LOCKER SECURITY SYSTEM USING RFID AND GSM TECHNOLOGY

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ABSTRACT
The main goal of this paper is to design a locker security system using RFID and GSM technology which can be organized in bank, secured offices and homes .In this system only authenticated person can recover money from locker. We can implement a locker security system based on RFID(Radio –frequency identification) and GSM technology containing door locking system using RFID and GSM technology which can activate ,authenticate and validate the user and unlock the door .The main advantage of using passive RFID and GSM is more secured than other systems .This system consists of microcontroller ,RFID reader , GSM modem ,keyboard and LCD .The RFID reader reads the id number from passive tag and sends to the microcontroller where it checks whether it is of valid person or not (from stored data in memory of microcontroller) .If the id number is valid then microcontroller sends the SMS request to the authenticated person's mobile through GSM, for getting original password to open the bank locker. when the person sends the password to the microcontroller, it will verify the passwords entered by the keyboard (by person present in front of locker) and received from authenticated person's mobile phone .If these two passwords are matched then locker will be opened otherwise it will remain in locked position .This system is more secured than other systems because two passwords are required for verification and the valid person can type password from his mobile and keypad of locker which should be same as that of stored (initially during account opening) .This system can also create a log containing check-in and check-out of each user along with basic information of user.

KEYWORDS: GSM, RFID, keyboard, locking system, Microcontroller.

I. INTRODUCTION

Some people will try to steal the property which may endanger the safety of money in the bank, house and office .To overcome the security threat, most people will install bunch of locks or alarm system. There are many types of alarm system available in the market which utilizes different types of sensors .The sensor can detect different types changes and process giving corresponding alert .In this paper we have implemented safety of the money in the bank locker ,house ,office(treasury) by using RFID and GSM technology which will provide more security than other systems. RFID based access – control system allows only authorized persons to open the locker with GSM technology .Basically an RFID system consists of an antenna or coil ,a transceiver (with decoder) and a transponder(RF tag) electronically programmed with unique information .There are many different type of RFID systems in the market .These are categorized on the basis of their frequency ranges .Some of the most commonly used RFID kits are low frequency (30 -500 kHz) , mid frequency (900 kHz-1500MHz) and high frequency(2.4-2.5GHz). The passive tags are lighter and less expensive than the active tags. GSM is a globally accepted standard for digital cellular communication and is a common European mobile telephone standard for a mobile cellular radio system operating at 900 MHz In the current work GSM module is used .The SIM 300 GSM module is used. The SIM 300 GSM module is a Triband GSM/GPRS solution in a compact plug in module featuring an industry –standard interface .It delivers voice, data and fax in a small form factor with low power consumption [1].In this paper we have designed a locker security system based on RFID and GSM technology .In this system only authentic person can recover money from locker with two password protection method. In this present

age, safety has become an essential issue for most of the people especially in the rural and urban areas.

II. RELATED WORKS

In this section some related works are connected to the monitoring system using GSM services. However [2] developed a water meter reading using GSM system which is suitable for remote places to monitor the water meter reading before any billing process .In [3] has developed a prepaid billing of water consumption through remote monitoring without any human involvement. This will give accurate and fast billing of water and prevent mishandling of it. The system was able of monitoring the meter reading and sent an SMS to the official center for billing purpose .This could reduce the number of estimated reading when the empower person is unable to reach the meter. In [4], this system is used to control home appliances tenuously and offer security when the owner is away from the place. The similar work is presented in [5] which designed and developed a smart home application system .This system allows the owner to be able to monitor and control the residence appliances via a mobile phone set by sending commands in the form of SMS messages and receiving the home appliances status.

