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RBI 3X-Fingerprint Based ATM Machine

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Abstract: The main objective of this system is to develop a system that will increase the ATM security. However, despite the numerous advantages of ATM system, ATM fraud has recently become more widespread. In this paper, we provide an overview of the possible fraudulent activities that may be perpetrated against ATMs and investigates recommended approaches to prevent these types of frauds..Biometrics technology is rapidly progressing and offers attractive opportunities. In recent years, biometric authentication has grown in popularity as a means of personal identification in ATM authentication systems. An 8-bit ATmega16 microcontroller developed by Microchip Technology is used in the system. The necessary software is written in AVR studio programmer and the system is tested.

Keywords: ATmega16 microcontroller, Finger print recognition, Liquid Crystal Display, DC motor.

1 . INTRODUCTION

Nowadays security becomes a great issue in every part of life. Passing of information faces massive problems due to various types of attacks to the communication link. Many security algorithms are available to protect information from being hacked. The biometric authentication process adds a new dimension of security for any person sensitive to authentication. This paper presents a secured and an energy efficient ATM banking system that is highly secured systemcompared with the existing one. At present most of the ATM systems use triple data Encryption Standard (3DES). Which has some drawbacks; such as, it is vulnerable to differential attacks and also slow in performance.Issues in current ATM network: ATM Card frauds, use of ATM Card duplicators card sharing by family and friends ,inability to trace the wrongful users ,ATM PINs can be shared on phone or recorded using secret cameras.In this system 3 vital things are to be matched i.e. 6 digits unique code, finger print and 4 digit password.In this system, a 6 digit number will be given to every user.The second thing will be the users finger print which will be detected by finger print recognition sensor. The third thing which is to be matched is the 4 digit pin code.The 4 digit pin code is the same concept which we are using nowadays for withdrawing money from ATM.

Many research works have been done by different hardware realizations using ASIC and FPGA technology. Some references of this paper present the energy efficient FPGA realization of the AES algorithm. This paper also focuses on biometric authentication for the client by capturing figure print image which provides another dimension of security. Fingerprint based authentication is more secure, reliable and standard than the password based authentication. Finger-scan biometric is based on the distinctive characteristics of the human fingerprint. Our existing ATM system is password based whose limitation is that its identification is inclusive to card and password, as well as the insecurity of the communication link which has access to be hacked. The proposed ATM system is able to overcome this type of limitations because proposed ATM system is fingerprint based.

2. BACKGROUND HISTORY

ATM, the abbreviation of "Automated Teller Machine" allows the account holder to have transactions with their own accounts without the opportunity to access the entire bank's database. The idea of self-service in retail banking was developed through independent and simultaneous efforts in Japan, Sweden, the United Kingdom and the United States. In the USA, Luther George Simjian has been credited with developing and building the first cash dispenser machine. The first cash dispensing device was used in Tokyo in 1966.

FIG. 1.1 A CONVENTIONAL ATM SYSTEM

ATM first came into use in December 1972 in the UK. Fig. 1 shows a conventional ATM system. IBM 2984 was designed for request of Lloyds Bank. ATM is typically connected directly to their hosts or ATM Controller via either ADSL or dial-up modem over a telephone line or directly via a leased line. For transaction security, all communication traffic between ATM and transaction process is encrypted by cryptography. Nowadays most of ATM use a Microsoft OS primarily Windows XP Professional or Windows XP Embedded or Linux. required appliance. XBee transceivers are used to eliminate the need for large amount of wiring between the processor and the appliances.

2.1 ATM ATTACKS

There are a variety of ATM attacks because it is such an attractive target. There are three basic types of ATM attacks .

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A. Physical attack: Brute force attack to ATM machines with the intention of gaining access to cash within the safe.
B. ATM Fraud: Theft of bank card information.
C. Software and network attack: Theft of sensitive information or controlling ATM spew out bills automatically.

