

Securing Bank Locker System Using Embedded System

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Abstract— When human beings were on earth, need of various things emerged. As years passed and with tremendous development people started earning money, property, jewelry and many more precious things. With huge development people felt need to secure their earnings.

In today's man's life the money security is an important aspect as he earns the money by his hard work, and banking is known for this. It is not enough to have these accessories, but security of this is very important, for this purpose we keep them in bank locker. Still we often hear or read in news paper that some fake person has access the locker of another person and have stolen money. In order to overcome this type of frauds, authentication of the person who wants to use the locker is very important. To overcome this security threat, a security system has been proposed using RFID (Radio Frequency Identification) and GSM technology.

Index Terms— Locker, RTC, Radio Frequency, Motorized Locks, Arm Controller.

I. INTRODUCTION

BANK is a financial institution which provides us financial services like issuing money, saving cards, etc. Earning money and saving it is very important part in man's life for enjoying a comfortable economic status and hence banking sector plays a vital role for all of us. Earlier people were not using banking facilities and used to neglect those facilities. However with the advancement of banking industry, common man began to development and started using facilities of bank. He began to realize the benefits of banking as it minimized his botheration of safety and security of his valuables and money.

It is necessary to keep the cash, ornaments and other valuable under safe custody because burglars now days have a lot of modern equipment with them. They are now equipped with such instruments that can destroy most of the conventional safety locker systems. As per one quotation if one loses health it can be regained, but one loses his valuable wealth it takes too much time to recollect it. So in order to protect our valuables banks provide some other benefits like providing their customers with safety lockers to store their valuables. The need for safe locker systems is not only in banks but also in various other institutes like in Offices, shops business establishments, financial institutions, Petrol stations, Hotels and Hospitals. And this need is increasingly felt in these days due to the increase in the security concerns.

Commonly we use locker system in bank for the safety of our important documents, ornaments fix deposited certificates. We also use this system for the security of secret

Formulas or procedure of some company product as it is highly necessary to keep that data confidential. Many of our nationalized banks in India provide customer lockers where they can keep their valuables.

II. EXISTING SCENARIOS

Current locker system in almost all banks uses traditional locks which are heavy and are not protective and completely manual. Lockers are operated with the help of keys. Each locker works on two keys, one master key is with the bank and the other one is with the customer. All such lockers of customers are present in strong room, which is also operated with two keys, which are handled by head cashier and branch manager.

Customers can access their respective locker for given number of times a month. Every time when customer wants to access his locker then a record is maintained manually where customer has to sign each time he uses his locker. Officer form bank looks after this matter every time at the same time he has to do other task since there is no full time officer for locker system. Customers have to wait if concern officer is busy in his important work; as soon as officer becomes free he will provide the service to customer. Initially he will register the name of customer in register then he will go in locker room to open the locker by inserting master key and then customer can open the locker by inserting his key. This is a time consuming job and for each and every time concern officer has to go in to the locker room.

Recently there was a case in bank robbery where robbers robbed customer's valuable things by digging a tunnel and reached strong room where they cut lockers. Also in few recent cases it was found in India where some internal officer made duplicate locker keys and then used it for robbery. In Banks a manual record is maintained for the locker system so there might be possibility of allowing non authorized family to access locker. Also if keys of locker are misplaced then also there is possibility of robbing locker.

These all cases points' to the following loop holes in the present system. Security and maintenance of locker system in banks has always been a matter of concern for administrations.

In this paper focus is on bank locker system where locker area is highly secured by only the owner of the locker not by particular bank or organization. The locks that are used in banks are manual and are not protective. Security guard or some employee is required to open and close the security door. It is very easy for thieves and burglars to unlock them. So we need another one improved security locking system with new electronics system and technology.

III. PROPOSED SYSTEM

Whenever user has to access locker he has to go through some procedure and after he is given his key of locker he is assisted by bank employer. Because of this system there might be possibility of illegal access to locker. This can be overcome with the automatic locker system. There are lot many techniques which can provide secure locker system. In this paper we have implemented a blank locker security system using RFID and GSM technology. RFID tags are used in this project which holds the user's information like his name, locker number assigned to his locker etc. In the existing project RFID tag is read by the RFID reader, which will help customer to open his lock electronically. As locker system is electronic, security is guaranteed and the customers waiting time is reduced.

