

# The New Embedded ATM Security based on Machine Vision using MATLAB

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**Abstract:** A facial recognition system is a computer application for automatically identifying or verifying a person from a digital image or a video frame from a video source. Proposed paper uses face recognition technique for verification in ATM system. For face recognition, there are two types of comparisons. The first is verification, this is where the system compares the given individual with who that individual says they are and gives a yes or no decision. The next one is identification this is where the system compares the given individual to all the other individuals in the database and gives a ranked list of matches. Face recognition technology analyzes the unique shape, pattern and positioning of the facial features. Face recognition starts with a picture, attempting to find a person in the image using mat lab software. The output of MATLAB result is given to the microcontroller, its checks user face and password. If both are matched with data based, then only user can continue their transaction.

**Keywords:** Facial recognition, ATM Security, MATLAB.

## 1. INTRODUCTION

A facial recognition system [1,2] is a computer application for automatically identifying or verifying a person from a digital image. Proposed paper uses face recognition technique for verification in ATM system. For face recognition, there are two types of comparisons. The first is verification, this is where the system compares the given individual with who that individual says they are and gives a yes or no decision. The next one is identification this is where the system compares the given individual to all the other individuals in the database and gives a ranked list of matches.

Face recognition technology analyzes the unique shape, pattern and positioning of the facial features. Face recognition starts with a picture, attempting to find a person in the image using MATLAB software. The output of MATLAB result is given to the microcontroller, its checks user face and checks the password which is typed from the keypad. If both are matched with data based, then only user can continue their transaction that is then only the motor get start to push the money from the ATM machine, and the LCD display is used to view the status of the password.

The main aim of Face Recognition Based ATM Security System project is develop a security lock system based on face recognition. In this project we are using microcontroller for opening and closing lock based on face recognition which is stored in microcontroller itself so that only authorized person will access the security lock.

Face Recognition [3, 4] comparison is one of the tough task; mainly comparing template on stored in ATM card will be most difficult part in face recognition. Its expert must be well trained and expert to perfectly analyze faces. This is ON-time verification through mobile technology. If the person will enter to the ATM, the card will be scratched and verify the face of currently accessed person. The face template will be stored for avoiding large data storage in the server and this method is very easy and very

effective. If the another person will try to use the ATM card, the face will be send through mobile owner and then the owner can decide the card further use or can block before enter the ATM center. One more thing, by this method we can easily identify the's tries to access the ATM.

By entering the pin number motor driver gets operated to deliver the amount. If there any deviation occurs during the whole process buzzer gets started to ensure the security. Face recognition has a large number of applications, including security, person verification, Internet communication, and computer entertainment.

Although research in automatic face recognition has been conducted since the 1960s, this problem is still largely unsolved. Recent years have seen significant progress in this area owing to advances in face modeling and analysis techniques. Systems have been developed for face detection and tracking, but reliable face recognition still offers a great challenge to computer vision and pattern recognition researchers. There are several reasons for recent increased interest in face recognition, including rising public concern for security, the need for identity verification in the digital world, and the need for face analysis and modeling techniques in multimedia data management and computer entertainment.

## 2. BACKGROUND

### 2.1 ATM security using pin number

ATM provides the fastest way of withdrawing the amount from the user's account. Here the security is given by means of pin number. Once the user enters into the ATM and strike his card the pin number of the particular ATM card will be asked. Then the user should enter his pin number and if it is correct then the remaining process will be carried out according to his requirement. The main drawback in the ATM security using pin number is, by getting the pin number of the particular ATM card

anybody can access it. Because the verification is only pin number.

### 2.2 ATM security using finger print

Here the security access is based on finger print and pin number. First the finger print of the user is verified then the user should enter his pin number and if it is correct then the remaining process will be carried out according to his requirement. Face Recognition [5,6] comparison is one of the tough task; mainly comparing template on stored in ATM card will be most difficult part in face recognition.

Fingerprint Recognition can be done by two methods which are defined as:

#### 2.2.1 Fingerprint verification:

It verifies an individual and known as one-to-one (1:1) relationship.

