

# ATM Security based on Iris Recognition using MATLAB and Arduino

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**Abstract:** Biometric deals with Identification of individuals based on their biological or behavioral characteristics. Iris recognition system is regarded as the most reliable and accurate biometric identification system available. Traditional personal authentication methods have many instinctive defects. Biometrics is an effective technology to overcome these defects. Among the available biometric approaches, iris recognition is one of the most accurate techniques. In this project work, an approach for Iris recognition system has been proposed. Simple morphological operations and two dimensional median filtering techniques are used to detect the pupil. The noises such as eyelashes, reflections are removed through the linear thresholding. The 1D log Gabor wavelet transformation is applied for feature extraction from segmented iris image. The Humming Distance has been adopted as the metric of dissimilarity between input iris template and enrolled iris templates. From the experimental results, it is observed that the proposed approach is more efficient compare to existing methods viz. Masek's method for the considered dataset. It is also observed that proposed approach takes reasonable amount of time to perform iris segmentation and recognition accuracy is alsoreasonable.

## I. INTRODUCTION

Security is becoming increasingly important in the information based society. Personal authentication is one of the most important ways to enhance the security. However, the traditional personal authentication methods, including token-based ones (such as keys and cards, etc.), suffer from some instinctive defects: the token can be stolen or lost and the knowledge can be cracked or forgotten. Biometrics, which automatically uses the physiological or behavioral characteristic of people to recognize their identities, is one of the effective techniques to overcome these problems. Biometrics is a field of automatic person identification based on physiological and behavioral characteristics of individuals. A behavioral characteristic is more a reflection of an individual's physiological makeup like gait, signature, speech patterns etc. whereas a physiological characteristic is relatively stable physical characteristic like face, fingerprints, irises, signatures, voices, etc. One of main advantages of using biometric systems is the fact that users no longer have to remember passwords or PIN numbers [Nabti M.etal,2008]. The main focus of this project is to develop biometrics iris recognition system. Iris recognition systems identify people by analyzing patterns of their irises, which are claimed to be unique for every individual and stable over long periods of time. The general structure of irises is determined genetically while small details depend on external factors, such as initial conditions of the embryo development. Thus, it is highly unlikely for two irises to be formed in the identical way. They are unique to people and stable with age. The difference even exists between identical twins and also between the left and the right eye of the same person.

A typical iris recognition process consists of four stages viz. Image Acquisition, segmentation, feature Extraction and Matching. For image acquisition, infrared (IR) iris cameras are employed to obtain high – resolution eye images. The quality is verified with the help of image processing algorithms. If the quality is unacceptable, the image is rejected and the acquisition is repeated. The accepted images are then processed and encoded in order to build iris templates containing identifying information. Finally, templates are matched to calculate differences between them.

Based on the degree of differences, the person is either accepted or rejected [Daugman J.G,1993].

**Biometric System:** The term biometrics derived from two Greek words bio means “*life*” and metric means “*to measure*”. It refers to the automatic individual's identification based on their physical or behavioral characteristics [Nabti M.etal,2008]. The physiological characteristics of a person such as face pattern, iris pattern, fingerprint, palm print, hand geometry present unique information to distinguish among them and can be used in authentication applications [Alice I,2003]. The biometric recognition system involves two phase viz. Enrollment phase and Identification or Verification phase. During enrollment phase feature vector is stored in a database after being extracted from individual object. In identification or verification phase, user provides a sample vector to the system where it is compare to stored vector and depending on pre- determined threshold value a decision is made [Ramkumar R.P,2012].

Fig. 1 demonstrates the stages of biometric system.