Here we have designed locker system which consists of main locker and two sub locker in which documents jewelry and other valuable things are kept. The RFID tag and GSM modem are connected to the box along with the ARM processor. GSM modem interfaced to ARM processor always sends the report of activities to customer via text messages. The overview of proposed system is shown in figure.

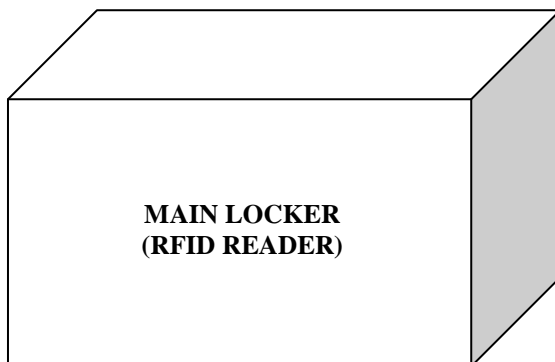


Fig.1. Overview of Proposed System

This system uses the technologies like RFID for identification, GSM for communication which has been controlled by an ARM controller depending on the real time clock. A motorized mechanism is used to lock and unlock the hard metal box.

TECHNOLOGIES USED

1. RFID

RFID is one of the numerous wireless technologies that collect information of any object or any item without touching or seeing the data carrier by using electromagnetic waves from a tag which is attached to the object. Basically RFID system is formed by RFID tag and antenna. The tag is the basic building block of RFID. RFID tag is a combination of antenna and a silicon chip that contains a radio receiver. Antenna in tag is used for transmitting and receiving purpose. The chip or IC used in tag consists of user information. This entire antenna and chip are mounted on a PCB just to hold these components together. RFID also consists of RFID reader and host computer. Reader sends electromagnetic signal to tag and waits for the response coming from tag.

When tag senses this energy signal it sends the user number and other relevant information which is present in the tag.

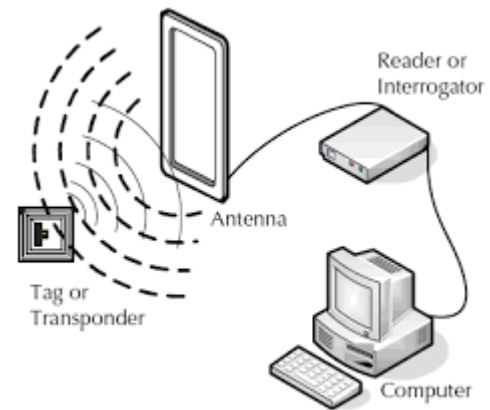


Figure.2.RFID system

2. GSM

GSM stands for Global System for Mobile communications. Earlier when there was development in communication system, there were many analog systems like AMPS, TACS. But they were bounded only to certain area and for particular countries which created problem. Solution to this problem was GSM. GSM is a globally accepted digital cellular technology used to transmit voice and data service such as SMS. GSM includes basically include two bands 900MHz and 1800MHz. In our project we have used GSM modem SIM900A. It can accept any GSM SIM card and can act like a mobile phone with its own unique number.



Fig.3. GSM Module

HARDWARE DESIGN

The proposed hardware design for the system is as shown in figure. The heart of the system is ARM7 Micro controller LPC2148 with Real Time Clock (RTC). Along with it many components are used such as RFID tag and Reader, GSM modem, Key matrix, DC motor and motor driver IC (L293D), LCD display etc are used.

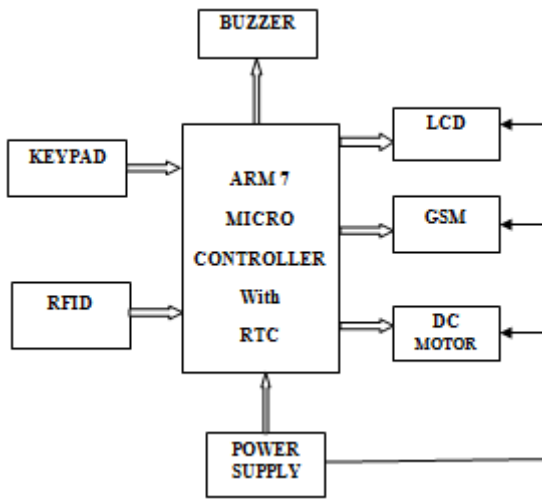


Fig.4. Block diagram of proposed system

ARM7 Micro controller (LPC2148)

ARM7 is the most popular 32 bit microcontroller in embedded family developed by Acorn computers limited. It is based on Reduced instruction set computing (RISC) architecture. This architecture provides less power consumption, reduces heat and also reduces cost. LPC2148 is a IC manufactured by Philips from ARM7 family. It provides real time emulation and embedded trace support along with flash memory having a range about 32 KB to 512 KB and on chip RAM ranging from 8 KB to 40KB. In our project ARM controller LPC2148 is used to control the function of the locker security system. It controls the motorized locking mechanism comparing on RTC and attributes stored in Electrically Erasable Programmable Read only memory (EEPROM) only after a valid RFID tag is swiped.