III. BLOCK DIAGRAM
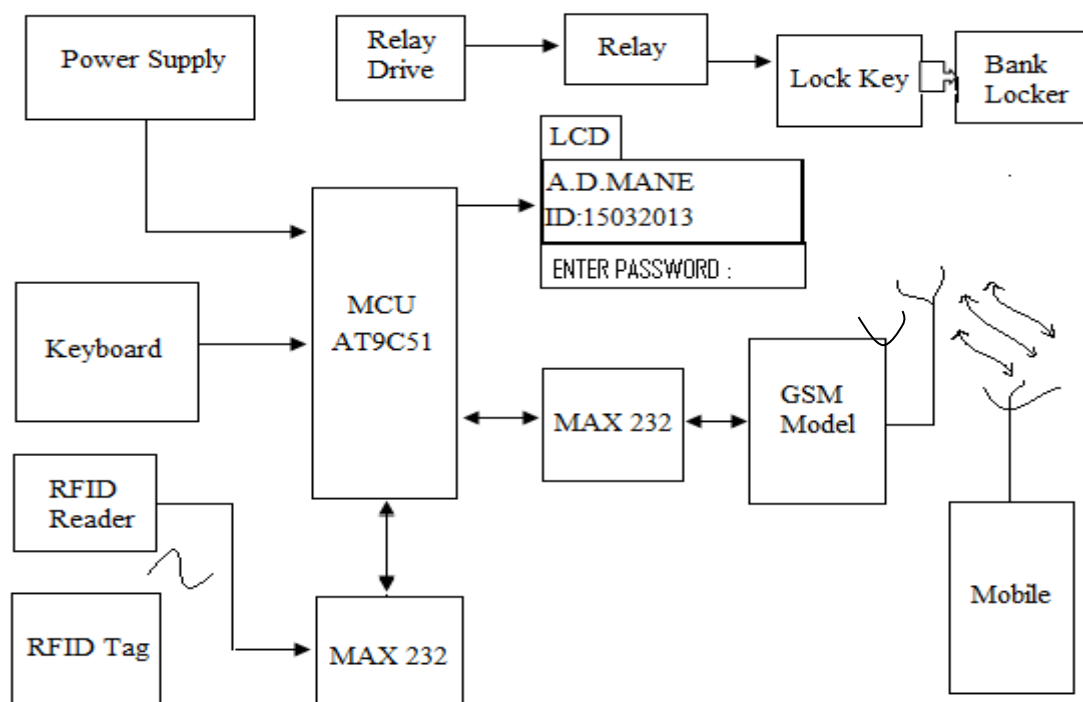
Figure 1: RFID & GSM based Locker System

The block diagram of locker system based on RFID and the GSM technology is shown in the figure1. It comprises power supply section, keyboard, RFID Reader, AT89C51 microcontroller, MAX232 driver, relay driver and GSM modem, LCD. The GSM board has a valid SIM card with sufficient recharge amount to make outgoing calls. The circuit is powered by regulated +5v dc.

IV. SYSTEM ARCHITECTURE AND IMPLEMENTATION

The RFID reader reads the data from the tag and send to the microcontroller, if the card is valid then microcontroller display the account holder name and number. Then the account holder need to enter the password, if the password is valid then microcontroller sends the SMS to account holder's mobile number. Then account holder sends the password to the microcontroller through mobile phone using