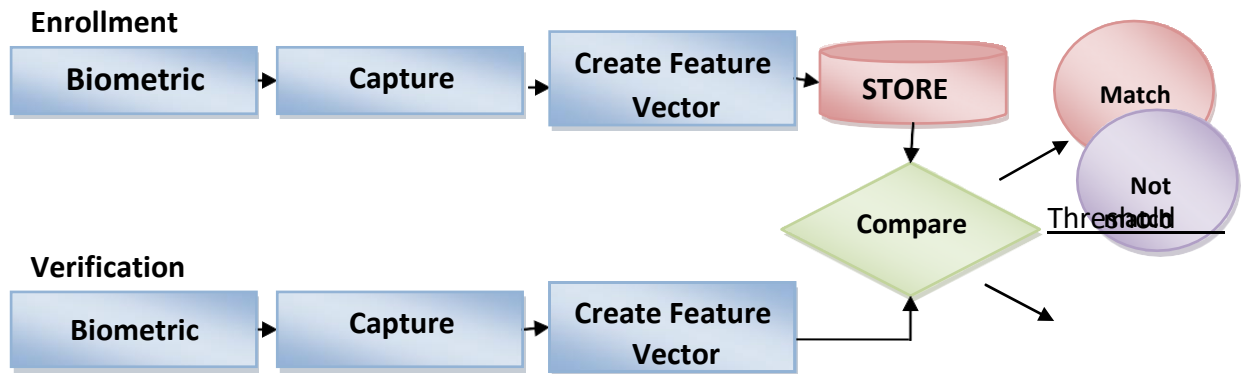


Fig: Stages in Recognition system

## 1. USING THE SOURCES

### ARDUINO:

**Arduino** is a computer hardware and software company, project, and user community that designs manufactures microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical world. Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (*shields*) and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs from personal computers. The microcontrollers are typically programmed using a dialect of features from the programming languages C and C++.

### LCD DISPLAY:

LCD (liquid crystal display) is the technology used for displays in notebook and other smaller computers. Like light-emitting diode (**LED**) and gas-plasma technologies, LCDs allow displays to be much thinner than cathode ray tube (**CRT**) technology. LCDs consume much less power than LED and gas-display displays because they work on the principle of blocking light rather than emitting it. An LCD is made with either a passive matrix or an active matrix display grid. The active matrix LCD is also known as a thin film transistor (**TFT**) display. The passive matrix LCD has a grid of conductors with pixels located at each intersection in the grid. A current is sent across two conductors on the grid to control the light for any **pixel**. An active matrix has a **transistor** located at each pixel intersection, requiring less current to control the luminance of a pixel. For this reason, the current in an active matrix display can be switched on and off more frequently; improving the screen refresh time (your mouse will appear to move more smoothly across the screen, for example).

### 2. SoftwareTools:

#### Matlab 7.12.0(R2011 a) :

MATLAB is a commercial software package written by The Math Works, Inc. Quoting from their web page: "Numeric computation, technical graphics and visualization, and an intuitive programming language for applications in engineering and science."

MATLAB is a complete environment for high-level programming, as well as interactive data analysis. MATLAB excels at numerical computations, especially when dealing with vectors or matrices of data. Symbolic math is available through an add-on toolbox that uses a Maple kernel. There are many add-on toolboxes that extend MATLAB to specific areas of functionality, such as statistics, finance, signal processing, image processing, bioinformatics, etc. In the present work the version of the software tool used is Matlab 7.12.0(R2011 a).

### 3. EXISTING SYSTEM:

#### Face Recognition System:

A Face Recognition system is an automatic identification or verification of a person from digital image or a video frame. The purpose of face recognition is mainly to identify a person, as a key to security (Biometric face recognition technology) and a wide variety of applications like law enforcement. As compared with the other biometric systems like finger print, palm print and iris, the face recognition has distinct advantage, because of its non-contact process. Face image can be captured from a distance without touching the person being identified, and the identification does not require interaction with the person. In addition, face recognition serves the crime deterrent purpose because facial images that have been recorded and archived can later be used to identify a person [N S Devi, K. Hemachandran, 2013].

**II. Advantage:**

- Nonintrusive
- Prevent card counters etc. from entering casinos.
- Prevents voter fraud.
- Targets shoppers.

**III. Disadvantage:**

- 2D recognition is affected by changes in lighting, the person's hair, and if the person wear glasses.
- Requires camera equipment for user identification; thus, it is not likely to become popular until most PCs include cameras as standard equipment.
- It is not always accurate.
- It is hindered by glasses, masks, long hair etc.
- It can easily be abused.

