IRIS Attendance System Using MATLAB

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Abstract : For an instinctual recognition of any individual based on a unique attribute or feature Biometric system can be used. The most genuine and precise Biometric system available is Iris recognition. The complicated and interesting characteristics of the iris makes it very secure for use as biometric .The biometric template is created by encoding the distinctive iris pattern from a digitized image of the eye ,and then reserved in a database. The objective mathematical representation of the distinct information in Biometric template which is stored in the iris enables differentiation between the templates. On the clean data sets, the existing algorithms that are used to extract and match characteristics have recorded very high identification rates. Implementation of Iris Recognition System based on database of image is done in our work. For this implementation we are using the MATLAB as a platform. There are four steps involved in complete iris recognition system were Image acquisition, segmentation, encoding and matching. For this all the steps in MATLAB provides the pre exist function. After training and testing the attendance will be directly updates to the database (ERP) and also to the authorized mail ID. This system gives very efficient results for attendance based on IRIS.

Keywords: IRIS Recognition, Normalization, Segmentation, Feature extracting, Database Access, Attendance mark, Mail service.

I. INTRODUCTION

The thin membrane on the interior of the eyeball is called iris. Design of iris is highly complicated. Patterns are discrete (even in identical twins or fraternal). Six months after birth, iris designs or patterns are formed and becomes stable after a year. The iris patterns remain unchanged for life. It is impossible to imitate. Capturing and encoding of iris patterns is easy. Instinctual recognition of individuals based on behavioural and biological features is Biometrics. The technology is designed to instinctively take an image from person and compare it to the digitized picture reserved in the biometric passport. By offering comfort to customers while increasing their security using biometric technology has shown a great potential, mainly in the financial services field. As information protection is an important issue, it is believed that this technology will be widely used in lot of different applications in future. Other Biometrics such as photographs, signatures, voiceprints, DNA and retinal blood vessel patterns, fingerprints all have notable drawbacks. Finger Print Recognition: Handprints or Finger Prints involve physical contact, and they also can be forged and spoiled by artefacts. Face Recognition: Changed with viewing angle, age, Expressions and illumination. Since the first automatic iris recognition system was proposed by J.G. Daugman in 1993. Daugman's and Wildes's approaches linger the most significant and distinguished among most of the recognized iris recognition system.

MATLAB is the tool used for reorganization in IRIS biometric system. Comparison of template produced from different eyes is done to determine the distinctive iris patterns in terms of hamming distance distribution. Epithelium layer is the lowest layer among all the layers of the iris. Just above the Epithelium layer there is a layer called stromal layer consisting pigment cells, two iris muscles and blood vessels. The color of the iris is determined by the density of the stromal pigmentation. There are two layers in the multi-layered iris which are in externally visible surface, which often differ in color. The inner papillary zone and the outer ciliary zone, Collarets which appears as the zigzag pattern divides these two layers.

To recognize and verify the identity of an individual distinctive features and attributes of human iris is used in iris scan biometrics. The part or area of eye which rings the dark pupil of the eye is pigmented usually blue or brown called iris. First a very high-resolution photograph is captured by illuminating the eye using an infrared imager. For this process highly specialized cameras are used which are kept very close to the subject approximately at a maximum distance of three feet. This is just a one to two second process which provides the details of iris that are mapped, registered and stored for the future verification or matching. The quality of the image is not affected by contact lenses or eyeglasses as iris-scan system test for a live eye by checking the normal continuous fluctuation in pupil size. An iris-scan algorithm locates the inner edge of the iris and maps unique iris patterns and features. To determine if the biometric record and sample is a match or not, number of step in the algorithm are used by the biometric systems .The iris remains stable throughout an individual's lifetime unless the eyeball is injured. Extremely complicated or complex patterns of iris holds a very large amount of data and have over 200 unique spots. Iris biometric system is very resistant to spurious matching compared to all other biometric systems.

