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# Design and implementation of RFID and MMS Technology Based Embedded Wireless Monitoring And access control

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***Abstract -The design and implementation of a wireless monitoring system that employs RFID and MMS technologies for user identification and theft detection. The RFID and MMS sections are each controlled by ATmega-32 microcontroller. The person want the access has to provide a valid RFID tag which is read serially by the microcontroller in RFID section. Searching the read information in a memory chip for a match in RFID section and triggering the microcontroller in MMS section accordingly while the microcontroller in MMS section is responsible for issuing AT commands to GSM module for capturing the user image and transferring the image to owner mobile phone using MMS, a multimedia service of GSM network. The owner then replies with the text message for either granting or denying the access. The microcontroller uses AT commands to read the text messages from cellular and either drives the stepper motor to open the gate. To improve the security PIR (Passive Infra-Red sensor) motion sensor, enter the secret pin number using 4x3 KEYPAD, IR sensor, serial interface JPEG Camera and magnetic REED switch is added. In this way the suspicious person can be identified and the performance of the security is improved.***

***Keywords-RFID;MMS;keypad;JPEGcamera;REEDswitch;PIR motion sensor;ATmega32 microcntroller.***

## I. INTRODUTION

The growing crime rate in the country has necessitated the deployment of some sort of monitoring and access control systems in homes and/or offices to reduce the security threats. These systems will certainly help in restricting the access of unauthorized persons to homes or sensitive areas in an organization. A noteworthy literature about the design of such systems is available that are either based on a single technology or use a combination of technologies. Amongst the various technologies available, biometrics including voice recognition, finger print recognition, face recognition, iris recognition etc., provides a high level of security but such systems are costly. The alternatives are PIN codes, RFID tags, ZigBee tags etc., but these identities can be misused by non-authorized persons resulting in a low level of security. However, if these identification systems are combined with biometrics technology, suspicious persons can be caught besides restricting their access to the sensitive areas.

The design and implementation of a wireless monitoring system that employ RF-ID and MMS technologies for user identification and theft detection. The RF-ID and MMS section are each controlled by AT-Mega32 Microcontroller. The person want to access as to provide valid RFID tag which is read serially by the microcontroller in RFID section. Searching the read information in a memory chip for a match in RFID section and triggering the microcontroller in MMS section accordingly while the microcontroller in MMS section is responsible for issuing AT commands, to GSM cellular module for capturing the user image and transferring the image the owner mobile phone using MMS a multimedia service of GSM network. The owner then replies with the text message for either granting or denying the access. The microcontroller use AT command to read the text message from cellular and either drives the DC motor to open the gate. To improve the security PIR(Passive Infra-Red sensor) motion sensor, enter the secret pin number using 4x3 KEYPAD, IR sensor, serial interface JPEG camera and magnetic REED switch is added in proposed work. In this way the suspicious person can be identified and the performance of the security is improved.

## II. EXISTING WORK

In [1], PIC16F876A microcontroller based embedded access control system for office use is presented. The system provides a keypad to enter the password in order to have an access. Upon matching the password, the system displays the user details on 16x4 LCD and de-energizes the electromagnetic lock to grant the access. If incorrect password is entered three times, the system turns on an alarm. In [2], AT89C52 microcontroller based wireless embedded access control and attendance management system is presented. The