GSM. The microcontroller compares the password entered by keyboard with received password through mobile phone. If these passwords are matched the microcontroller provides necessary control signal to open the locker. This method is simple and more secured than other systems.
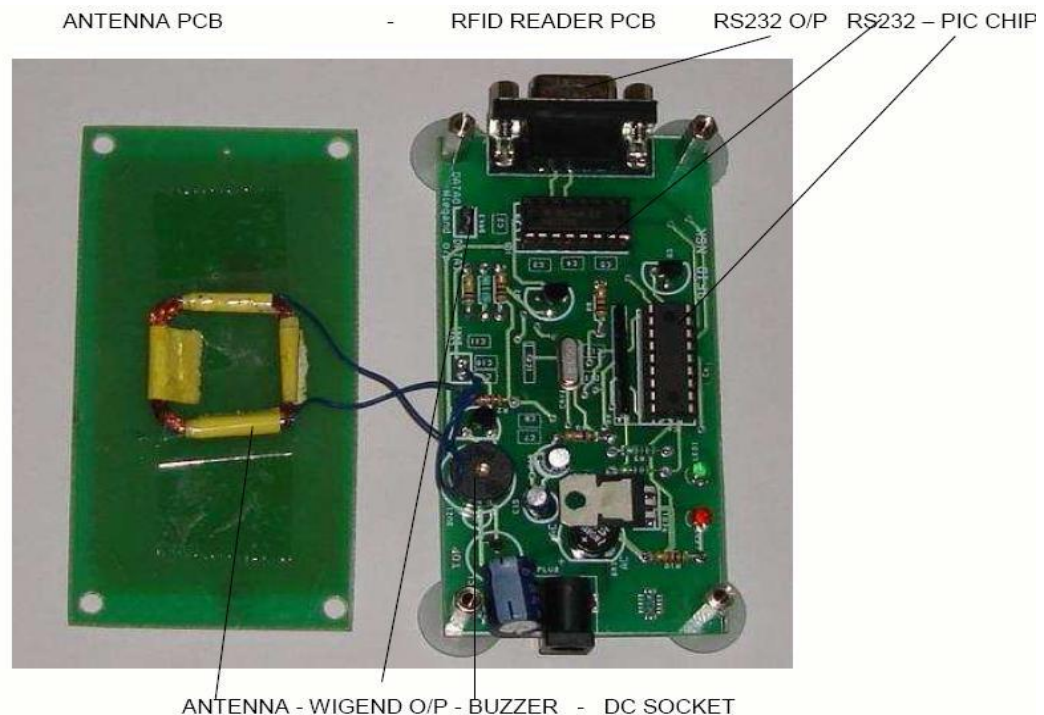
4.1 RFID Fundamentals

Figure2. RFID Reader

Basically an RFID system consists of three components - an antenna or coil, a transceiver with decoder and a transponder (RF Tag) electronically programmed with unique information as shown in figure2. There are many different types of RFID system in the market .These are categorized on the basis of their frequency ranges. Some of the most commonly used RFID kits are low frequency (30 - 500 kHz) , mid frequency (900 kHz-1500MHz) and high frequency(2.4-2.5GHz) .An RFID reader is a device that is used to interrogate an RFID Tag. The reader has an antenna that emits radio waves. The Tag responds by sending back its data. An RFID tag is a microchip combined with an antenna in a compact package. The packaging is structured to allow the RFID tag to be attached to an object to be tracked. The tags antenna picks up signals from an RFID reader or scanner and then returns the signal , usually with some additional data (like a unique serial number or other customized information) A passive tag is an RFID tag that does not contain a battery .The power is supplied by the reader. When radio waves from the reader are encountered by a passive RFID tag, the coiled antenna within the tag forms a magnetic field. The tag draws power from it, energizing the circuits in the tag. The tag then sends the information encoded in the tags memory. The RX and TX pins of RFID reader connected to TX and RX pins of AT 89c51 microcontroller respectively. Then the reader senses the data from the tag and transmits the sensed data to microcontroller via serial port.

4.2 GSM Modem SIM 300 V7.03

The GSM Modem shown in figure3 is specialized types of modem which accept a SIM card operate on a subscriber mobile number over a network, just like a cellular phone. Basically it is a cell phone without display. Modem SIM 300 is a Triband GSM/GPRS engine that works on EGSM 900MHz, DCS1800MHz and PCS1900 MHz frequencies GSM. Modem is RS-232 –logic level compatible i.e. it takes -3v to -15v as logic high and +3v to +15 as logic low. MAX 232 is used to convert TTL into RS232 logic level converter used between the microcontroller and the GSM board. The signal at pin 11 of the microcontroller is sent to the GSM modem through pin 11 of MAX232. This signal is

received at pin 2 (RX) of the GSM modem. The GSM modem transmits the signals from pin 3(TX) to the microcontroller through MAX232, which is received at pin 10 IC1.