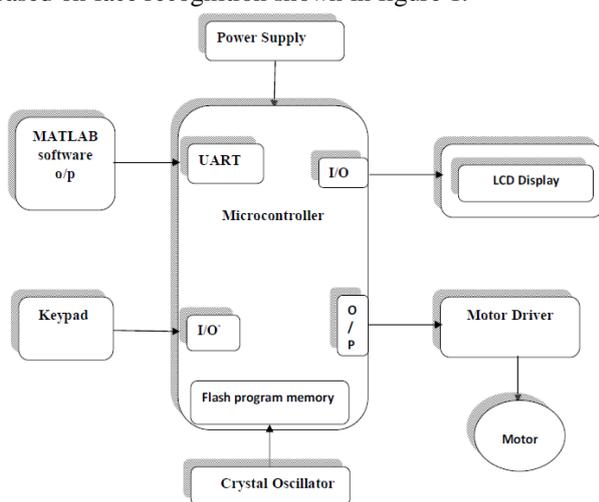
#### 2.2.2 Fingerprint identification:

It identifies an individual and known as one-to-many (1: N) relationship.

The verification is much easier and faster because we have the two fingerprints and we just need to compare them. On the other hand, the identification implies more time for extracting the fingerprint because there are needed much more details. Each individual has unique and different fingerprints. Fingerprint [7,8] classification involving 6 classes with critical points in a fingerprint called core and delta marked as circles and triangles. Fingerprint matching is the process which describes matching percentage/score between two fingerprint images.

### 3. PROPOSED DESIGN

The below block diagram explains the ATM security based on face recognition shown in figure 1.



**Figure 1 Block diagram of face recognition**

In figure 1, the block diagram of face recognition shows the operation that has MATLAB software output block which couples the output of PC to the microcontroller using RS232 cable. It converts serial bits into parallel bits. The keypad interfaced with microcontroller is used for entering the pin number for pin number verification process. Motor driver is used to drive the motor which is operated to take the given amount.

Microcontrollers with Harvard architecture are called “RISC microcontrollers”.

Since PIC16F877 is RISC microcontroller, because it has reduced set of instructions, more precisely 35 instructions. These instructions are executed in one cycle except for jump and branch instructions. Harvard architecture is a newer concept than Von-Neumann's. It rose out of the need to speed up the work of a microcontroller. In Harvard architecture, data bus and address bus are separate. Thus a greater flow of data is possible through the central processing unit, and of course, a greater speed of work. Separating a program from data memory makes it further possible for instructions not to have to be 8-bit words and there are so many length of bits arranged with different types of techniques.

Some pins of I/O ports are multiplexed with an alternate function for the peripheral features on the device. In general, when a peripheral is enabled, that pin may not be used as a general purpose I/O pin. UART stands for Universal Asynchronous Receiver Transmitter. It is a computer hardware which converts serial data bits into parallel data bits. It is used in conjunction with EIA, RS-232, RS-422; RS-485. In UARTs the data format and transmission speeds are configurable. A crystal oscillator is an electronic circuit that uses the mechanical resonance of a vibrating crystal of piezoelectric material to create an electrical signal with very precise frequency.

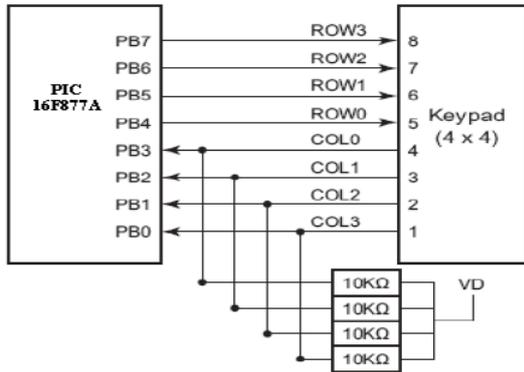
Flash memories usually require less complex programming algorithms and they are now divided into several sectors. The benefit of having sectors is that the Flash memory is sector-erasable, meaning we can erase one sector at a time. In the past, erase commands erased the entire memory chip therefore to keep a working copy of that data during run-time, an application required additional memory. Since Flash memory is integrated on-chip with microcontrollers, its usage became even easier. Having Flash memory and a microcontroller on the same chip opened up the opportunity to take advantage of the "additional intelligence". Microcontrollers have additional ROM area containing code for handling the Flash programming.

