

LIBRARY MANAGEMENT SYSTEM BASED ON RFID TECHNOLOGY AND GSM

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Abstract-- RFID systems are becoming very popular nowadays as they play a very vital role in reducing theft with less human effort. RFID reader and tags are used to started in industries, Shopping malls, and Departmental stores for efficient management. This system is become an integral part of our day to day life. RFID in libraries are a developing technology and is being implemented in small in small and medium sized libraries. Implementation of RFID will help in reducing the work burden of the administrator as well as the user in arranging and searching the books respectively. In this paper we are using RFID technology identification of books and person based on unique tag number. The Arduino microcontroller will process the RFID data and send back to personal computer database in which books and person database will maintain. The database is created using Microsoft access.

Index Terms- RFID-Radio Frequency and Identification, GSM- Global System for Mobile, Arduino, VB- Virtual Basic, MIC- Microcontroller

I. INTRODUCTION

Radio-Frequency Identification (RFID) devices have an important presence in our daily life and will become appearing in the near future. RFID technology is being implemented in a number of industries. Supply chain implementation is one of the most frequently mentioned applications of RFID tags and equipment. The bar-code system used in libraries is very time consuming and labor intensive. In the opposite, the RFID system provides a solution to effectively collect, manage, and distribute items. The RFID tag does not have to be visible for detection. It can be read even when it is embedded in an item, such as in the cardboard cover of a book or in the packaging of a product. It can also store data such as stack number, accession number, book number, author information etc. but barcode is limited to just an identification number. RFID significantly reduces the efforts involved in management of records.

In practical applications of using RFID technology, a tag is attached to an object used to identify the target. When object passes through the area that the reader can read, the tag and the reader builds up the radio signal connection. The tag sends its information to the reader, such as unique code and other data stored. The reader receives this information and decodes it, and then sends it to a host computer, so as to complete the whole information processing. The database is created using Microsoft access. The database can be updated by entering the data in forms created using VB.

II. EXISTING SYSTEM

Now the currently library system are employed with the bar code technology. In the library, all books are provided with the bar code. The bar code techniques are differs with the thickness of the lines. This type of library management system is controlled manually. All the major function of library like issuing, reissuing, and returning of the books needs to be monitored. The capability of barcodes reader is to be read only one code at a time. Reader is also lead to a long queue at a counter of issue and return. Barcode need to be manufacture programmed at a time & these codes can be programmed only one time. Its have one properties that is codes cannot be altered. Every code are printed on a piece and attached on the books. During the both the function, issue and return of the books the bar code reader read direct line of contact with the bar code. It is compulsory to make operation manually if it is possible. It is very time taking consuming process. The reader need to be placed near the barcode tag for the book to be read clearly in each time. The barcode readers have very small range for reading.

III. PROPOSED SYSTEM

This system is proposed on the RFID technology where RFID tags are joined into the books, & on the user card and RFID reader are used to read RFID tags properly, and theft controlled operation for library system. GSM system is also used in this system. GSM technology is used to alert the user's book taken, due date for return and if not return on a time then the fine to be paid.

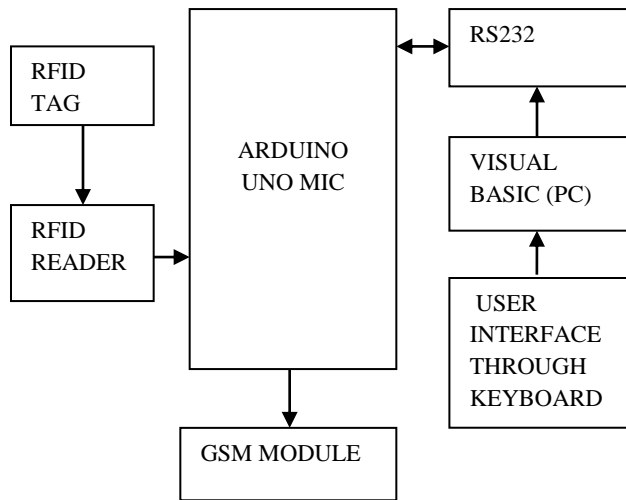


Figure 1: Block diagram of LMS

Fig 1 shows block diagram of LMS. It consist of RFID tag, RFID reader, Arduino Microcontroller, GSM module as system requirement. Each Book is stick with RFID tag and Each student Identity card stick with RFID tag with a unique code. There is RFID reader to scan this unique code. To access the LMS features there will be user interface to student such as Issue Book, Return Book provide on the desktop application. If student want to take book he can take by clicking on issue book option same if he want to return book he can click on Return book option. When student click on Issue book he has to take book near RFID reader then reader will fetch unique code from book tag and will send back to Arduino MIC for further processing. Arduino MIC will send this code to database which is created using Microsoft access and VB through RS232 serial communication. After this database will be updated. At each transaction student will get an SMS through GSM module.