LCD Display

A liquid crystal display is a flat panel display, electronic visual display that uses light modulating properties of liquid crystals which is used to display the messages for local user. It is a 16x2 characters display.

Keypad

Keypad is a set of various buttons having different symbols numbers and alphabets arranged in a array. We have different types of key pads available in market like push button keypad, membrane switch keypad, resistive touch keypad, capacitive touch keypad, etc. In our project we need to type password so out of various keypads, the push button keypad is to be used due to high rigidity as well as low cost as compare to other keypads.

DC Motor and Motor driver

The function of the motor is to convert electrical energy to mechanical energy. In order to open and close locker box we require motor circuit where we need to drive DC motor in two directions. Instead of developing a circuit we have single integrated circuit package as L293. Along with L293 one more IC is present that is L293D which has fly back diodes to reduce voltage spikes. IC L293 and L293D is designed to work at voltage range from 4.5 V to 36 V.

MAX232

The MAX232 is a 16 pin IC, used with RS232 in communication system that converts signals from an RS232 serial port to signals which is required to make TTL compatible with PC serial port.

SOFTWARE REQUIREMENT

To run LPC2148 microcontroller there are number of software for compiling and debugging of the code. Kiel is being one of them is widely used IDE for LPC family of microcontrollers. And Flash magic is used to load the hex file created by the compiler on to the development board of LPC2148.

IV. WORK FLOW OF THE SYSTEM

- A person can access his locker only if he has his RFID tag. So when customer will swipe his RFID tag on RFID reader module, then the RFID module will check whether the data is having a match with the record that was saved when the person got his locker.
- Whenever a customer swipes his RFID tag a message is sent to his mobile through GSM module. And if correct RFID is swiped motorized lockers will get open then he receives a message as "Locker is opened".
- Also if RFID address is wrong a message is sent to customer as "Inauthentic User". As banks has there working time, so even if a correct RFID tag is swiped

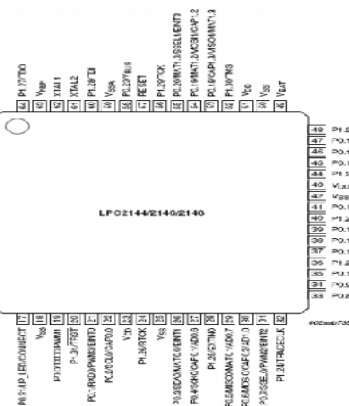


Fig.5. Pin Diagram of ARM 7

Real Time Clock (RTC)

As the system is to secure bank lockers, so the embedded system should have continuous record of all activities. For this purpose there should be a clock which should be continuously in working state. And RTC is the solution. RTC is a digital clock which stores date, time and all details even if the system is in idle state. ARM7 controller has an inbuilt low power RTC that maintains date calendar and other information.

on time other than bank time, the lock of Locker will not be opened.

- As soon as main Locker is opened successfully, there's another security system. In order to open sub locker which consist of all valuables there is keypad to enter password. If the customer types correct password then only sub locker is opened otherwise processor sends a message through GSM Module as "Wrong password".
- Once sub locker is used it will be closed after entering a closing password and again a message will be received as "Sub Locker Closed". After some delay of about 60 sec main locker will be closed and a message will be received "Main Locker Closed".

V. PERFORMANCE AND ANALYSIS

- It provides 2-level security. The first security feature is RFID technology to open the lock of LOCKER while the second using keypad to open the lock of the sub Locker.
- The system also communicates with the authorized person for valid as well as invalid RFID tag and key combinations via a SMS through GSM modem.
- The system has LCD display which shows all instructions to follow. Also whenever RFID is swiped there is LED blink and also a buzzer indication.

VI. CONCLUSION

In this project we have used RFID, password verification using keypad and GSM technology that will provide high security in the areas like of Bank, Office, and Industry. In this the future extension can be made by adding the Digital Image Processing using biometrics and face recognition and it will ensure high security.

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