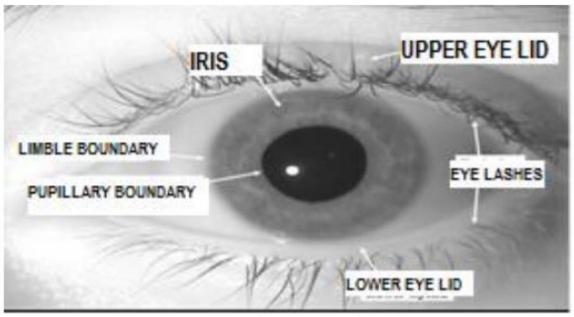


Figure 1: Human Eye

II. METHODOLOGY

- Iris Image Dataset is built for Training Dataset and Testing Dataset.
- Testing Dataset has iris scans for different persons for which the attendance needs to be monitored.
- Image is acquired from the testing database.
- Pre-processing Image Processing Step are performed.
- Iris Detection Algorithm is performed to identify the Person.
- Based on the identity match, attendance is counted for that person.
- The Entire project is carried out in MATLAB and an MATLAB UI is developed as an end product.

Block Diagram of the Project:

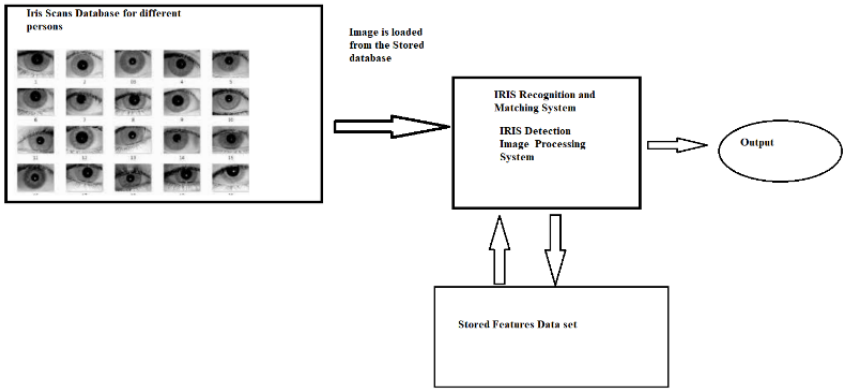


Figure 2: Top level diagram

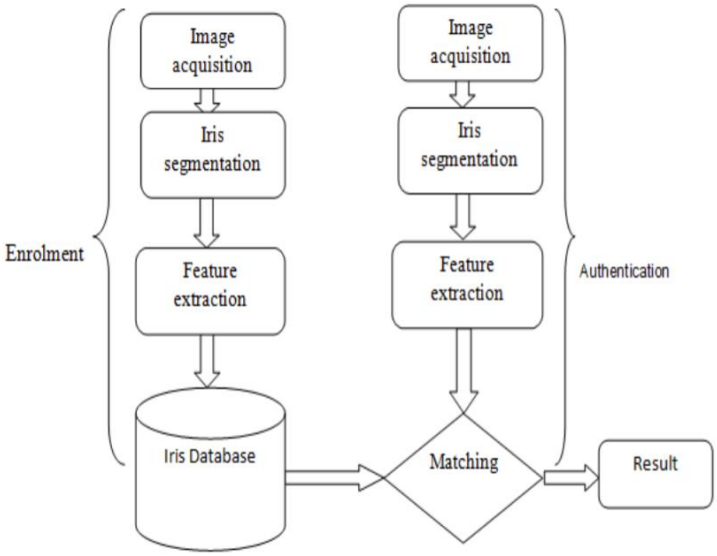


Figure 3. Architecture of IRIS Attendance System.

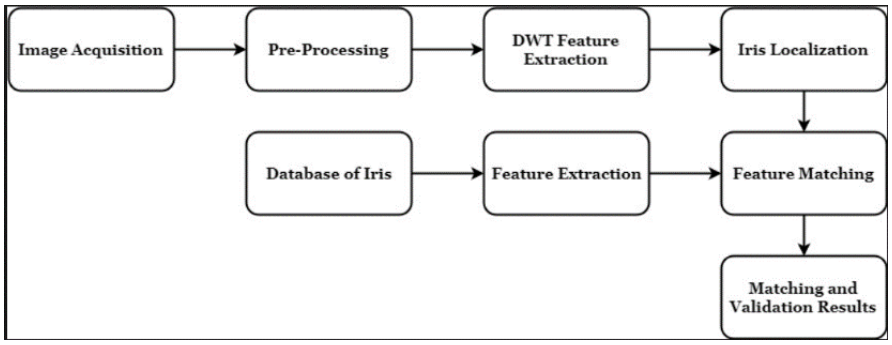


Figure 4. Image Processing Block.

