ATM Security using Iris Recognition Technology and RFID (2017)
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Abstract:
The dawn of monetary transactions has brought about a new economic and technological reform around the world. Along with the continuous development of technology, security concerns are also increasing. ATM or Automated Teller Machine, which helps in transaction of money anytime, and anywhere, faces the threat of fraud and theft, and thus, there is a need for high security to provide safety to the consumer market. Iris technology, which uses the iris pattern of an individual as an identity proof, along with radiofrequency identification, is the best method to address and eradicate the threats involved in ATM transactions.

Index Terms: ATM, Iris, RFID, Normalization, Acquisition, Recognition, Matching, Database.

I. INTRODUCTION

The full form of ATM is Automated Teller Machine. It is an electronic telecommunications device that enables the customers of a financial institution to perform financial transactions, particularly cash withdrawal, without the need for a human cashier, clerk or bank teller [1]. ATMIA is the ATM Industry Association, which has a record that close to 3 million ATMs are currently installed worldwide. Along with the growing convenience and feasibility of the ATMs, there is also an increase in the amount of ATM thefts and frauds, which are developing at an alarming rate. The conventional ATM transaction, which uses a magnetic card and pin number to allow a transaction, are not enough to keep the customer safe from the likelihood of fraud, identity-loss and false transactions. This is where the Iris Recognition technology comes as a relief to the ailment of the public. Iris Recognition Technology involves the method of allowing a transaction, only if the identity of the individual is verified and the verification is done by recognizing the iris pattern of the account holder. The entire process involves two main identification steps to ensure zero security threats. The first step is RFID detection, or radio frequency identification, in which the individual will bring his RFID tag in front of the RFID reader. If the RFID tag matches an account in the database, then the next step is for the individual to get their iris scanned. If the stored iris pattern matches the scanned iris image, the transaction will be allowed, otherwise, any activity will be disabled. Iris recognition plays a vital role in providing absolute security to the customer as;
1) the iris of each individual is unique, and
2) the iris remains stable throughout life.
The combined process of RFID identification and iris recognition makes for a safe and secure ATM transaction and provides minimal threat.

II. COMPONENTS

LCD- It stands for liquid crystal display. Character and graphical LCDs are very common among all project makers. Since their interface pins are defined in a nice way so it’s easy to interface them with AM processor. LCDs are there to show status and to provide interface in selecting some process. In our project we have used 16*2 size of LCD. All character LCDs performs the same functions (display characters, numbers, special characters, ASCII characters etc). A 16x2 LCD means it can display 16 characters in a line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers that is Command and Data. All character LCDs have Eight(8) data pins D0-D7, Vcc (Apply +5 volt here), Gnd (Ground this pin), Rs (Register select), Rw (read - write), En (Enable), V0 (Set LCD contrast). RFID Tag and Reader-RFID tagging is an ID system for identification and tracking purposes that uses radio frequency identification devices. An RFID tagging system consists of the tag, a read/write device, and a system application for data collection, processing, and transmission. RFID tags fall into three regions in respect to frequency; Low frequency (LF, 30 – 500 kHz), High frequency (HF, 10 - 15MHz), Ultra high frequency (UHF, 850 - 950MHz, 2.4 - 2.5GHz, 5.8GHz [4]. Data between reader and tag are transmitted in half-duplex mode. The reader keeps on generating a RF carrier wave. When the passive tag is within its read range, this signal powers it. Then the tag responds to the reader. The time taken for the tag to become fully functional is called the setup time. After this time, the reader requests for read/write access by sending instructions to the tag. The demodulator recovers the received data stream. After demodulation of the received instructions, the information stored in the tag is transmitted back to the reader by backscattering. After all of the read/write operations are completed, the reader acknowledges the successful completion of the communication and the tag shuts off [2]. Raspberry Pi 3- Raspberry pi features a Broadcom system on a chip (SoC), that includes an ARM compatible central processing unit (CPU) and an on-chip graphics processing unit (GPU, a Video Core IV). CPU speed ranges from 700 MHz to 1.2 GHz for the Pi 3 and on board memory range from 256 MB to 1 GB RAM. Secure Digital (SD) cards are used to store the operating system and program memory in either SDHC or Micro SDHC sizes. Most boards
have between one and four USB slots, HDMI and composite video output, and a 3.5 mm phone jack for audio. Lower level output is provided by a number of GPIO pins which support common protocols like PCI. The B-models have an 8P8C Ethernet port and the Pi 3 has on board Wi-Fi 802.11n and Bluetooth. Specifications are; SoC- Broadcom BCM 2837, CPU- 4*ARM Cortex-A53, 1.2 GHz, GPU- Broadcom Videocore IV, RAM- 1GB (900 MHz), Storage- micro SD, Bluetooth - 4.1 Classic, Bluetooth Low Energy, Ports- HDMI (High Definition Multimedia Interface), 3.5 mm analogue audio-video jack, 4 USB 2.0, Ethernet, Camera Serial Interface (CSI), Display Serial Interface(DSI)[3]. CMOS Camera- CMOS stands for complementary metal oxide semi-conductor. They have to convert light into electrons. One simplified way to think about the sensor used in a digital camera like CMOS camera is to think of it as having a 2-D array of thousands or millions of tiny solar cells, each of which transforms the light from one small portion of the image into electrons. In most CMOS camera, there are several transistors at each pixel that amplify and move the charge using more traditional wires and the CMOS approach is more flexible because each pixel can be read individually. CMOS camera consumes very little power and has great battery life. CMOS chips can be fabricated on just about any standard silicon production line, so they tend to be less expensive.