4.2.1 Features of GSM

- Single supply voltage 3.2v to 4.5v
- Typical power consumption in SLEEP mode : 2.5mA
- SIM300 tri-band
- MT, MO, CB, text and PDU mode , SMS storage : SIM card
- Supported SIM Card : 1.8v -3v

Figure3. GSM modem

V.   CIRCUIT DESCRIPTION

5.1 Power Supply

The power supply section is the important for any electronics circuits. To derive the power supply, the 230V, 50Hz AC mains is stepped down by transformer X1 to deliver a secondary output of 12V, 500 mA. The transformer output is rectified by a full-wave rectifier comprising diodes D1 through D4, filtered by capacitor C1 and regulated by ICs 7812 (IC2) and 7805 (IC3). Capacitor C2 bypasses the ripples present in the regulated supply. LED1 acts as the power indicator and R1 limits the current through LED1.The power supply section is shown in the figure4.
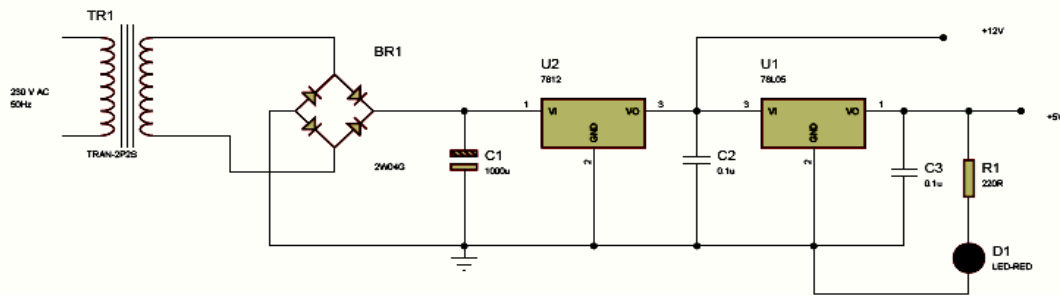
Figure 4. Power Supply

