IMPLEMENTATION OF LOCKER SYSTEM USING MULTILEVEL AUTHENTICATION

Tripti Singh[1], Sonal Khadye[2], Bhavika Jain[3], Trupti Vishwasrao[4], Savita Chavan[5]

[1] *Student, Computer, Padmabhushan Vasantdada Patil Pratishthan's College of Engineering, Maharashtra, India*
[2] *Student, Computer, Padmabhushan Vasantdada Patil Pratishthan's College of Engineering, Maharashtra, India*
[3] *Student, Computer, Padmabhushan Vasantdada Patil Pratishthan's College of Engineering, Maharashtra, India*
[4] *Student, Computer, Padmabhushan Vasantdada Patil Pratishthan's College of Engineering, Maharashtra, India*
[5] *Assistant Professor, Computer, Padmabhushan Vasantdada Patil Pratishthan's College of Engineering, Maharashtra, India*

ABSTRACT

This project is aimed at developing an accurate biometric secured locker system using eye veins recognition as a biometric feature and NFC and OTP as other authorization means. Eye veins identification serves the purpose of verification. In identification, the identity of the user is not known in advance, but shall be determined based on sample image of user's eye vein and a set of known identities. The identification system processes the eye vein of the user with the set. Depending upon the comparison value, above a certain threshold, the user is successfully identified to be authorized person. NFC and OTP serves as other levels for authentication increasing the security. NFC is an updation of RFID.

Keyword : - *NFC[1], Eye-Vein[2], OTP[3], Biometric[4], RFID[5]*

1. INTRODUCTION

In today's real time modern industrialized world security systems place a vital role. This bank security system is mainly designed to meet the requisite of the security of valuables things (jewels) which are hard earned. unlike the present system involving the physicals locks which can be easily forged this has the main feature of biometrics together with digital (electronic) code locks which will open the door automatically whenever the series of authentication is verified and gives alert sounds when any mismatch occurs.

In this system, micro controller continuously monitors the sensors of the biometric system (Iris Scanner and Vein Detector), the keypad for the authenticated Codes (Unique Password and Registered Identification Number) and the output of wireless motion detector.

 Biometrics has been used for identification or recognition purposes. The physical, behavioral, biological traits of an individual can verify a person's identity. Physical traits include face, fingerprint, iris, and sclera. Behavioral traits are like gait, voice and biological include DNA. Each of these has its own advantages and disadvantages. Some traits could change over a period of time, cannot be used for recognition from a distance or can cause hygiene issues.

A biometric may be more applicable in a particular scenario than the rest. No biometric is perfect or can be applied universally.

Biometric systems compared with traditional authentication schemes are more reliable and it is difficult to copy, share or distribute the biometric feature. The biometric characteristics have the following requirements due to which they can be used in authentication schemes.

Biometric scanning of eye vein which is a new and unique way of authentication. The veins in the sclera — the white part of the eyes — can be imaged when a person glances to either side, providing four regions of patterns: one on each side of each eye. Verification employs digital templates from these patterns, and the templates are then encoded with mathematical and statistical algorithms. These allow confirmation of the identity of the proper user and the rejection of anyone else. Advocates of eye vein verification note that one of the technology's strengths is the stability of the pattern of eye blood vessels; the patterns do not change with age, alcohol consumption, allergies, or redness. Eye veins are clear enough that they can be reliably imaged by the cameras on most smart phones. The technology works through contacts and glasses, though not through sunglasses. At least one version of eye vein detection uses infrared illumination as part of the imaging, allowing imaging even in low-light conditions. The NFC technology implementation directed for fast transaction such as supermarket payment or transportation payment. Here we are using this fast authentication device for a locker. The NFC can be used for authentication due to its uniqueness. Near Field Communication is a wireless close-range connectivity technology which allows data trade between two gadgets. NFC commonly integrated within mobile devices. This will allow the device to establish communication with sim card or other reader devices. NFC works using 13.56 MHz radio frequency. This technology optimizely works under the space of 20 cm.