system provides the user with a module to have access at various entrance points in the organization. This module is designed using cost effective and readily available wireless door bell, a microcontroller and a set of push buttons. The user needs to press the main button to enter the organization. The access module installed at the entrance scans the code in EEPROM and upon a match; the check in time of the employee is recorded. In the same fashion, check out time is recorded upon leaving the organization. If the module is lost, the user has to inform the central control station either through a keypad or mobile phone. The module lost information is provided to all the access points through a set of designed wireless sensor nodes in order to prevent the misuse of the user module and for theft identification. In [3], a wireless monitoring and access control system is designed using ZigBee wireless technology. The system operates the commercially available digital door lock module through a set of ZigBee wireless sensor nodes. When a person is detected by pyroelectric PIR motion sensor, the ZigBee node connected to digital door lock module sends a message to ZigBee video phone node that scans the presence of ZigBee tag. After the received information is processed in microcontroller, decision signal is transmitted to ZigBee digital door lock module for either granting or denying the access. If the access is denied, the user can talk to the person using speaker phone option. In [4], RFID based access control system is designed and installed at laboratories entrances inside university premises. Every user is provided with a passive RFID tag and RFID receivers are installed at entrances. When the transponder card is in the vicinity of receiver, the unique identification number is read by the receiver. The Spartan FPGA board is programmed to receive the identification code from RFID receiver on RS232 protocol where it is compared with all identification codes stored in the memory of FPGA board. Upon a match, the access is granted to the user. A database of the users developed in Microsoft Access is maintained in a central station to which all the receiver nodes communicate using a telnet program. In [5], the access control system is designed by combining the CDMA voice phone and DTMF technologies. The system is installed in a building where the visitors can enter the desired room number at entrance using cap-sensor based touch screen. The entered number is read by a central ARM microcontroller using DTMF decoding algorithm which makes a voice connection to that particular room using CDMA wireless network. The resident of room talks to the visitor and presses a '#' button to allow the visitor to enter the particular room of the building or hangs the phone to deny the visit request. Upon detecting a dial tone frequency, microcontroller either opens the door or displays an error message on the LED display. In [6], voice recognition based access control system is realized using 16 bit sound controller chip SPCE061A and memory chip SPR4096. In training phase, the voice data of the user is gathered using a microphone attached to the sound controller chip. The data is distilled to extract the characteristic voice parameters which are then stored in the memory unit. In this way, a database of registered users is built. In the testing phase, after pre-processing the voice signal, pattern matching is performed with the templates in the database. In case the voice is alike, access is granted to the user. The effectiveness of the designed system is verified based on minimizing two parameters namely error identification ratio i.e., a non-registered user is granted access and rejection identification ratio i.e., a registered user is denied access. In [7], an access control system is designed by using M04 finger print identification module. The module is interfaced to an AT89S52 microcontroller which issues commands for acquiring and processing the finger print data during the registering phase. The microcontroller stores the response of the module in 2K serial EEPROM. During testing phase, after the acquisition and feature extraction of finger print, it is searched in database developed during registering phase for a match. The accuracy of the system is high and error rate is found to be one in thousand tests. However, in wet and foggy weather conditions, the accuracy of the system is found to be low. In that case, an intercom module is interfaced to the microcontroller and user can talk to house owner for permission to enter. In [8], a medium level security and access control system is designed by combining hand geometry verification and smart card. Hand geometry verification technique is selected amongst other biometric methods to reduce the computational complexity and verification time. The user registering phase begins by placing the hand on a transparent screen with six tops for palm adjustment. The pressure sensors are also detect the presence of hand. The CCD camera takes top views and side views of hand and the image is then processed to extract the feature vectors. The dominating feature vectors that vary in a set of registered users are saved on smart card. The verification phase begins by comparing the feature vectors already saved on smart cards to hand image feature vectors. The Euclidean distance, Hamming distance and Gaussian mixture modeling are employed for verification purposes with false acceptance ratio and false rejection ratio being the performance parameters. The real time results have shown that Hamming distance method is a good choice owing to be computationally efficient with reasonable accuracy. After the verification is successful, the access is granted to the user. The present work is analogous to the technique presented in [5]. However,

instead of using voice, image data is transferred to the owner for making a decision.

## III. OVERVIEW OF RFID

RFID is an automatic identification method using radio waves. RFID is also began to see use in wildlife monitoring and research. RFID tag can be used to monitor the animal movement without adversely affecting the animal. RFID system consist of three components namely Transponder (Tag), interrogator (reader) and computer.

The system offers diverse frequency band ranging from low frequencies to microwave frequencies [9]:

- Low Frequency: 125-134 KHz
- High Frequency: 13.56 MHz
- Ultra High Frequency: 902-928 MHz
- Microwave Frequency: 2.4GHz

Depending upon the source of electrical energy, RFID tags are classified as either active or passive. The active tags use a battery for powering the circuit on the tag and transmit the tag information upon the reader request. However, these tags are very expensive and seldom used. On the other hands, passive tags get energy from the reader to power their circuit. These RFID tags are very cost-effective. The comparison of these tags highlighting important features is shown in Table 1.