5.2 locker System Based on RFID and GSM Technology

Fig.5 shows the circuit of the locker system based on RFID and GSM technology. The compact circuitry is built around Atmel AT89C52 microcontroller. The AT89C52 is a low-power; high performance CMOS 8-bit microcomputer with 8 kB of Flash programmable and erasable read only memory (PEROM). It has 256 bytes of RAM, 32 input/output (I/O) lines, three 16-bit timers/ counters, a six-vector two- level interrupt architecture, a full-duplex serial port, an on- chip oscillator and clock circuitry. The system clock also plays a significant role in operation of the microcontroller. An 11.0592MHz quartz crystal connected to pins 18 and 19 provides basic clock to the microcontroller. Power-on reset is provided by the combination of electrolytic capacitor C3 and resistor R1. Port pins P2.0 through P2.7 of the microcontroller are connected to data port pins D0 through D7 of the LCD, respectively. Port pins P3.7 and P3.6 of the microcontroller are connected to register -select (RS) and enable (E) pins of the LCD, respectively. Read/write R/W pin of the LCD is grounded to enable for write operation. All the data is sent to the LCD in ASCII format for display. Only the commands are sent in hex form. Register-select (RS) signal is used to distinguish between data (RS=1) and command (RS=0). Preset RV1 is used to control the contrast of the LCD Resistor 10k limits the current through the backlight of the LCD. Port pins P3.0 (RXD) and P3.1 (TXD) of the microcontroller are used to interface with the RFID reader through Max232(1) and GSM Modem are used to interface through Max232(2). When an allowed person having the tag enters the RF field generated by the RFID reader, RF signal is generated by the RFID reader to transmit energy to the tag and retrieve data from the tag. Then the RFID reader communicates through RXD and TXD pins of the microcontroller for further processing. Thus on identifying the authorized person, the authorized person enters the password through keyboard and send to the microcontroller. If the password is correct then the microcontroller send the SMS to the account holder person, account holder again send the password through SMS to the microcontroller.
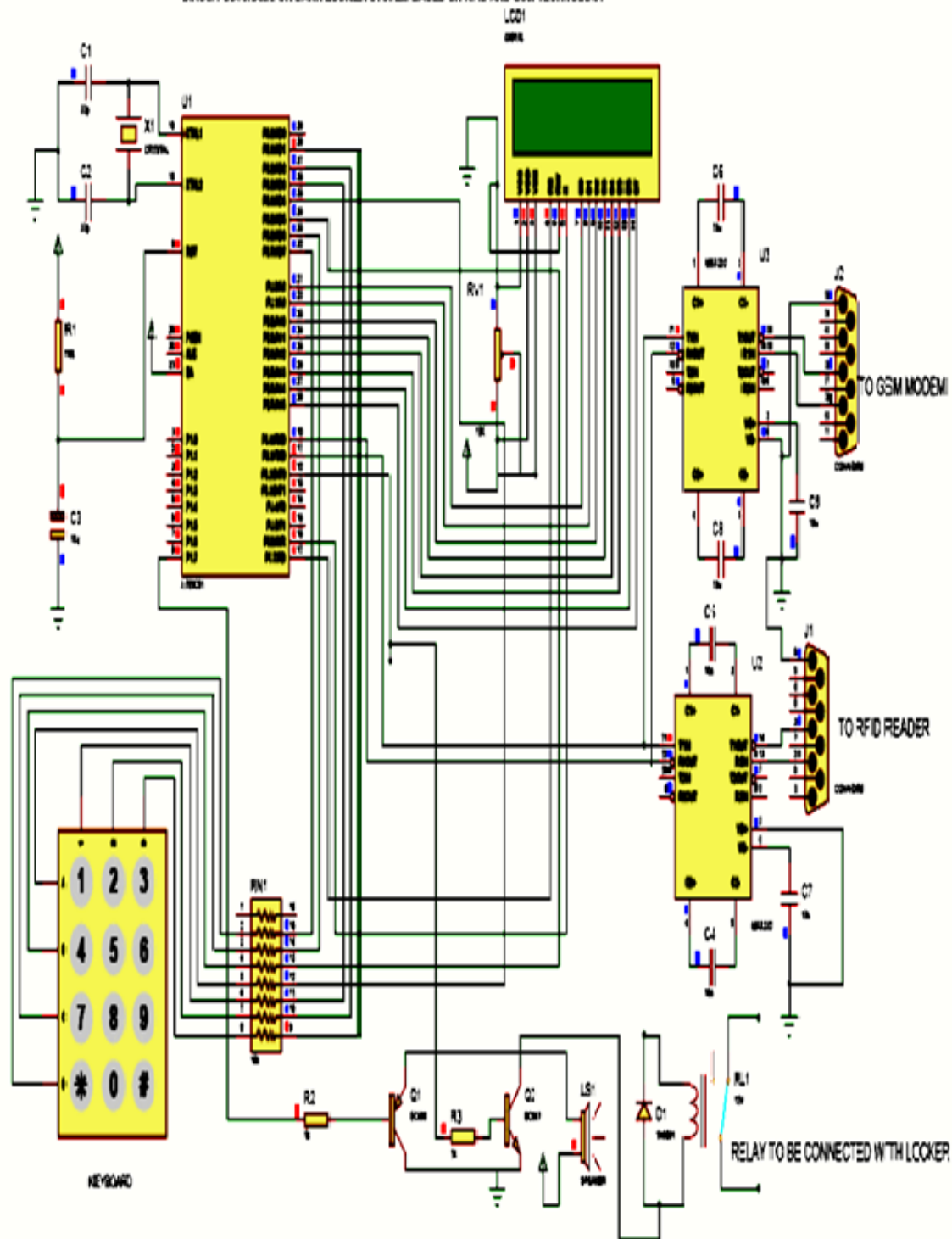
Figure 5. Circuit diagram of locker system based on RFID and GSM technology