The 4 x4 matrix keypad is a general-purpose keypad. It consists of 16 switches arranged in 4 rows and 4 columns. It can connect to the MCU 8-bit port directly. There are many methods depending on how you connect your keypad with your controller, but the basic logic is same.

In this application, all keys are used as data keys. The keypad is connected to Port B. Port B is connected to the keypad, and scans the keys continuously. The columns of the keypad are pulled up with 10KΩ resistance to set them normally High. Key-pad and Port B connection detail is illustrated in Figure 2. In this application, all keys are used as data keys. The keypad is connected to Port B which scans the keys continuously. The columns of the keypad are pulled up with 10 KΩ resistance to set them normally High and shown in figure 2.

In an electric motor, operation is based on simple electromagnetism. A current carrying conductor generates a magnetic field; when this is then placed in an external

magnetic field, it will experience a force proportional to the current in the conductor, and to the strength of the external magnetic field.



**Figure 2 4 x 4 Matrix Keypad interfacing**

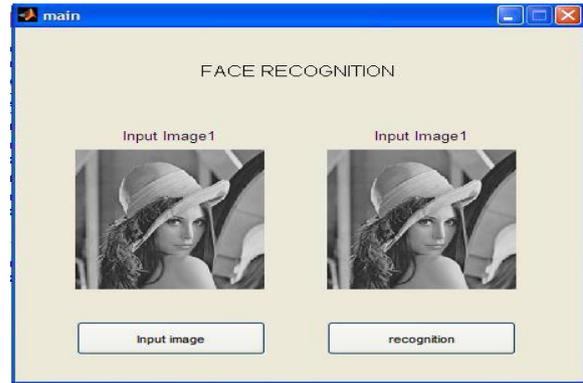
The internal configuration of a DC motor is designed to harness the magnetic interaction between a current-carrying conductor and an external magnetic field to generate rotational motion. DC motor has six basic parts, axle, rotor (a.k.a., armature), stator, commutator, field magnet(s), and brushes. The external magnetic field is produced by high-strength permanent magnets. The stator is the stationary part of the motor -- this includes the motor casing, as well as two or more permanent magnet pole pieces. The rotors (together with the axle and attached commutator) rotate with respect to the stator. The rotor consists of windings (generally on a core), the windings being electrically connected to the commutator.

The L293D is designed to provide bidirectional drive currents of up to 600-mA at voltages from 4.5 V to 36 V. devices are designed to drive inductive loads such as relays, solenoids, dc and bipolar stepping motors, as well as other high-current/high voltage loads in positive-supply applications.

#### 4. IMPLEMENTATION RESULTS

The output of MATLAB result is given to the microcontroller, it checks user face and checks the password which is typed from the keypad. If both are matched with data based, then only user can continue their transaction that is then only the motor get start to push the money from the ATM machine, and the LCD display is used to view the status of the password.

The simulation results of face recognition is shown in the below figure 3,



**Figure 3 simulation results of face recognition**

In Figure 3, if one or more of the images in a data set is taken through a filter that allows radiation that lies outside the human vision span to pass – i.e. it records radiation invisible to us - it is of course not possible to make a natural colour image. But it is still possible to make a colour image that shows important information about the object. This type of image is called a representative colour image.

Normally one would assign colours to these exposures in chromatic order with blue assigned to the shortest wavelength, and red to the longest. In this way it is possible to make colour images from electromagnetic radiation far from the human vision area, for example x-rays. Most often it is either infrared or ultraviolet radiation that is used. The ATM security based on machine vision using face recognition kit is shown in below Figure 4.