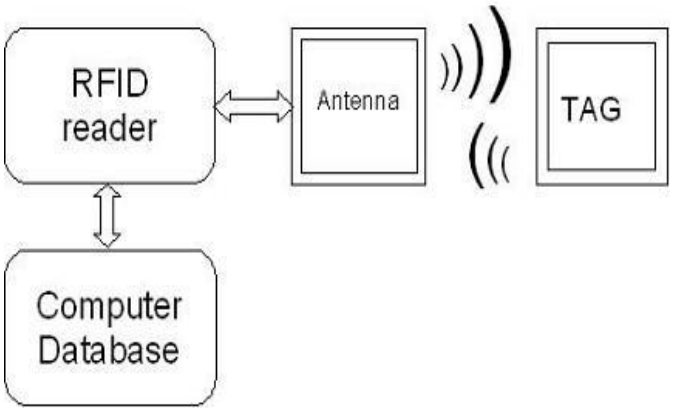


Figure 1.Basic RFID System

In the present work, passive RFID tags have been used. A passive RFID tag transmits information to the reader when it comes in the vicinity of electromagnetic field generated by the reader. The phenomenon is based on Faraday's law of electromagnetic induction. The current flowing through the coil of interrogator produces a magnetic field which links to the transponder coil. The transponder coil varies this current by changing the load on its antenna. This variation is actually the modulated signal (scheme is known as load modulation) which is received by the interrogator coil through mutual induction between the coils. The interrogator coil decodes this signal and passes to the computer for further processing.

TABLE I. COMPARISON OF ACTIVE & PASSIVE RFID TAGS

| **Attribute** | **Active Tags** | **Passive Tags** |
|---|---|---|
| Source of Power | Built-in Battery | Electromagnetic Induction |
| Reading Distance | High (20 to 100 m) | Low (Up to 3m |
| Required Signal Strength | Low | High |
| Tag Cost High | High ($15 to $100) | Low ($0.15 to $5) |
| Size | Large | Small |
| Weight | Large | Small |
| Tag Life | Small (3 to 8 years depending upon tag broadcast rate) | Large (Up to 10 years depending upon the environment the tag is in) |

## IV. OVERVIEW OF MMS TECHNOLOGY

Multimedia messaging service (MMS) is a standard way of transferring multimedia contents between the mobile phones. It can be regarded as an extension of short messaging service (SMS) where the message body is limited to a total of 160 characters; however the transferring algorithm for MMS is different than SMS. MMS message after being encoded in a format similar to MIME is transferred to a store and forward server known as MMSC. This server extracts the multimedia content in message after verifying the compatibility of receiver handset and transfers it to a temporary storage server with HTTP front end where an SMS control message is formed containing the URL of the content. The control message is then transmitted to receiver where it triggers the WAP browser and displays the content from embedded URL Some MMSC servers implement the 'content adaptation by' the which the multimedia content in message is modified to

suit the receiver handset. In case, if the receiver mobile phone does not support MMS, the URL of the content is delivered in a normal text message and thus the content can be viewed using a normal internet browser .

## V. PROPOSED WORK

The design and implementation of a wireless monitoring system that employ RF-ID and MMS technologies for user identification and theft detection. The RF-ID and MMS section are each controlled by AT-Mega32 Microcontroller. The person want to access as to provide valid RFID tag which is read serially by the microcontroller in RFID section. Searching the read information in a memory chip for a match in RFID section and triggering the microcontroller in MMS section accordingly while the microcontroller in MMS section is responsible for issuing AT commands, to GSM cellular module for capturing the user image and transferring the image the owner mobile phone using MMS a multimedia service of GSM network. The owner then replies with the text message for either granting or denying the access. The microcontroller use AT command to read the text message from cellular and either drives the DC motor to open the gate. To improve the security PIR(Passive Infra-Red sensor) motion sensor, enter the secret pin number using 4x3 KEYPAD, IR sensor, serial interface JPEG camera and magnetic REED switch is added in proposed work. In this way the suspicious person can be identified and the performance of the security is improved.

