points along each radial line that is defined as the radial resolution, and the number of radial lines going around the collarette region is considered as the angular resolution. After completing the normalization, it comes to feature extraction here, in this phase PCA algorithm is applied to select the necessary feature and reduce the number of features. The feature representation should have information enough to classify various irises and be less sensitive to noises. Also, in the most appropriate feature extraction we attempt to extract only significant information, more over reducing feature vector dimensions, the processing lessened and enough information is supplied to introduce iris feature vectors classification. Finally, comes for Matching and Recognition, in this phase all selected feature are compared with feature of iris which are stored in the database by using grid search algorithm and comes out with the matching iris image and person name.

IV. PROPOSED METHODOLOGY

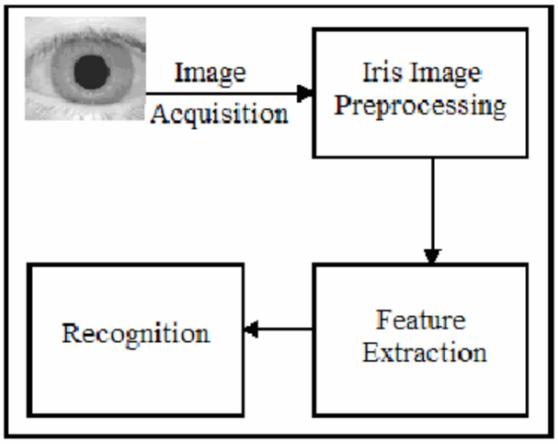

Figure 4.1 proposed methodology

The usage of biometric technology for personal identification will increase in the future. Traditional methods like keys, ID cards, usernames, and passwords are frequently insufficient or unreliable in security domains. Research on biometric authorizations using the face, iris, and fingerprint has gained popularity. Since iris recognition is regarded in those methods as a high accuracy verification technology, many nations share the idea of applying it to strengthen the security of their vital departments.

The real-time iris recognition application system's iris localization phase is crucial. The segmentation and localization real-time performance of the iris regions will have an impact on the accuracy rate and effectiveness of the whole recognition system for large-scale databases. The iris is a small item with a low grey value, making it particularly difficult to shoot with strong contrast. These illuminations might, however, result in certain faculas in the iris image and affect iris segmentation and iris features. To increase intensity and enhance contrast in the iris picture, near infrared light sources are widely used.

There are three basic steps that are responsible for recognising an iris by the system:

1. Segmentation– This process uses Daugman's integro-differential operator is used for locating the circular iris and pupil regions, and also the arcs of the upper and lower eyelids.
2. Normalization- The homogenous rubber sheet model devised by Daugman is used to remap each point within the iris region to a pair of polar coordinates (r, θ) where r is on the interval [0,1] and θ is angle [0,2π],

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3. Feature Encoding- Wavelets can be used to decompose the data in the iris region into components that appear at different resolutions. Wavelets have the advantage over traditional Fourier transform in that the frequency data is localised, allowing features which occur at the same position and resolution to be matched up.

Benefits of the Proposed System:

- Secure access to bank accounts at ATMs.
- Computer login; access control.
- Premises (home, office, laboratory, etc.)
- Forensics: locating people who are missing or wanted birth certificates
- Authentication of credit cards
- Secure financial transactions (e-commerce)
- Anti-terrorism (such as security checks on flights)
- Any presently used keys, cards, PINs, or passwords.

Grid search

Grid search is just a method of optimization that automates the "trial-and-error" process by letting you select the best parameters for your optimization problem from a list of parameter options you provide. Though it has its drawbacks, it is most known for its application in machine learning to pinpoint the variables where the model performs with the highest degree of accuracy.

Assume that your model's inputs are the three variables given below:
1. The quantity of covert layers [2, 4]
2. Each layer's neuronal density [5, 10]
3. A total of [10, 50] epochs

If we wish to test two options for each parameter input, there are a total of 23=8 different possibilities, as shown above in the square brackets (for example, one such combination is It would be difficult to complete this manually.

Imagine that each of the 10 input parameters had to be tested with 5 different values. To change a parameter value, we would need to manually enter the new value, run the code once again, and record the results for every conceivable parameter combination. In order to automate the process, Grid Search takes the potential values for each parameter, runs the code to try out every possible combination, and then outputs the results for each combination as well as thea mixture that offers the best level of precision.

V. RESULTS AND ANALYSIS

Principal component analysis, or PCA, is a method used to reduce the size of the data dimensions. It may be likened to a projection technique where data with m columns (features) is projected onto a subspace with m columns or less while preserving the key qualities of the original data. The PCA method may be used and explained using linear algebraic approaches. When PCA is used on a dataset with n x m matrix A, the output is a projection of A that we'll call B. Let us run through each stage of the process one at a time.
The proposed system provides most accurate and efficient system for iris recognition and solve problems in the existing iris recognition system. The accuracy is a metric that generally describes how the model performs across all classes. It is useful when all classes are of equal importance. It is calculated as the ratio between the number of correct predictions to the total number of predictions. Here is how to calculate the accuracy using Scikit-learn, based on the confusion matrix previously calculated. The variable ac holds the result of dividing the sum of True Positives and True Negatives over the sum of all values in the matrix. The result is 0.9014, which means the model is 90.14% accurate in making a correct prediction.

VI. CONCLUSION

The iris identification method is trustworthy, quantifiable, recordable, and strong. As a result, it meets the key criteria for the ideal biometric system. The biometric template may be used for the entirety of an individual's life since iris patterns are resistive to change and remain stable for long periods of time. Iris recognition systems for biometric security are simple to use and offer hassle-free security. Businesses and governmental organisations have adopted iris recognition-based authentication systems swiftly after realising the benefits of this technique. Based on the measured distance between

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the characteristics of the test picture and those of the database photos, person identification is used. Performance measures like Accuracy, Sensitivity, and Specificity of the Process are used to evaluate the process' performance. About the iris recognition procedure. The system may be improved by using further feature extraction techniques like SURF and other recently improved feature extraction methods that can provide more details about the iris picture. The difficulty in implementing the procedure.

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