2.2 ATM AUTHENTICATION

To continue the ATM operation we authenticate the valid identity of a customer using three different parameters: a. What we have i.e. an ATM card b. What we know i.e. a PIN code or a Password c. What we are i.e. Biometrics it may be Fingerprint, Face, Iris etc. We usually authenticate the user with combination of what we have and what we know but a password can be easily guess or can be trapped and an atm card can be lost or borrowed. But with a dual combination of three way authentication which is a card, a password and with the addition of biometric technique we can protect our ATM transaction more safely.

2.3 WHY BIOMETRIC FINGERPRINT?

- Surety over the Cards and Keypads .
- Against to Cards Duplication, misplacement and improper disclosure of password.
- No excuses for RF/Magnetic Cards forgetness.
- No need to further invest on the Cards Cost
- Uniqueness.

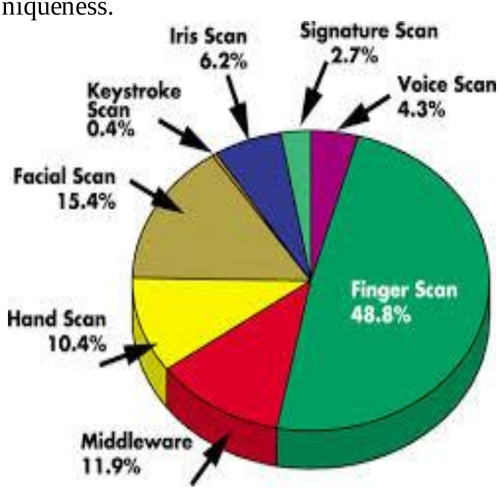

FIG2.2: Survey on fingerprint

3. LITERATURE REVIEW

Most finger-scan technologies are based on minutiae. Samir Nanavati states that 80 percent of finger-scan technologies are based on minutiae matching but that pattern matching is a leading alternative. This technology bases its feature extraction and template generation on a series of ridges, as opposed to discrete points. The use of multiple ridges reduces dependence on minutiae points, which tend to be affected by wear and tear . The downside of pattern matching is that it is more sensitive to the placement of the finger during verification and the created template is several times larger in byte size. Finger-scan technology is proven and capable of high levels of accuracy. There is a long history of fingerprint identification, classification and analysis. This along with the distinctive features of fingerprints has set the finger-scan apart from other biometric technologies. There are physiological characteristics more distinctive than the fingerprint (the iris and retina, for example) but automated identification technology capable of leveraging these characteristics have been developed only over the past few years.

3.1 BIOMETRIC TECHNOLOGY

Biometric refers to any and all of variety of identification technique which are based on some physical behavioural characteristics. Biometric ATM support only at ATM machine which is facilitates these types of services. The ATMs are network connected centralised computer system with controls ATMs.The use of fingerprints as a biometric is both the oldest mode of computer-aided, personal identification and the most prevalent in use today . In the world today, fingerprint is one of the essential variables used for enforcing security and maintaining a reliable identification of any individual. Fingerprints are used as variables of security during voting, examination, operation of bank accounts among others. They are also used for controlling access to highly secured places like offices, equipment rooms, control centers and so on . The result of the survey conducted by the International Biometric Group (IBG) in 2012 on comparative analysis of fingerprint with other biometrics is presented in Figure. 2. The result shows that a substantial margin exists between the uses of fingerprint for identification over other biometrics such as face, hand, iris, voice, signature and middleware .

4. METHODOLOGY

The design of ATM system based on fingerprint recognition took advantages of the stability and reliability of fingerprint characteristics, The security features were enhanced largely for the stability and reliability of owner recognition. The whole system was built on the technology of embedded system which makes the system more safe, reliable and easy to use.

Along with AADHAAR CARD authentication for more security. In our module we have taken (a) Fingerprint module,(b)motor,(c)motor driver,(d)ATMEGA 16 Microcontroller,(e)Lcd (f)keypad .LCD is used in a project to visualize the output of the application.LCD can also used in a project to check the output of different modules interfaced with the microcontroller. Thus lcd plays a vital role in a project to see the output and to debug the system module wise in case of system failure in order to rectify the problem.Keypad is basically used to provide the input to the microcontroller. ATMEGA 16 has 16 Kbytes of In-System Programmable Flash, Program memory with Read-While-Write capabilities, 512 bytes EEPROM, 1 Kbyte SRAM, 32 general purpose I/O lines, 32 general purpose working registers, a JTAG interface for Boundary scan, On-chip Debugging support and programming, three flexible Timer/Counters with compare modes.A fingerprint sensor is an electronic device used to capture a digital image of the fingerprint pattern. The captured image is called a live scan. This live scan is digitally processedto create a biometric template (acollection

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of extracted features) which is stored and used for matching.