The microcontroller verifies the password and received password through GSM mobile. If this password is correct, the microcontroller provides high signal to port pin P3.2, transistor Q2 drives into saturation, and relay RL1 energizes to open the locker. Simultaneously, the LCD shows "access granted" message and send to and port pin P1.7 drives piezo buzzer PZ1 via transistor T1 for aural indication. If the password is not valid, the LCD shows "access denied" and the locker doesn't open.
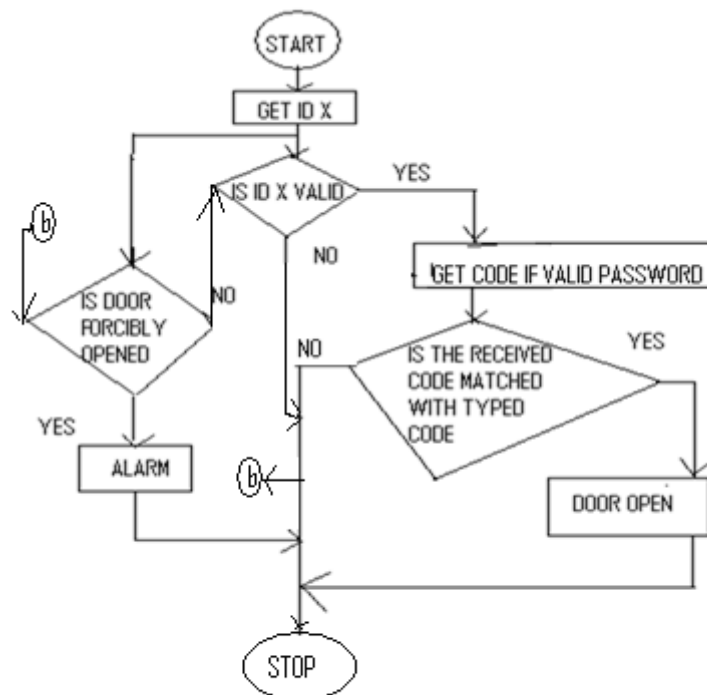
VI.   FLOW CHART

Figure 6 : Locker Security System using RFID and GSM Technology

The flowchart is shown in figure 6.

6.1 Software program testing

The software program can be written in c or assembly language and compiled using keil software. After compiler operation the hex code is generated and stored in the computer. The hex code of the program is burnt into the AT89C51 by using Top win Universal programmer.

6.2 Hardware Assembling and Testing

First step, we need to make single side PCB layout of the locker system based on RFID and GSM technology for testing the circuit, proceed as follow
1.After assembling all the components on the PCB ,connect TX and RX pins of the GSM modem to pins 13 and 14 of MAX 232 and RFID Reader, respectively and insert a valid SIM in the card holder of the GSM modem
2. Connect ground pins of the GSM modem and RFID to the ground rail of the circuit..
3. This system is very useful for bank locker, office, homes to keep the money safely.

Table 1: Comparative study of existing and proposed locker system

Sr no.	Existing System	Proposed System
1	RFID Technologies	RFID & GSM Technologies
2	One Password is Reffered	Two Password are Reffered
3	May be Secured	More Secure due to Double Password

VII.   CONCLUSION

This paper can be implemented as a locker security system using passive RFID and GSM for banks. It is a low cost, low in power consumption, compact in size and standalone system. The authenticated customer's information (such as name, id, phone number..) can be stored in

microcontroller's memory database system and the memory capacity can also be increased if the customer limit exceeds. The microcontroller compares the passwords entered by keyboard and received through mobile phone. If these passwords (codes) are correct the microcontroller provides necessary control signal to open the locker otherwise door remains locked. Alarm will turn on whenever door is forced to open.

VIII.   FUTURE WORK

Future work of this paper, is planned to a develop security system based on 3G camera for visual identification of the person.

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