2. DESIGN
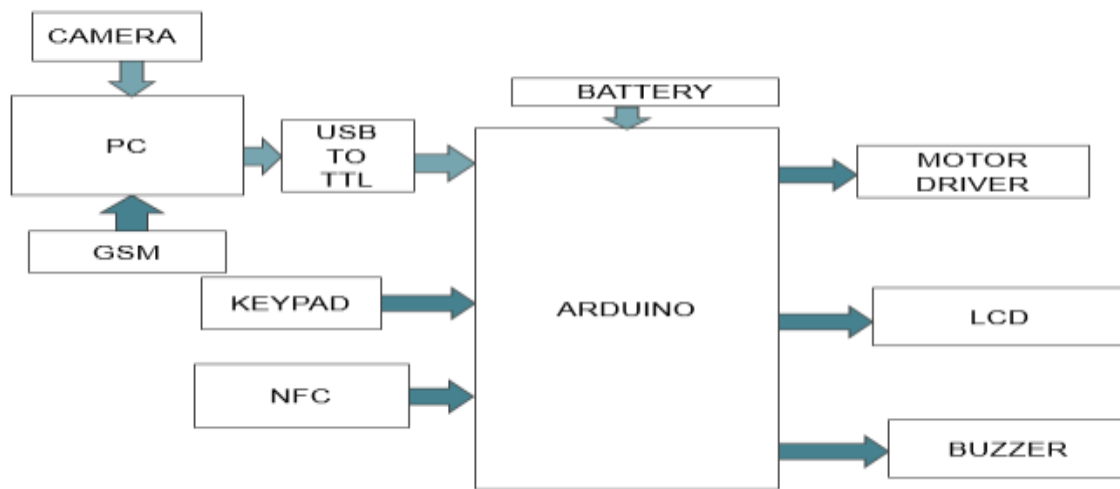
- Fig 1: structural design of the system

- **Webcam:** It is used to capture image of the eye's vein pattern. Camera is a normal camera which is connected to PC/laptop. Captured image is sent to PC.
- **PC/Laptop:** Here PC is used for authentication purpose.
- **ARDUINO mega :** Arduino is an open-source physical computing platform based on a simple i/o board and a development environment that implements the Processing/Wiring language. Arduino can be used to develop stand-alone interactive objects or can be connected to software on your computer (e.g. Flash, Processing, MaxMSP). The open-source IDE can be downloaded for free (currently for Mac OS X, Windows, and Linux).
  The Arduino Mega is a microcontroller board based on the ATmega2560. It has 54 digital input/output pins (of which 14 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

- **L293D (motor driver):** It is a quadruple half-H-bridge Motor driver. It is designed to provide 600mA current at voltages from 4.5V up to 36V. It is possible to drive 2 DC-Motors in both directions with it, using only 2 pins per motor. Motor driver drives the motor to open the lock of locker. As the all stages of authentication is done.
- **LCD:** As each authentication stages are carried out, input through keypad is displayed on LCD. Here LCD we are using is 16X2 LCD. This will display all the steps to be followed for authentication. If wrong password entered, then error message will be displayed.

- **NFC: Near Field Communication (NFC)** is a radio technology enabling bi-directional short range wireless communication between devices to make life easier and more convenient for worldwide consumers by simplifying transactions, digital content exchange, and electronic device connection with a touch. This technology is adopted in smart phones and has a large infrastructure with hundreds of millions devices already in place.

- **USB TO TTL**: Used for communication between arduino and computer.
- **Buzzer**: Buzzer is used for warning purpose , indication or alarm.

- **Keypad** : it is a human interface component for microcontroller projects.

3. WORKING:

The main focus of the system is to introduce different authentication levels to the system and allow only authenticated users to gain access to the system. The system at different levels authenticate the user and checks him, only if he clears all levels will he be allowed to gain access to the system. Let us see the step by step working of the system.

Flow of working:

- Create a folders with of database folder.
  Here the eye vein patterns of the authenticated user will be stored.
- Fetch the path of the pre-defined folders into MATLAB code.
  So that when comparison procedure is on it can call the stored vein patterns for matching purposes.
- LCD is used to display message. LCD asks user to "enter the password".
- Then user will enter the password using 4x4 keypad. If password is proper then arduino will send instruction to PC. Password notification we can see on LCD in star (*) format.
- if password is proper then LCD will display "show NFC". NFC Will be tapped using an android app from a NFC enabled mobile or an tag.

Fig 2: android application for NFC authentication

- If nfc is matched with database then LCD will display "show eye vein".
- MATLAB code will compare the user's eye vein with database.