BLOCK DIAGRAM

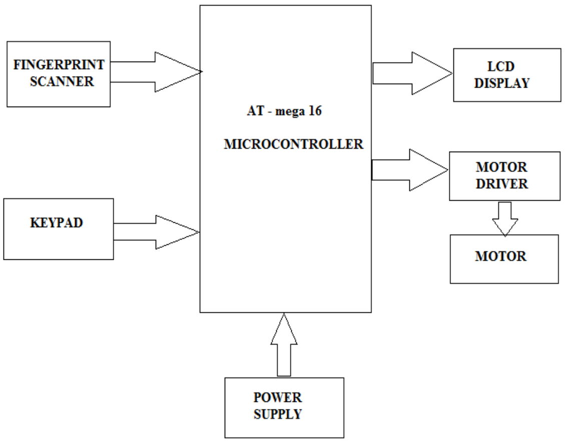


FIG 4.: Overview of the system

4.1 PROPOSED SYSTEM:

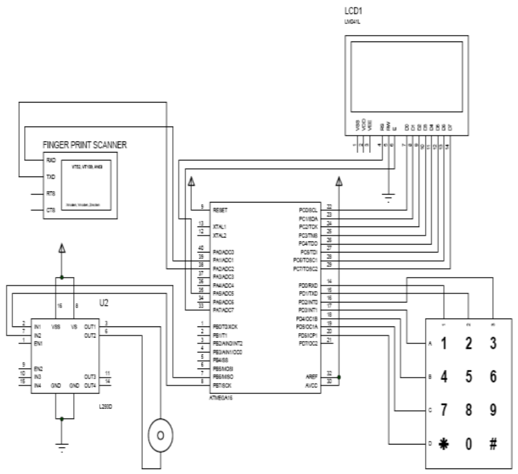


FIG 5:CIRCUIT DIAGRAM

4.2 POWER SUPPLY

This section is meant for supplying power to all the sections mentioned above. It basically is consisted of a transformer to step down the 230V ac to 18V ac followed by diodes. The diodes are used to rectify the ac to dc. After rectification process, the obtained rippled dc is filtered using a capacitor Filter. A positive voltage of 12V and 5V are made available through LM7812 and LM7805. Further, LM317 is used to provide variable power e.g. 3.3V to LPC2148.

4.3 AT-MEGA16 MICROCONTROLLER:

ATmega16 is an 8-bit high performance microcontroller of Atmel's Mega AVR family with low power consumption. Atmega16 is based on enhanced RISC (Reduced Instruction Set Computing, Know more about RISC and CISC Architecture) architecture with 131 powerful instructions. Most of the instructions execute in one machine cycle. Atmega16 can work on a maximum frequency of 16MHz.ATmega16 has 16 KB programmable flash memory, static RAM of 1 KB and EEPROM of 512 Bytes. The endurance cycle of flash memory and EEPROM is 10,000 and 100,000, respectively.ATmega16 is a 40 pin microcontroller. There are 32 I/O (input/output) lines which are divided into four 8-bit ports designated as PORTA, PORTB, PORTC and PORTD.ATmega16 has various in-built peripherals like USART, ADC, Analog
Comparator, SPI, JTAG etc. Each I/O pin has an alternative task related to in-built peripherals. The following table shows the pin description of ATmega16.

