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Real Time Innovative Secure Human Area Networking Technology based Smart ATM

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***Abstract*— The design system of smart security card for ATM system has been proposed in this project. The project is a Human Area Networking technology (HAN) that uses human body as a safe high speed network transmission path. With the use minute electric field on the surface of human body which acts as a medium for transmitting data. A transmission path is formed at the moment a part of human body comes in contact with Human Area Network transceiver. Human Area Network transmitter consists of a Dual Tone Multiple Frequency (DTMF) encoder which generates both valid and invalid signals and can be transmitted through human body to Human Area Network receiver (Dual Tone Multiple Frequency receiver) for further processing. In order to enhance the security for ATM cards, Human Area Networking based smart security card is presented.**

Keywords—ATM; Human Area Networking; DTMF; Authentication.

I. INTRODUCTION

Human area networking technology uses our own bodies as the medium of transmission of data. It was first developed by Robin Gaur Jind. The surface of the body is used as a safe high speed network transmission path. The transceiver of this system sense the availability of the body part and the transmission is cut-off when the body is removed from the system. Hence this system ensures complete security with no space for hackers or outsiders to tap into the important information of the user.

When we insert our debit or credit card into the ATM, it reads the information encoded on the magnetic strip on the back of the card. That black strip is encoded with our unique card number, expiration date and personal identification number (PIN). Our card is basically a hard copy of the access information to our account. The ATM then asks for our PIN to verify whether or not you are the real owner of the card and account holder. Once you enter the correct password the ATM then communicates with the bank so that we can access our account funds and information. The main security concern of this existing system is the ATM skimming. ATM skimming is the illegal theft of personal identity and information stored in the card through unique electronic devices which are mounted on the existing card reading devices. When the ATM card is swiped on this device the information from the magnetic strip is copied on to the device which can be later extracted and misused [1].

The proposed system uses a unique method of identity authentication which does not involve any swiping of cards and the personal information is literally out of bounds for the hackers or any machine contact. The proposed system uses minute signals on the surface of the body as the medium for transmission and eliminates the use of magnetic strips or swiping of cards. The use of human area networking technology proposes the planting of a smart card or a similar device on the body permanently which would be unique for each user. This device could be strapped onto the body or there are various other options available like integrating the device onto clothes, wallets, wrist watches etc. The electric field being used is very minimal and hence poses no threat to the person using it. Also this low electric field serves as immunity towards wrong handling or security breach of the necessary information. What we will be explaining in this paper is the small scale implementation of Human Area Netwrok based ATM system.

II. PROPOSED METHOD

A. DTMF Encoder and Decoder

Each digit in DTMF (dual tone multi-frequency) code corresponds to a combination of two discrete frequencies, one each from a low and high group of frequencies, which are generated when any switch on a dialer key-pad is pressed. Such a key-pad along with the frequencies associated with each row and column (Fig 1).

Hi-Group / Low-Group	1290	1336	1477	1633
697	1	2	3	?
770	4	5	6	?
852	7	8	9	?
941	*	0	#	?

Fig.1 Tones in DTMF Dialing

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The DTMF encoder encodes the signal and is transmitted to the DTMF decoder. The transmission medium that is used is the human contact with the help of touch plates. The touch plates used are of Copper material. The DTMF encoded signal is given to the touch plate which has been suitably mounted on the body. The receiving touch plate is on the receiver side that is on the ATM machine. The user has to make contact with this touch plate for authentication from where the signal is sent to the DTMF Decoder. The DTMF code being used is in the form of BCD as a DTMF to BCD converter is used before transmission. Hence the decoder receives signal in the form of BCD or hexadecimal which represents a combination of frequencies [5].

B. Microcontroller and supporting peripherals

The microcontroller we use is 89C51. The 89C51 is of the Intel 8051-compatible family of 8 bit microcontrollers (µCs) manufactured by the Atmel Corporation. It is a general purpose microcontroller. It has a industry standard instruction set, and low unit cost and it is based on the Intel 8051 core. This allows us to reprogram the IC as and how we wish. This microcontroller houses the main ATM code, which is to ask for the PIN and to authenticate the user.

We use a specially designed power supply to get the +12V and +5V regulated voltages to run the whole setup. The power supply plays a very important role in smooth running of the connected circuit. The main object of this 'power supply' is, as the name itself implies, is to deliver the required amount of stabilized and pure power to the circuit. The power supply that we are using has 4 stages. The stages being Step-down Transformer, Rectifier Stage, Filter Stage and the Voltage Regulation Stage.

We use the IC4050 HEXBUFFER. The logical state of a digital signal is not affected by the Buffer. Buffers are normally used to provide extra current drive at the output, but can also be used to regulate the logic present at an interface. And Inverters are used to complement the logical state (i.e. logic 1 input results into logic 0 output and vice versa). Also Inverters are used to provide extra current drive and, like buffers, are used in interfacing applications. This 16-pin DIL packaged IC 4050 acts as Buffer as-well-as a Converter. The input signals may vary from 2.5 to 5V digital TTL compatible or DC analogue but the IC always gives 5V constant signal output. The IC acts as buffer and provides isolation to the main circuit from varying input signals. The working voltage of IC is 4 to 16 Volts and propagation delay is 30 nanoseconds. It consumes 0.01 mill Watt power with noise immunity of 3.7 V and toggle speed of 3 Megahertz.