Pre-Processing-

We go for converting an RGB image to grayscale image in image processing as there is no necessity of maintaining the color details and also because all the details of the original image are retained. This is in addition to the mentioned advantages of grayscale over RGB.

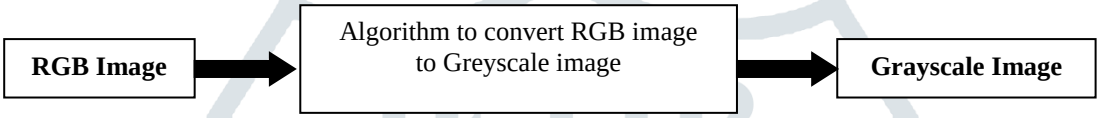


Figure 5. Conversion of RGB Image to Greyscale Image.

rgb2gray is an MATLAB inbuilt function which converts the RGB values to gray scale values by forming a weighted sum of the R(red), G(Green) and B(Blue) components, according to the Equation (2.1).

Y=0.2989*R+0.5870*G+0.1140*B……(2.1)

Normalization of Image

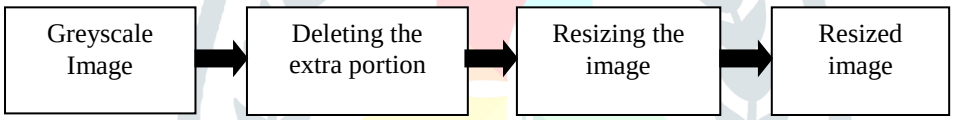


Figure 6. Normalization Block

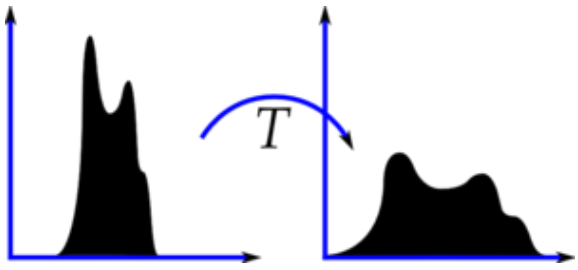
1. **Deleting the extra portion-** The portion of the image that does not contain any required data is deleted so as to memory required and computation cost and time.

   The images are represented by a matrix of pixels, here the goal is to only retain the portion of the image having the required require region of interest. Hence the rows from 18 to 563 and the columns from 65 to 700 are retained while the remaining are removed.

2. **Resizing the image-** The image is resized to 512x512 matrix in order obtain a square matrix representation of the image. This resizing is done in order to get circles of iris inner and outer boundary during segmentation.

Histogram Equalization

An **Image Histogram** is a type of histogram that acts as a graphical representation of the contrast distribution in a digital image. It plots the number of pixels for each tonal value. By looking at the histogram from a specific image a viewer will be able to judge the entire tonal distribution at a glance.



(a) (b)

Figure 7. Histogram Equalization (a) Unequaled Image (b) Equalized Image.

Image Filtering

Image filtering transforms pixel intensity values to reveal certain image characteristics. It enhances the image quality by improving the contrast and smoothing to remove noise.

- **Gaussian Filtering-** Gaussian filter is a smoothing filter that is used for blurring and for noise reduction. Gaussian noise contains variations in intensity that are drawn from a Gaussian or normal distribution and is a very good model for many kinds of sensor noise, due to camera electronics. Blurring is used in pre-processing tasks, such as removal of small details from an image prior to object extraction and bridging of small gaps in line or curves. Noise reduction can be accomplished by blurring with Gaussian filter.