4.4 LIQUID CRYSTAL DISPLAY:

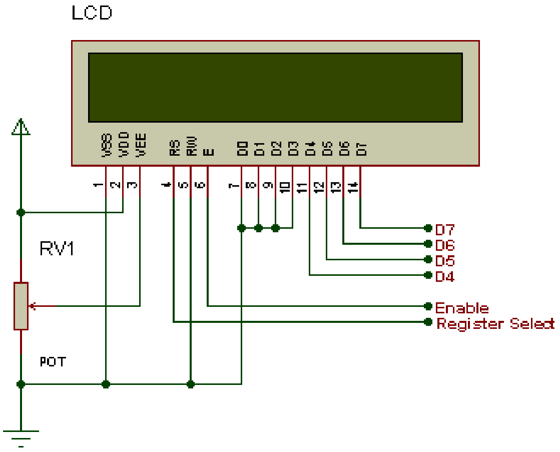


FIG 6:DISPLAY

LCD is used in a project to visualize the output of the application. We have used 16x2 lcd which indicates 16 columns and 2 rows. So, we can write 16 characters in each line. So, total 32 characters we can display on 16x2 lcd. LCD can also used in a project to check the output of different modules interfaced with the microcontroller. Thus lcd plays a vital role in a project to see the output and to debug the system module wise in case of system failure in order to rectify the problem.

4.5 DC MOTOR:

A DC motor is any of a class of electrical machines that converts direct current electrical power into mechanical power. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current flow in part of the motor. Most types produce rotary motion; a linear motor directly produces force and motion in a straight line.DC motors are used to physically drive the application as per the requirement provided in software.The DC motor works on 12v. To drive a dc motor, we need a dc motor driver called L293D. This dc motor driver is capable of driving 2 dc motors at a time. In order to protect the dc motor from a back EMF generated by the dc motor while changing the direction of rotation, the dc motor driver have an internal protection suit. We can also provide the back EMF protection suit by connecting 4 diode configurations across each dc motor.

4.5.1 DC MOTOR DRIVER:

L293D is a dual H-bridge motor driver integrated circuit (IC). Motor drivers act as current amplifiers since they take a low-current control signal and provide a higher-current signal. This higher current signal is used to drive the motors.L293D contains two inbuilt H-bridge driver circuits. The motor operations of two motors can be controlled by input logic at pins 2 & 7 and 10 & 15. Input logic 00 or 11 will stop the corresponding motor. Logic 01 and 10 will rotate it in clockwise and anticlockwise directions, respectively.

4.6 FINGERPRINT MODULE:

A fingerprint sensor is an electronic device used to capture a digital image of the fingerprint pattern. The captured image is called a live scan. This live scan is digitally processedto create a biometric.

4.6.1 FINGERPRINT RECOGNITION:

Fingerprint from before birth and except for resulting in permanantscars,,remain unchanged till death. Each one is known to have unique,immutable fingerprints. Hence fingerprint recognition is most powerful techniques used in field of biometrics.

Each fingerprint is made of a series of RIDGES and FURROWS on the surface of finger. Another feature of a fingerprint are MINUTIAE points. MINUTIAE points are local ridge characteristics. That occur at either a ridge bifurcation or ridge ending. The uniqueness of a fingerprint tcanbe determine by the pattern of ridges and furrows as well as minutiae points.

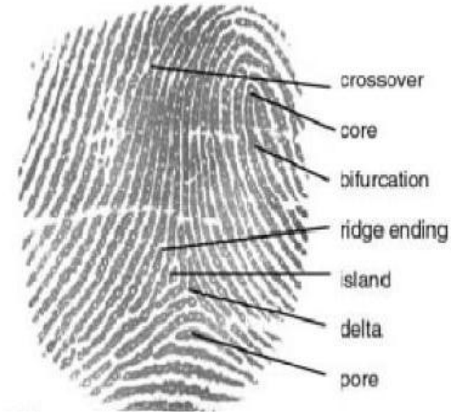


FIG 7: HUMAN FINGERPRINT

The important module of the system is fingerprint scanner. We used **FIM3030** by NITGEN. It has ADSP-BF531 as central processing unit with 8 MB of SDRAM and 1 MB offlash ROM. It uses overall supply voltage of 3.3 V.