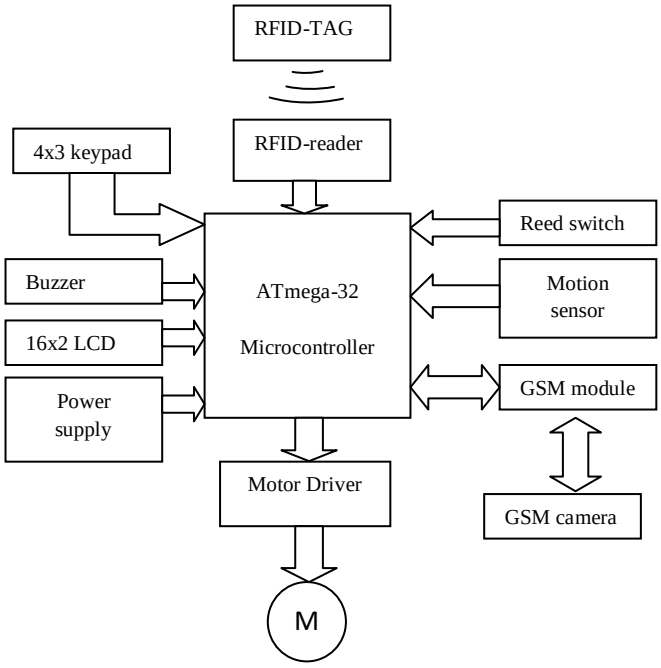


Figure 2. block diagram of system design

*1) ATmega32 Microcontroller:* ATmega32 is an 8-bit high performance microcontroller of Atmel's Mega AVR family. Atmega32 is based on enhanced RISC (Reduced Instruction Set Computing) architecture with 131 powerful instructions. Most of the instructions execute in one machine cycle. Atmega32 can work on a maximum frequency of 16MHz.the ATmega32 achieves throughputs approaching 1 MIPS per MHz allowing the system designer to optimize power consumption versus processing speed.

*2) Lcd:* A liquid crystal display (LCD) is a thin, flat display device made up of any number of color or monochrome pixels arrayed in front of a light source or reflector. Each pixel consists of a column of liquid crystal molecules suspended between two transparent electrodes, and two polarizing filters. One of the most common devices attached to an controller is an LCD display. Some of the most common LCDs connected to the controllers are 16X2.

*3) Motors:* Stepper motors convert digital information into proportional mechanical movement. Stepper motor is used to control the gate or door in this project.They are digital and different from DC motors that are controlled by changing the current across them. The electromagnets of a stepper motor are energized by an external control circuit, such as a microcontroller. Stepper motor's ability to run in various modes with various speed and torque gives it a more degree of advantage over the simple DC motor for various projects, especially in robotics based projects.

*4) Driver IC:* 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 is a dual H-Bridge motor driver, So with one IC we can interface two DC motors which can be controlled in both clockwise and counter clockwise direction and if you have motor with fix direction of motion the you can make use of all the four I/O s to connect up to four DC motors.

*5) Buzzer:* A buzzer or beeper is a signalling device, usually electronic, typically used in automobiles, household appliances such as a microwave oven, or shows. It most commonly consists of a number of switches or sensors connected to a control unit that determines if and which button was pushed or a preset time has lapsed, and usually illuminates a light on the appropriate button or control panel, and sounds a warning in the form of a continuous or intermittent buzzing or beeping sound. Initially this device was based on an

electromechanical system which was identical to an electric bell without the metal gong (which makes the ringing noise).

*6) PIR Motion Sensor:* (Passive Infrared) sensors allow you to sense motion, almost always used to detect whether a human has moved in or out of the sensors range. They are small, inexpensive, low-power, easy to use and don't wear out. For that reason they are commonly found in appliances and gadgets used in homes or businesses. They are often referred to as PIR, "Passive Infrared", "Pyroelectric", or "IR motion" sensors.

*7) Reed switch:* The reed switch is an electrical switch operated by an applied magnetic field. It consists of a pair of contacts on ferrous metal reeds in a hermetically sealed glass envelope.