**Finger Print Recognition System:**

Fingerprint recognition or fingerprint authentication refers to the automated method of verifying a match between two human fingerprints. Fingerprints are one of many forms of biometric used to identify individuals and verify their identity. Fingerprint recognition is one of the best known and most widely used biometric technologies. Fingerprint recognition technology extracts features from impressions made by the distinct ridges on the fingertips. The fingerprints can be either flat or rolled. A flat print captures only an impression of the control area between the fingertip and the first knuckle; a rolled print captures ridges on both sides of the finger. An image of the fingerprint is captured by a scanner, enhanced, and converted into a template. Scanner technologies can be optical, silicon, or ultrasound technologies. Fingerprint technology acquires the fingerprint, but doesn't store the full image. It stores particular data about the fingerprint in a much smaller template, requiring from 250- 1000 bytes. It is an extremely useful biometrics technology since fingerprints have long been recognized as a primary and accurate identification method [A.K.Jain,etal,2010].

**PROPOSED SYSTEM:**

Iris recognition is an automated method of biometric identification that uses unique iris pattern of an individual. Iris is an internal organ of our body visible from outside whose patterns are complex random patterns which are most unique and stable. Among all the biometric technologies used for human authentication today, it is generally conceded that iris recognition is the most accurate [Daugman J.G,1993]. Out of various biometric techniques such as face recognition, fingerprint recognition, gait, hand and finger geometry, ear, iris recognition have been accepted as best and most accurate biometric techniques because of the stability, uniqueness, and non-invasiveness of the iris pattern. The iris region, the part between the pupil and the white sclera provides many minute visible characteristics such as freckles, coronas, stripes, furrows, crypts which are unique for each individual. Even two eyes of same person have different characteristics. Furthermore, the chance of obtaining two people with same characteristics is almost zero that makes the system efficient and reliable when security is concerned [Jain A.K,2004].

Coupling this high confidence authentication with factors like outlier group size, speed, usage/human factors, platform versatility and flexibility for use in identification or verification modes- as well as addressing issues like database size/management and privacy concerns- iris recognition has shown itself to be exceedingly versatile and suited for large population applications.

**Advantage:**

- Verification time is generally less than 5seconds.
- The eye from a dead person would deteriorate too fast to be useful, so no extra precautions have to be taken with retinal scans to be sure the user is a living human being.
- As iris is an externally visible internal organ of our body, it cannot be easily abused.

#### IV. RESULT:

The experiments were implemented in MATLAB 7.12.0 and executed on Intel Pentium N3540 2.16 GHz with 4 GB RAM. To evaluate the performance of the proposed approach IIT Delhi iris database is used [Raffei A. F. *et al.*,2013]. This iris image database mainly consists of the iris images collected from the students and staff at IIT Delhi, India. The database of 2240 images is acquired from 224 different users and made available freely to the researchers. Total 200 images of left eye of 20 persons are taken randomly for the experimentation. 70% of images are used for training and 30% of images are used for testing respectively. For recognition purpose, the Hamming Distance is adopted as the metric of dissimilarity between input iris template and enrolled iris templates. The performance of iris recognition is estimated with recognition accuracy. From the experimental results, the average recognition accuracy is obtained as 97.5%. The Masek's method [Masek, 2003] achieves the recognition accuracy of 97%.

#### V. CONCLUSION:

In this project work, an approach for Iris recognition system has been proposed. Simple morphological operations and two dimensional median filtering techniques are used to detect the pupil. The noises such as eyelashes, reflections are removed through the linear thresholding. The 1D log Gabor wavelet transformation is applied for feature extraction from segmented iris image. The Hamming Distance is adopted as the metric of dissimilarity between input iris template and enrolled iris templates. From the experimental results, it is observed that the proposed approach is more efficient compare to existing methods viz. Masek's method for the considered dataset.

It is also observed that proposed approach takes reasonable amount of time to perform iris segmentation and recognition accuracy is also reasonable. The future work would be to test the influence on accuracy of the proposed approach over a large dataset and also to develop more robust iris recognition system suitable for real life applications.

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