4.6.2 FEATURES:

- On-line and off-line fingerprint identification incorporated
- Identification rate 1:1 and 1:N; FAR: 1/100.000 y FRR: 1/1.000
- Algorithm and high hardness optical sensor (7 Moh)
- It provides high recognition ratio even to small size, wet, dry, calloused fingerprint.
- Fast acquisition of difficult finger types under virtually any condition.
- Memory capacity for 100 fingers (each finger registers 2 fingerprints)
- Memory events: up to 2,000 authentications

5. SOFTWARE DESIGN

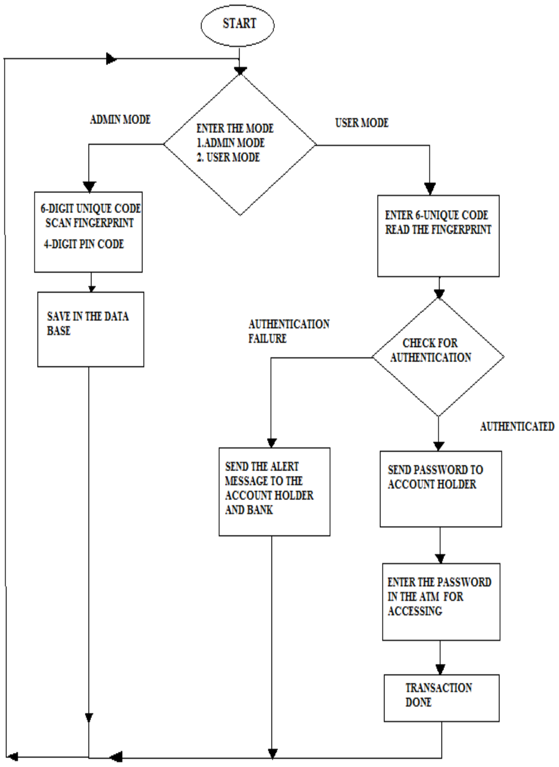


FIG 8: REALIZATION OF FLOW OF TASKS FOR THE PROPOSED SYSTEM

5.1 SOFTWARE REQUIRED:

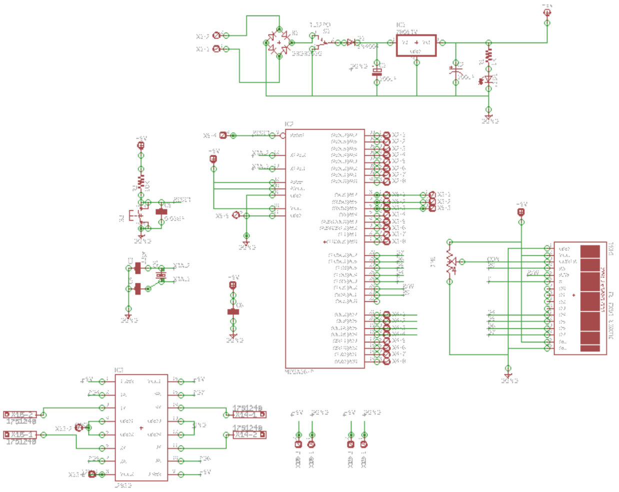
For ATMEGA 16:AVR STUDIO 6.0

For simulating: PROTEUS

For Circuit Designing: ORCAD 9.1

For PCB design: DIP TRACE

6. SIMULATION



7. RESULT

The Implementation of ATM security by using fingerprint recognition took advantages of the stability and reliability of fingerprint characteristics. In addition, the system also contains the original verifying methods which were inputting owner's password which is sent by the controller.

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The security features were enhanced largely for the stability and reliability of owner recognition. The whole system was build on the technology of embedded system which makes the system more safe, reliable and easy to apply for better use.

8. CONCLUSION

In these systems, bankers will collect the customer finger prints and mobile number while opening the accounts then customer only access ATM machine. The design of ATM terminal system based on fingerprint recognition took advantages of the stability and reliability of fingerprint characteristics, a new technology which was designed for the sake of human beings when their ATM card is stolen, based on the image enhancement algorithm of Gabor and direction filter. The security features were enhanced largely for the stability and reliability of owner recognition. The whole system was built on the technology of embedded system which makes the system more safe, reliable and easy to use.

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