*8) Sim900 Gsm Module:* The microcontroller first adjusts the baud rate of SIM900A GSM module to 9600 by using the AT command and saves the initialization settings using the AT commands. GSM is used to send ,receive the message and transmit MMS to Owner mobile phone. A authority person (Owner)numbers can be programmed in the microcontroller. GSM modem requires a SIM card from a wireless carrier in order to operate. As mentioned in earlier sections of this SMS tutorial, computers use AT commands to control modems. Both GSM modems and dial-up modems support a common set of standard AT commands. You can use a GSM modem just like a dial-up modem. In addition to the standard AT commands; GSM modems support an extended set of AT commands. These extended AT commands are defined in the GSM standards

*9) Keypad:* keypad is a commonly used device to get user input. Although simple push switches can be used to get user input, as we have done so, this would require 1 I/O line per switch. Keypads are collection of push switches however arranged in the form of a matrix. So there are rows and columns of switches. The two connections of a switch are also connected in the matrix, so that the row has common connection and column has a common connection. Thus when a button is pressed a row and a column, where the button is pressed gets connected internally. The keypads are usually available as telephone type 3 x4 keypad. This one has three columns and 4 rows, or a 4 x 4 keypad having 4 rows and 4 columns.

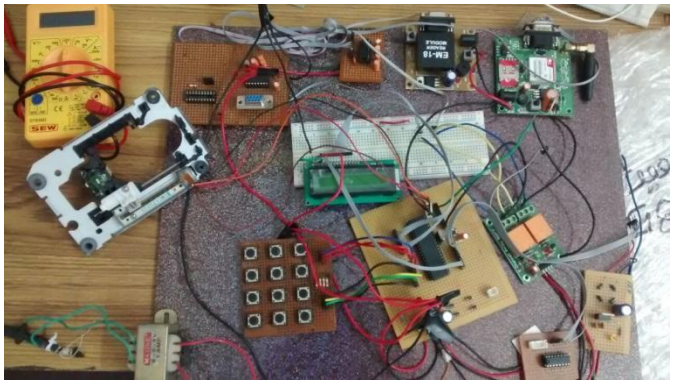

Figure 3. Experimental Setup

## VI. CONCLUSIONS

Design and implementation of a wireless monitoring and access control system is presented that combines the two existing technologies including RFID and MMS. Both the modules interface with ATmega32 microcontrollers for processing the user information and executing the control tasks.. The main aim of the projects is user verification and theft identification. Additionally, To improve the security PIR(Passive Infra-Red sensor) motion sensor, enter the secret PIN number using KEYPAD, IR(Infrared) sensor, serial interface JPEG camera and magnetic REED switch is added. In this way the suspicious person can be identified and the performance of the security is improved.

## REFERENCES

[1] Sadeque Reza Khan, "Development of Low Cost Private Office AccessControl System(OACS)," International Journal of Embedded Systems and Applications vol.2, no.2, June 2012, pp. 1-7.

[2] Umar Farooq, Muhammad Amar, HafizaRabbia Ibrahim, OneezaKhalid, SehrishNazir, M. UsmanAsad, "Cost Effective Wireless Attendence and Access Control System," Proc. IEEE International Conference on Computer Sciences and Information Technology, July 9- 11, 2010.

[3] Il-Kyu Hwang, and Jin-WookBaek, "Wireless Access Monitoring and Control System based on Digital Door Lock," IEEE Transactions on Consumer Electronics, vol. 53, no. 4, Nov 2007, pp.1724-1730.

[4] Mario Alberto Ibarra-Manzano, and Dora Luz Almanza-Ojeda, "Access Control System using an Embedded System and Radio Frequency Identification Technology,"

Proc. Electronics, Robotics and Automotive Mechanics Conference 2008, pp.127-132.

[5] Ron Weinstein, "RFID: A Technical Overview and Its Application to the Enterprise," IT Pro., May-June 2005, pp. 27-33.

[6] Han Cheng-ha, Sang Dan-hong, Ren Ye, "Design of Fingerprint Access Control System in Intelligent Community," Proc. International Conference on Transportation, Mechanical, and Electrical Engineering, December 16-18, 2011, pp. 1173-1176.

[7] Rand Sanchez-Rclllo and Ana Gonznlez-Marcas, "Access Control System with Hand Geometry Verification and Smart Cards," IEEE AES Systems Magazine, Feb 2000, pp.45-48.

[8] Kuo-shien Huang and Shun-ming Tang, "RFID Applications Strategy and Deployment in Bike Renting System," Proc. ICACT 2008, pp. 660- 663.

[9] Available [online]: www.alldatasheet.com

[10] RFID & Biometrics Access Control System Application Guide, IDTECK.

[11] M. A. Mazidi, J. C. Mazidi, R. D. Mckinaly, The 8051 Microcontroller and Embedded Systems, Pearson Education, 2006.