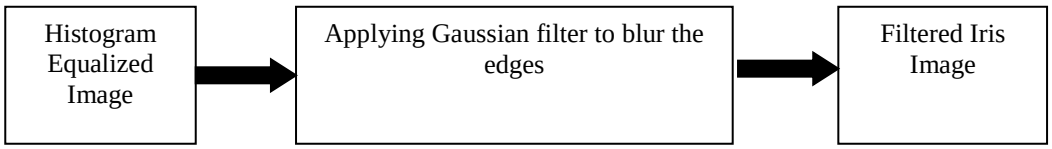


Figure 8: Block diagram for Gaussian filter.

Segmentation

Segmentation is the process of partitioning a digital image into multiple segments. The goal of segmentation is to simplify and/or change the representation of an image into something that is more meaningful and easier to analyze.

1. **Segmentation by Edge Detection-** Edges are local changes in the image intensity. In typical images, edges are characterized as object boundaries and are therefore useful for segmentation, registration and identification of object in the scene.

2. **Canny Edge Detection-** Canny is an edge detection algorithm that uses a multi-stage technique to detect a wide range of edges in images. Canny edge detection Algorithm is one of the best because of Good Detection, Good Localization, Minimal Response.

IRIS Segmentation

During image acquisition an iris image has pupil and retina as unnecessary parts in the image. If not segmentation properly, then the feature extraction process takes into account the properties of these parts also. This reduces the overall recognition efficiency. The proposed work emphasizes on fast processing of the data.

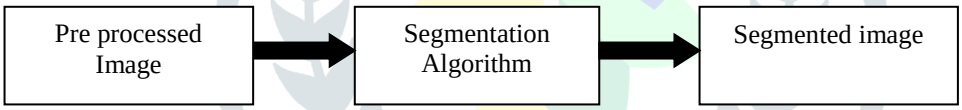


Figure 9: Iris Segmentation

IRIS Feature Extraction

After the Filtering and Segmenting the image, now it is fully transparent to extract the feature. Feature are nothing but the most discriminating information present in an iris pattern which has to be extracted. This information will be easily encrypted and stored in the database while training the system.

Different types of transforms for feature extraction are:

1. FT (Fourier Transform)
2. DCT (Discrete Cosine Transform)
3. DWT (Discrete Wavelet Transform)

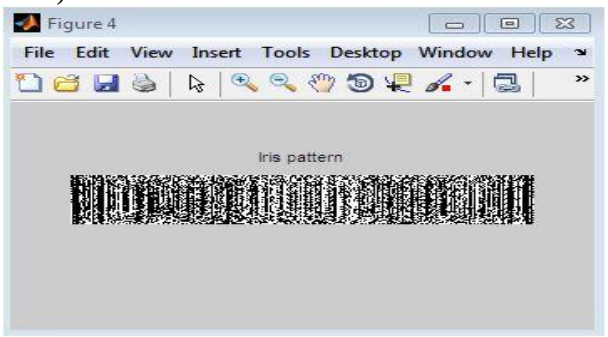


Figure 10: Final IRIS Pattern.

Feature Matching

Until this all step are performed in both the training and testing the system, but this step will be only performed in the testing side. In testing the new feature will be compared with the pre stored database feature and decision will be taken.