The process of eye vein comparison:
- Capturing the eye.
- Converting the colorful image to grayscale image.
- Noise removal and conversion of the image to Black & White.
- Hole filling, and feature extraction from edge to edge.
- Correlation of the detected features along with dataset.
- All noise removal based upon the different.
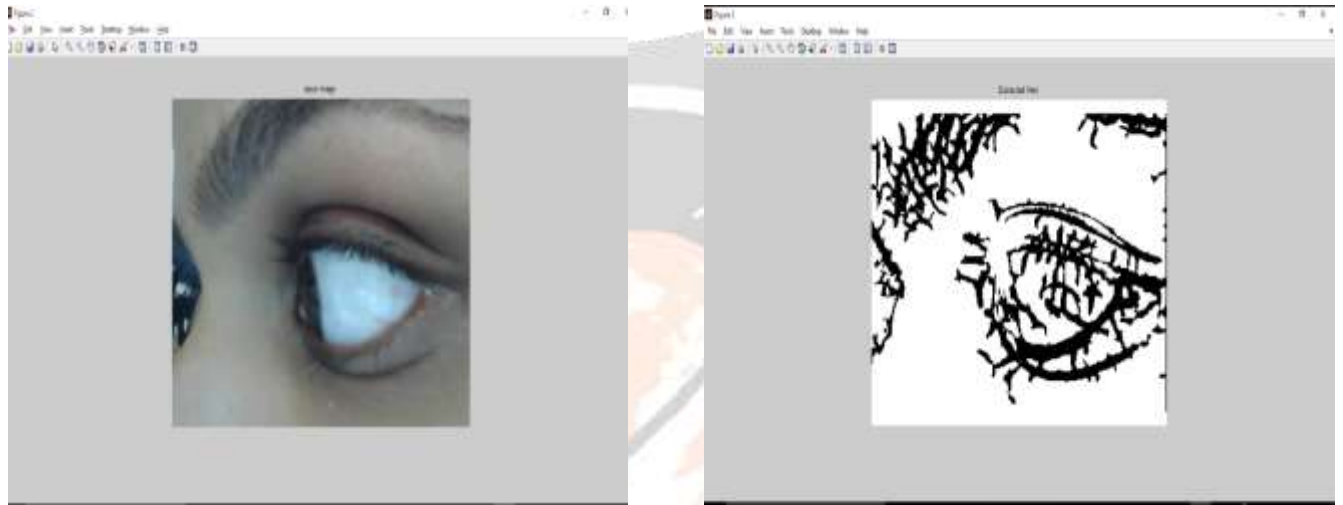- Vein detection and final result showcase.

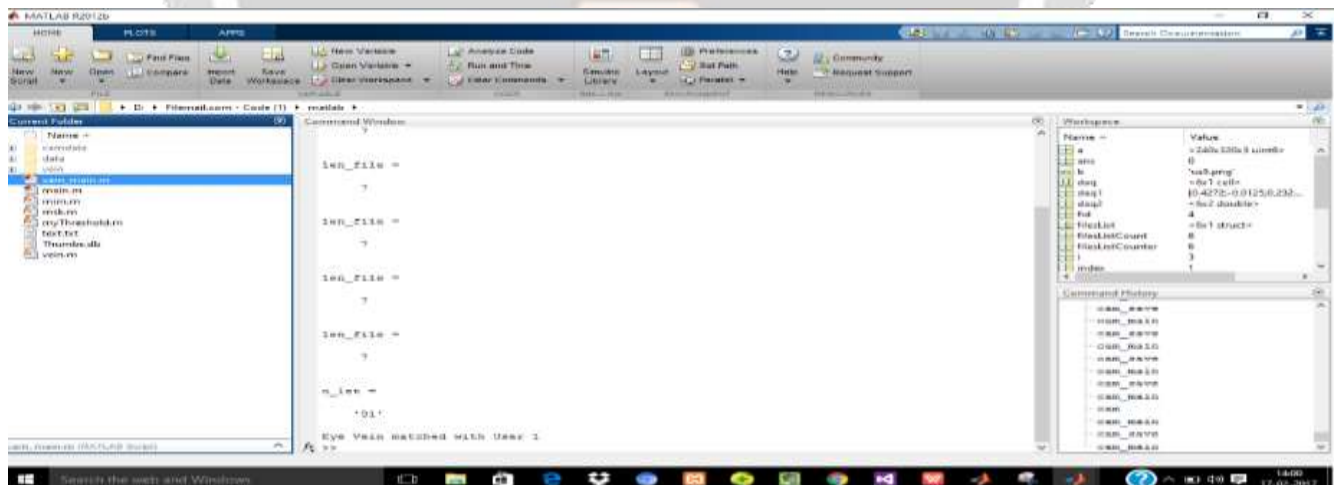Fig 3: capturing and extraction of eye vein patterns in matlab.

Fig 4: result of eye vein matching in matlab

- We will mention mobile number facility in MATLAB code.
- PC will fetch that number and send OTP number to that pre-defined number.
- User will enter OTP number using keypad and that will display on LCD.

Fig 5 : OTP generated and sent to authenticated user through registered number.

- If it is matched, locker will get open.
- If any of the authentications turns wrong and input does not match then buzzer will be turned on.

4. CONCLUSION:

The system has been developed and tested using different vein patterns. The biometric locker system combining the advantages of several authentication levels and biometric result in producing higher recognition accuracy. The proposed system uses eye vein. This can be used for identification purposes, using eye vein is really advantageous as it ignores the redness of the eye and also do not change with time and thus are resistant to false matches. Also NFC, the new evolution of technology and OTP increase the security to a higher level.

The future enhancements to this system can be made by using algorithms that will reduce the computational time. If the task to be completed by the algorithm can be run in less time,The overall computational time can be reduced. Thus the system can be used at bank providing higher security and assurance to the locker users.

5. REFERENCES:

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