III. PROCEDURE

The process of ATM transaction starts when the account-holder shows their RFID card, unique for each person, to the RFID reader for scanning. The account related to the unique RFID number will be accessed. The next step involves scanning of the iris using a camera that will capture the image of the iris pattern and after various methods, will generate a code for the iris pattern. If the code matches the iris pattern code of the account being accessed, stored in the database, then the transaction will be allowed. Otherwise, the account information will not be displayed and further activity will be disabled.

Figure. 1. Block Diagram of Components for ATM Transaction

IV. IRIS RECOGNITION

Iris recognition is the process of recognizing a person by analyzing the random pattern of iris. The iris is a muscle within the eye that regulates the amount of light entering the eye by controlling the size of pupil. The system is to be composed of a number of sub-systems, which corresponds to every stage of iris recognition technique. The stages involved in iris recognition are: Image Acquisition – capturing the eye image using Cmos camera, Segmentation – locating the iris region in an eye image, Normalization - creation of a dimensionally consistent representation of the iris region, Encoding – creating a template containing only the most discriminating features of the iris[4], Database Enrollment – storing up of all the iris patterns of the users, Matching - involves matching up of iris pattern with the stored one, and Recognition – proper matching and recognition is done.

Figure. 3. Iris Recognition process.

Image Acquisition- Image acquisition is the process of acquiring or capturing the eye image. The iris image should be rich in iris texture as the acquisition method depends upon the image quality. Therefore to acquire a high quality image of the iris we are using a Cmos camera. Cmos Camera stands for complementary metal oxide semiconductor camera. It provides high quality image and requires less power. Cmos Camera actually converts light energy into electrons. To acquire the image, a distance of approximately 9 cm should be in between the user and the camera and the source of light is about 12cm. Segmentation- The first stage of iris recognition is to isolate the actual iris region in a digital eye image. The iris region, as shown in the figure below can be approximated by two circles, one for the iris/sclera boundary and another, interior to the first, for the iris/pupil boundary[5]. The success of segmentation depends on the imaging quality of eye images. The center of pupil can be used to detect the outer radius of iris patterns. The iris inner and outer boundaries are located by finding the edge image. Normalization- Normalization process involves un-wrapping the iris and converting it into its polar equivalent. It is done using Daugman’s Rubber sheet model. The centre of the pupil is considered as the reference point and a remapping formula is used to convert the points on the Cartesian to the polar scale [6]. The radial resolution was set to 100 and the angular resolution to 2400 pixels. For every pixel in the iris, an equivalent position is
found out on the planar axes. The normalized image is then interpolated into the size of the original image.

Figure. 4. Normalization Process

Encoding- Encoding is the process of generation of the iris code. In this process, the most discriminating feature in the iris pattern is extracted. The phase information in the pattern only is used because the phase angles are assigned regardless of the image contrast [6]. In this process, amplitude information is not used since it depends on the extraneous factors. Also, extraction of the phase information is done using the 2D Gabor wavelets. 2D Gabor wavelets are used to determine the quadrant in which the resulting phasor lies.

![Figure 4. Normalization Process](image)

Figure. 5. Encoding of the human iris.

Database Enrollment- Database enrollment is the process of storing all iris patterns of all the users. When all the above mentioned processes will be applied to every individual, then a database will be created that will be stored in digital form in the computer using python language. Matching- It is the process of matching the iris of the present user with the database stored, if the iris pattern will match then the user is allowed for further otherwise not. The purpose of the matching process is to establish a precise correspondence between characteristic structures across the two images [7]. Both of the systems under discussion compensate for image shift, scaling, rotation [8]. In pattern matching or iris matching of pixels with the database will be done using algorithm [9]. Iris Recognition- It is the last process in the iris biometric technique. When the iris of the user is matched with the iris stored in the database, then the system gives a signal in text form saying that iris is been recognized and the user can access further steps and can finally make a transaction.

V. CONCLUSION

Iris recognition is a very useful and versatile technique. Iris recognition is highly accurate technique. This technique has successful applications. This technique increases both privacy and identity. Highly secure biometric method. Iris recognition is a very easy process involving very less steps. Iris recognition consumes less time in comparison to other biometric recognition techniques. Iris recognition is a quick and accurate way of identifying an individual. This technique is now into use in fields involving high security concerns.

VI. FUTURE SCOPE

Iris biometric technique finds a wide range of applications in fields involving high security concerns. It is actually the use of your body as a security measure. This biometric technique can be used in many fields like transportation, medical sciences, computer sciences, home security. It is advancement in the field of technology thereby giving a great push to the technology industry. Many projects related to security and control can be implemented by this biometric technique.

VII. REFERENCES


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