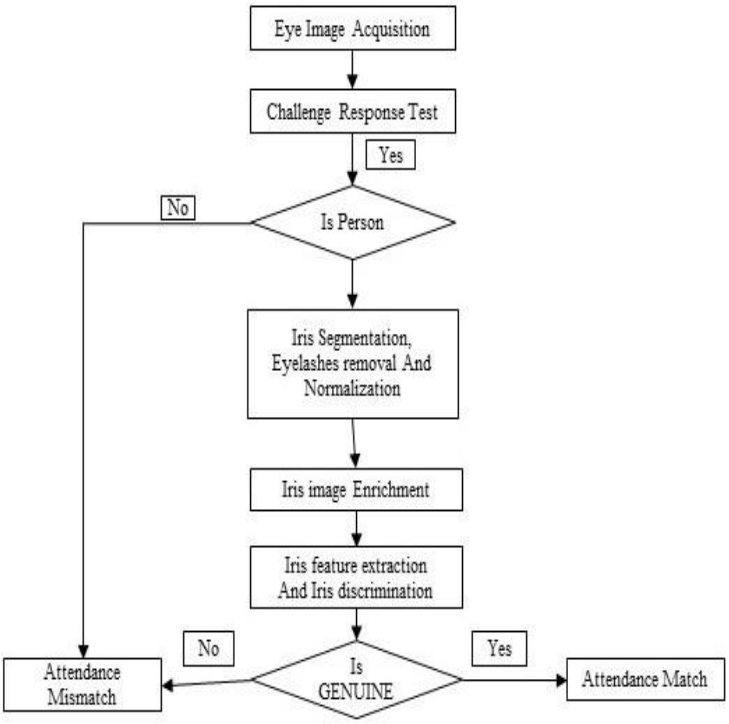


Figure 11. Data flow diagram.

RESULTS AND DISCUSSION

A data base for several for 15 different iris scans was prepared, the training was done on the dataset to identify the individual identity of the users. The MATLAB application is started, any input iris is selected as input. It should identify the person to which this iris scan belongs and mark his attendance similarly this should happen for all the other scans. Below is the database for 5 candidates

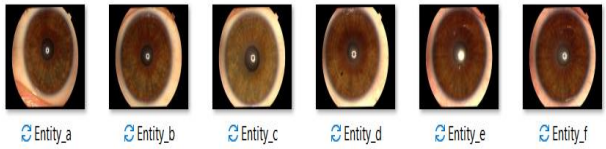


Figure 11. IRIS Captured by camera.

Below shows the application for Iris Attendance management system,

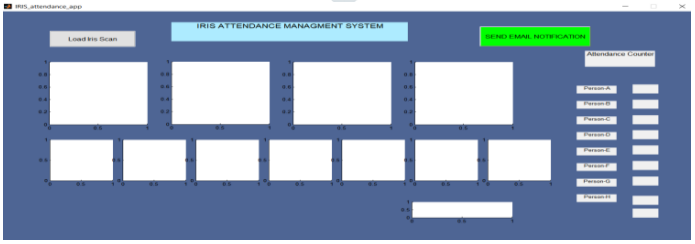


Figure 12. Blank Application From MATLAB.

After an input image is selected it performs various image processing algorithms for authentications and recognition for that particular identity and marks his attendance as 1, which indicates present.

Below is the snap shot for the obtained results.

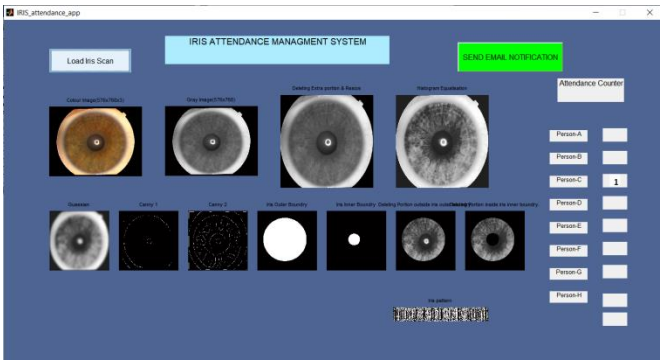


Figure 13. Final output of application.

There is also an Email notification option included which can be selected by the authority to send Gmail to a particular recipient.

Conclusion

Just imagine the spectrum of all the security services and technologies available either it be software or hardware .For an instance it would include any of the hardware security technology such as firewall, router, Proximity devices, FOBs, Network intrusion devices, etc. Software security services include patches, upgrades, antimalware mechanism, etc.

All these security technologies are not questioned regarding it's impacts or effects on the end users during deployment and installation(except there is a functionality problem).Everybody assumes that these software will work fine and prevent occurrence of cyber attacks. But when it comes to biometric systems, they are always questioned from the standpoint of it's impact on the end user.

For all the questions like why it is happening? why everyone is concerned about their iris or fingerprint being scanned? The main reason behind this is people are worried that a piece of their physiological information is being used. Common man is not able to understand how biometric device process the information.

An average citizen is failing to understand the processing that is happening inside the device. In other geographical areas these biometric devices are widely being used.

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