We also use the ULN 2003 relay. Relays are basically electromagnetic devices which are activated by current or voltage in one circuit to activate or deactivated another circuit. This voltage or current in some circuits may sometimes not be able to directly drive the relays. Thereby high-voltage high-current Darlington arrays are designed to interface with such circuits. The series ULN2000A/L ICs can drive up to seven relays. Typical loads for relays include magnetic print hammers, solenoids, stepping motors, multiplexed LED and incandescent displays, and heaters. These Darlington arrays are furnished in 16-pin dual in-line plastic packages and 16-lead surface-mountable SOICs. An additional feature of this IC is that all the output pins are opposite to the input pins, this makes it easy for circuit board layout.

C. Output Peripherals

The output peripherals we use are 16X2 LCD, buzzer, APR33A3 voice chip. The buzzer rings every time there is an unauthorized user trying to access the system. The voice chip is used to store 4 pre recorded messages, each message being 15 to 20 seconds long.

D. RF Transmitter and Receiver

To add an extra layer of security, we have added a RF transmitter and receiver. The transmitter will placed be in the system and whenever there is an unauthorized signal/user detected, it sends a signal to the receiver which can placed in the nearest police station or the bank branch. The receiver also has a microcontroller and we have used the same microcontroller. The code is burnt into the IC and whenever it detects an unauthorized signal a buzzer starts ringing and on the LCD unauthorized is shown.

III. BLOCK DIAGRAM

The block diagram is shown in figure 2. The encoder generates the signal and sends it to the touch plate which is in contact with the human body. When the human comes in contact with the touch plate on the machine, the signal is transferred through the body to the decoder. The decoder, decodes the signal and sends it to the microcontroller. If its an authorized signal, then the LCD display will ask to enter the password, upon verification of which it will display whether or not the entered password is correct. Now if the signal sent is detected as unauthorized by the microcontroller then the buzzer starts ringing and the microcontroller circuit is switched off using the relays. Along with this a RF signal is sent to the receiver which is placed in the nearest police station or the bank branch. There the receiver circuit has a buzzer on it which will start ringing thereby alerting the authorities.

There is always the question of human safety. How safe this would be for the human health? In real time we will be using RedTacton devices [2]. The electrodes of the RedTacton is completely covered so the human body is also completely insulated. The electrons that are present in our body generate something called the displacement current when there is transmission in progress. This is because the body is subjected to minute electric fields. However, such displacement currents are very common everyday occurrences to which we are all subjected. RedTacton conforms to the "Radio Frequency-Expo- sure Protection Standard (RCR STD-38)" [6] issued by the Association of Radio Industries and Business- es (ARIB). The levels produced by RedTacton are well below the safety limit specified by this standard.

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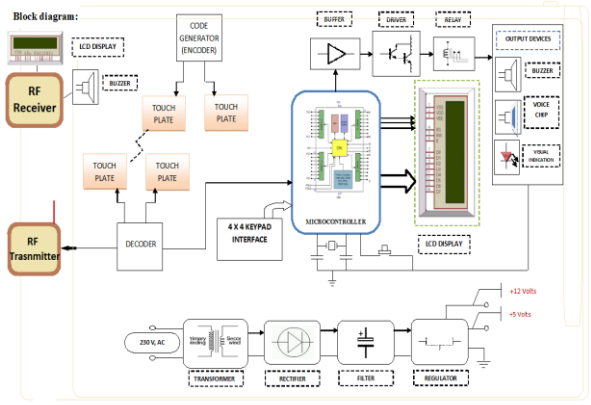

Fig. 2. Basic Block Diagram of the proposed HAN based Smart ATM

IV. APPLICATIONS

The applications of this technology are vast. A few among them being:

1. Automobile Applications
2. Conference Systems
3. Touch Advertising
4. Wireless Headset
5. This project can be used in Military, Medical and Consumer applications.

V. CONCLUSION

The proposed system has been implemented successfully and is tested on hardware. Experimental results verify the effective developed operation. When we compare RedTacton with other technologies, it can give a better security since there is no problem of hackers as our body itself acts as transmission medium and can be used more in the fields where there is a need to upgrade the security in times of high theft rate.

VI. RESULTS

Figure 3. Displays the transmission of data via the human body. An Encoder generates the valid/invalid signal for authorized/unauthorized entry respectively. Figure 4. Shows the LCD display which asks for a PIN after authorized entry is detected. This procedure is used to provide an extra layer of security. Figure 5. The RF Paging Circuit Displaying the authorized entry at a distance which can be used at monitor stations adding another layer of security to our system. Figure 6. The RF detecting unauthorized entry and setting off the alarms.

Fig. 3. Encoder and Decoder touch plates

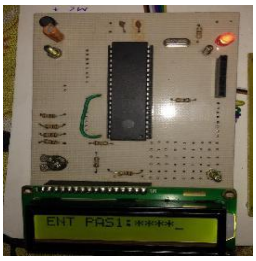

Fig. 4. Password Entry

Fig. 5. Authorized User Detected

Fig. 6. Unauthorized User Detected

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