# Library Automation System Using Em

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**Abstract -** *– Radio Frequency Identification (EM) is a new generation of Auto Identification and data collection technology which helps to automate the process and allows identification of a large number of tagged books, using radio waves. EM-based Library Automation System would allow fast transaction flow for the library and will prove immediate and long-term benefits to the library in traceability and security. In this paper, we will see how EM technology is recommended for library automation system. EM technology is not just there to tags books and other assets; it will provide upgrade operations for everyone concerned with the library and comprehensive route for enhancing all library services. This paper also presents experimental results of EM tag detection when attached to different materials and its effect on detection range.*

## 1.INTRODUCTION

A library is a Bunch of books, sources, resources, information and services, and the structure in which it is housed. In many libraries apart from books there are now also repositories and access points for maps, prints and other documents on various storage media such as microform, CDs, cassettes, videotapes, and DVDs. In Libraries, materials are arranged in an order according to a classification system so that items collections and may be located quickly and browsed efficiently. Current library management systems use barcode technology and security strips. But barcodes and security strips (electronic article surveillance or EAS) have their limitations. The main problems these ancient libraries face are thefts, non-returns, and missfiled Items. All these lead to irreparable loss to a library and its valuable inventory stock. To overcome the limitations of barcode and security strips, we have decided to use the new technology which increases efficiency, productivity and enhance user satisfaction for the library such as EM technology. EM technologies are poised to revolutionize the way that electronic devices and the human who use them will interact in the future. In the spirit of such new technology, the objective of this project is to implement a library automation system using EM technology The paper is organized as follows; introduction to EM-based Library System is given in part II. This is followed by detail information of EM Reader and EM Tag in part III. Design based on EM reader interfaced to a Microcontroller for Library automation is given in part IV. The experimental result is taken up in subsequent part V. Concluding remark

and extending the scope of the paper is given in part VI followed by the reference.

## 2. EM BASED LIBRARY

An EM system consists of: A smart label, a reader or hardware for interrogating the smart label software for controlling the hardware and decoding the responses from smart labels in a library, all books must be tagged with EM. The tag is made up of a microchip with an antenna, the transmitter/reader also has an antenna with an external coil that sends out electromagnetic waves to tag. The tag antenna is tuned to receive these waves. A passive EM tag draws power from the field created by the transmitter/reader and uses it to power the microchip's circuits. The tag chip then modulates the waves with stored data and sends back to the reader, which demodulates the new waves into digital data.
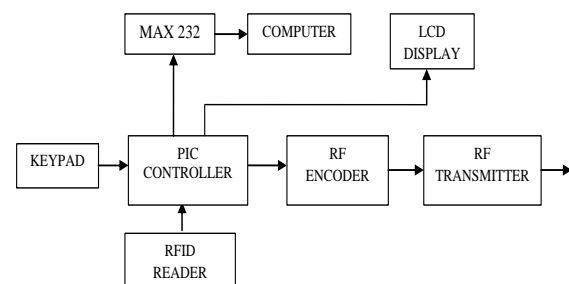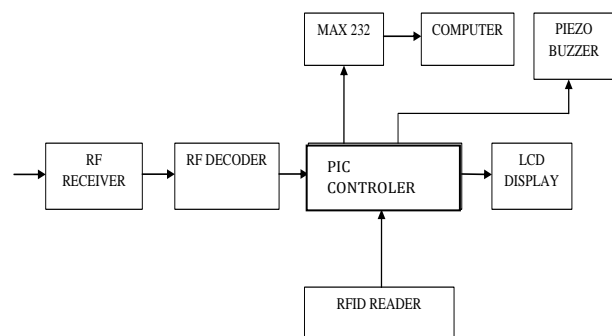


Fig.1.   Counter side



Fig. 2.   Door Section

EM  transmitter/reader is composed of three parts: an

antenna, RF electronics module, which is responsible for communicating with the EM tag, and an electronics module, which communicates with the pic-controller as shown in Figure1.

The microcontroller is interfaced with the Com-puter, which consists of the application software to manage the record of the books. The applications software would have the APIs (API: Applica-tins Programming Interface) necessary to interface the EM system with the server, etc. so as to achieve automated library system. EM application software is generally a browser-based management interface for centralized monitoring. The software enables safe, secure and highly efficient movement of library items by asset tracking and prevents loss or tampering.

Conceptual EM based Library Management System is shown in Figure2. A Library member can perform either of the 2 operations: Issue the book or Return the book at their respective counter. The EM tag located on the cover of the book when comes into the EMF field of the EM reader located at the counter, sends back the Unique ID (UID) through the same EMF field. The UID read by the EM reader is sent to pic-controller, which is compared with the ID stored permanently in its ROM.

If the ID matches

At Issuing Counter: The book is issued on the UID of the Library Member, and updates the database at the Computer.
At Returning Counter: The entry of the book on the UID of the Library Member is removed and updates
The database at the Computer.
If any Library Member try to leave the Library without issuing the Book, then the EM reader at the gate checks the database and if found any non issued book the system rings an alarm.



Fig. 2.1.   EM based Library Management System

## 3. EM TAG AND EM READER

Radio Frequency Identification (EM ) Card Readers provide a low-cost solution to read passive EM transponder tags up to 2 inches away. Figure 3 shows a EM Card Reader that can be used in a wide variety of hobbyist and commercial applications, including access control, automatic identification, robotics navigation, inventory tracking, payment systems, and car immobilization [1] . The EM card

reader read the EM tag in range and outputs unique identification code of the tag at baud rate of 9600 bps. The data from EM reader can be interfaced to be read by pic-controller or PC.