Component Used:

1. RFID:

It is the wireless non contact system that uses radio frequency EM waves to transfer data from a tag attached to an object, for automatic identification and tracking. A Radio-Frequency Identification system has three parts that are –a scanning antenna ,a transceiver with a decoder to interpret the data, a transponder - the RFID tag - that has been programmed with information. The scanning antenna puts out radio-frequency signals in a relatively short range. The RF radiation provides a means of communicating with the transponder (the RFID tag) and provides the RFID tag with the energy to communicate (in the case of passive RFID tags).The scanning antennas can be permanently affixed to a surface, handheld antennas are also available.

They can take whatever shape you need; for example, you could build them into a door frame to accept data from persons or objects passing through. When an RFID tag passes through the field of the scanning antenna, it detects the activation signal from the antenna. That "wakes up" the RFID chip, and it transmits the information on its microchip to be picked up by the scanning antenna. The RF low frequency range 120- 150 KHz is used for the data transmission.

READER:

Readers come in many forms, operate on different frequencies, and may offer a wide range of functionality. Readers may have their own processing power and internal storage, and may offer network connectivity.



Figure 2: RFID reader

They are electronically programmed with unique information. There are many different types of RFID systems out in the market. They are categorized according to their frequency ranges. Some of the most commonly used RFID kits are as follows:

1. Low-frequency (30 KHz to 500 KHz)
2. Mid-Frequency (900 KHz to 1500MHz)
3. High Frequency (2.4GHz to 2.5GHz)

These frequency ranges mostly tell the RF ranges of the tags from low frequency tag ranging from 3m to 5m, which is the one that we have chosen.

TAG:

A RFID tag is shown in figure .The antenna is clearly visible. The antenna has the largest impact of the size of the tag. The microchip is visible in the center of the tag, and since this is a passive tag it does not have an internal power source .RFID Tags are attached to books and student identity card. Radio Frequency (RF) tags or transponders transmit the data to a reader. Tag readers interrogate tags for their contents by broadcasting an RF signal. Tags respond by transmitting back resident data, typically including a unique serial number. RFID tags store some sort of identification number .A reader retrieves information about the ID number from a database, and acts upon it accordingly. RFID tags can also contain writable memory, which can store information for transfer to various RFID readers in different locations.

This information can track the movement of the tagged item, making that information available to each reader. RFID tags fall into two general categories, active and passive, depending on their source of electrical power. Active RFID tags contain their own power source, usually an on-board battery. Passive tags obtain power from the signal of an external reader.

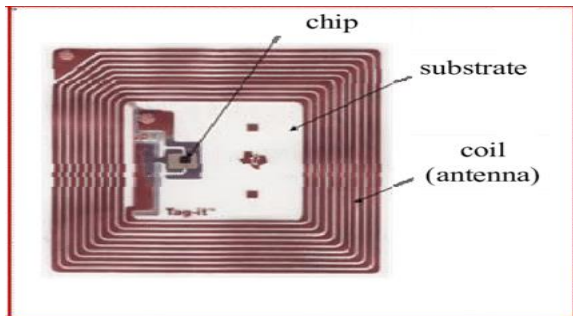


Figure 3: RFID tag

2. Arduino Uno MIC:

Arduino Uno is a microcontroller board based on 8-bit ATmega328P microcontroller. Along with ATmega328P, it consists other components such as crystal oscillator, serial communication, voltage regulator, etc. to support the microcontroller. Arduino Uno has 14 digital input/output pins (out of which 6 can be used as PWM outputs), 6 analog input pins, a USB connection, A Power barrel jack, an ICSP header and a reset button.

Arduino can be used to communicate with a computer, another Arduino board or other microcontrollers. The ATmega328P microcontroller provides UART TTL (5V) serial communication which can be done using digital pin 0 (Rx) and digital pin 1 (Tx). The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino board. There are two RX and TX LEDs on the arduino board which will flash when data is being transmitted via the USB-to-serial chip and USB connection to the computer (not for serial communication on pins 0 and 1). A Software Serial library allows for serial communication on any of the Uno's digital pins.