**Figure 4 ATM security using face recognition kit.**

In Figure 4, The MAX232 requires 5 external 1uF capacitors. These are used by the internal charge pump to create +10 volts and -10 volts. The MAX232 is an electronic circuit that converts signals from a serial port to signals suitable for usage in e.g. microprocessor circuits. The only thing that we need some sort of connector to connect to the serial port. The sample code below is written for Comm1 and most computers use a 9 pin DB9 male connector for Comm1 so a 9 pin female connector is included for this project. You may also want to buy a DB9 extension cable (Shown on order form as DB9 to DB9 cable) to make the connection easier. There should be 3 wires soldered to the DB9 connector pins 2, 3 and 5.

Connect the wire from pin 5 of the connector to ground on the breadboard. Connect the wire from pin 2 of the

connector to pin 14 of the MAX232. (The other wire is for receiving and is not used in this project.)

This GSM modem is a highly flexible plug and play quad band GSM modem for direct and as integration to rs232. GSM/GPRS-compatible Quad-band cell phone, which works on a frequency of 850/900/1800/1900MHz. The GSM900 device that integrates an analog interface, an A/D converter, an RTC, an SPI bus, an I<sup>2</sup>C, and a PWM module. The radio section is GSM phase 2/2+ compatible and is either class 4 (2 W) at 850/ 900 MHz or class 1 (1 W) at 1800/1900 MHz. The TTL serial interface is in charge not only of communicating all the data relative to the SMS already received and those that come in during TCP/IP sessions in GPRS.

GSM is a digital mobile telephone system that is widely used in Europe and other parts of the world. GSM uses a variation of Time Division Multiple Access (TDMA) and is the most widely used of the three digital wireless telephone technologies (TDMA, GSM, and CDMA). GSM digitizes and compresses data, then sends it down a channel with two other streams of user data, each in its own time slot. It operates at either the 900 MHz or 1,800 MHz frequency band.

## 5. CONCLUSION

The facial expression recognition system presented in this research work contributes a resilient face recognition model based on the mapping of behavioural characteristics with the physiological biometric characteristics. The physiological characteristics of the human face with relevance to various expressions such as happiness, sadness, fear, anger, surprise and disgust are associated with geometrical structures which restored as base matching template for the recognition system. The behavioural aspect of this system relates the attitude behind different expressions as property base. The property bases are alienated as exposed and hidden category in genetic algorithmic genes.

The facial expression based face recognition system is made efficient with genetic algorithm invariants of the facial surface resulting to a recognition rate of 95.4%. The illustration of this model is given in this research work to build expressional representations using the concept of hierarchy based embedding approach. The facial representation model is deployed in laptop for biometric authentication process. The impact of the embedding space choice on the metric (distortion) concludes that spaces with spherical geometry are more favorable for representation of facial surfaces.

## 6. FUTURE ENHANCEMENT

The use of spherical canonical images allows us to perform matching in the spherical harmonic transform domain, which does not require preliminary alignment of the images. The errors introduced by embedding into an expressional space with some predefined geometry are avoided. In this facial expression recognition setup, end-to-end processing comprises the face surface acquisition and reconstruction, smoothening, sub sampling to

approximately 2500 points. Facial surface cropping measurement of large positions of distances between all the points using a parallelized parametric version is utilized. The general experimental evaluation of the face expressional system guarantees better face recognition rates. Having examined techniques to cope with expression variation, in future it may be investigated in more depth about the face classification problem and optimal fusion of color and depth information. Further study can be laid down in the direction of allele of gene matching to the geometric factors of the facial expressions.

Advances of the smart application plays important role in AMS and it still suffers from little deviations like the image captured using CCTV are more expensive in installing around each and every classroom of the universities and connection to android also cost less more.

In case of security it does not supported for person who enters the classroom by mask the face.

- The future work can be done on server-client application which could hold more number of images in both sides. If the server system fails the same image database can be recovered from the client side.
- Any alternative algorithm can be used in face recognition to identify the variations of face still more clearly.
- An effective way of analyzing has to implement in identifying the people who enters the environment with masked face.
- In all government and private offices this system can be deployed for identification, verification and attendance.

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