Fig. 3.   EM Reader A. EM Tag

Various types of EM tags available in the market are given below

Active: EM Identification system in which tags have their own power source (usually a battery), enabling them to broadcast an identifying signal.
Passive: EM Identification system in which the tags are Not powered, relying on active signals from the location transmitters for their response.
RSSI: Received Signal Strength Indication is an algorithm that determines the location of an Active tag by measuring the power of radio signals.
TDOA: TDOA typically works best in outdoor environments or large open indoor environments.

Passive EM Tag is suitable for Library system [1] [2]. It is made up of a chip and antenna as shown in Figure 4. For reusable applications, it is typically embedded in a plastic housing, and for tracking shipments, it is usually part of a "smart" packaging label. Identification system, in which the tags are not powered, is relying on active signals from the location transmitters for their response. This limits the range of the tags to a few feet.
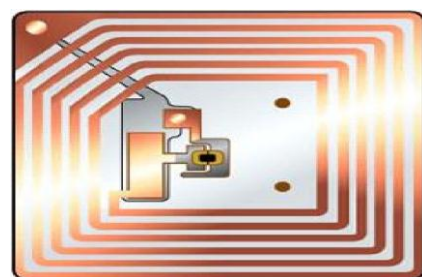


Fig. 3.1.   EM Tag

## 4. SYSTEM IMPLEMENTATION

To design and develop the proof of concept it involves the following hardware and software requirements. Hardware Requirement: Microcontroller P89v51RD2, LCD, EM Reader, EM Tags,
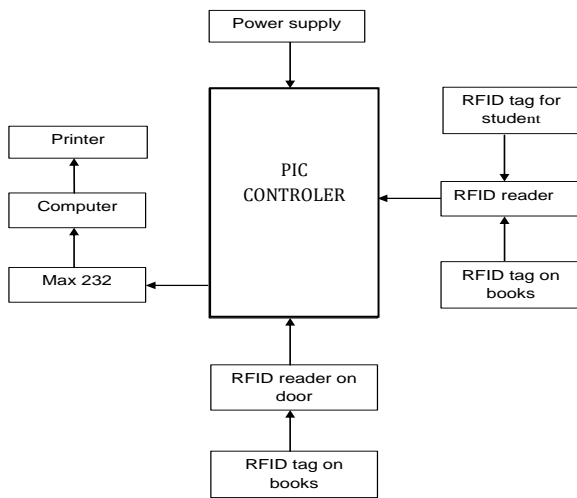RS 232 connection and Computer and Software Requirement: KEIL version 3, FLASHMAGIC version 8.31

Fig. 4.   Block Diagram

The complete block diagram is shown in Figure 5. In above library system we are using two EM  readers, EM reader-1 for books and EM  reader-2 for students. The overall functioning is as follows:

Step 1: Apply the power supply to pic-controller and EM reader

Step 2: Initialize the pic controller and testing of EM  reader.

Step 3: EM  reader-1 is interfaced with pic-controller to read the code for EM  Tag on book.

Step 4: EM  reader-2 (student) is interfaced with pic-controller for maintaining the record of books issues and return from student in library

Step 5: pic-controller is interfaced with com-puter.

Step 6: EM  Tag is attached on books which contain unique code for every book to provide the information about the book.

Step 7: EM  Tag for student as ID card is providing all the information of student to maintain the record of books issues and return by that student

Step 8: EM  reader on door is interfaced with microcontroller for theft detection if any person takes the book without any entry then buzzer starts sounding for indication.

The application program is written in Embedded C. We have used KEIL 4 [5] version for compiling the written code and generates the various compiled files for programming the controller. After successful implementation and testing some additional experimentation are carried out with respect to EM  card detection as given in next section.

This experimentation is carried out to find the range of EM tag detection when applied on different surfaces as suggested in [6] for experimental purpose we measure the variation of detection range of various types of tags under different intervening medium. The complete system is as shown in Figure 6
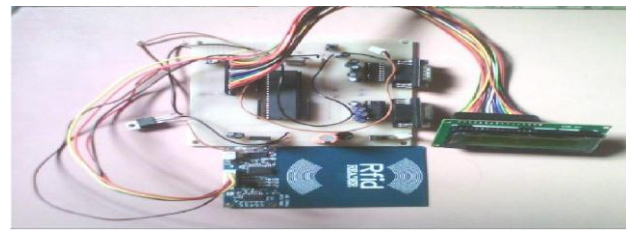


**TABLE I**

DETECTION RANGE OF EM  TAGS FOR VARIOUS INTERVENING

TABLE I
DETECTION RANGE OF EM  TAGS FOR VARIOUS INTERVENING
MEDIUM

| Medium | Range (cm) | Remark |
|---|---|---|
| Air | 15.5 | Detected |
| Plywood | 14.8 | Detected |
| Metal sheet on reader | - | Undetected |

## 5. CONCLUSIONS

In this paper, we have presented how EM technology can be used in library automation system .The EM  technology. Consist of two parts: 1.EM  reader 2.EM tag. We have successfully implemented and tested the system in laboratory. In order to use the same system in actual library, we have also carried out experimentation to find out detection range of EM  tags under different intervening medium.

Experimental results show that placement of the tag is very crucial. Also more care has to be taken in case someone tries to take away the book without issuing by blocking EM reader with some tact's like metal shield etc.

Future scope includes installation of substation of central library for flexibility of customer to return book and can send message via GSM system to central library. We can install similar system in hospital for patient record , hotel management, industries ,toll tax etc. The EM  card used in library can be used in multiple application such student I-card , mess card etc

## REFERENCES

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