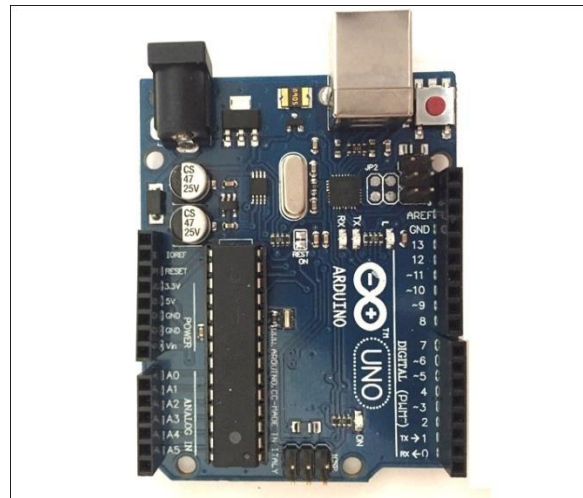


Figure 4: Arduino Uno MIC

3. GSM:

Features:

1. Single supply voltage: 3.4V – 4.5V.
2. Power saving mode: Typical power consumption in Sleep mode is 1.5mA.
3. Frequency bands: SIM900A Dual-band: EGSM900, DCS1800. The SIM900A can

search the two frequency bands automatically. The frequency bands also can be set by AT command.

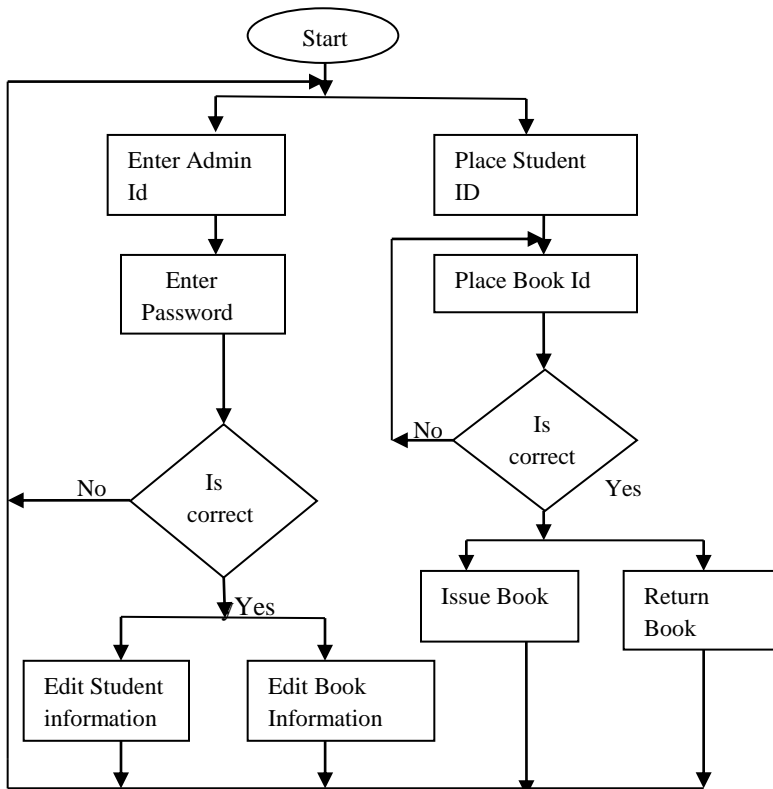
4. GPRS connectivity: GPRS multi-slot class 10 (default) , GPRS multi-slot class 8 (option)
5. Transmitting power: Class 4 (2W) at EGSM 900, Class 1 (1W) at DCS 1800
6. DATA GPRS: download transfer max is 85.6KBps, Upload transfer max 42.8KBps.



Figure 4: GSM module

IV. DESIGN FLOW:

Flowchart:



Different cases used in the system are:

1. Issue Book:
In this case student can take book by simply clicking on Issue button provided in application.
2. Return Book:
In this case student can return book by click on Return book button provided in application.
3. Add Book:
This case is available to Admin only student cannot access this case. Admin can new book into the database.
4. Remove Book:
In this case Admin can remove book from database. This case is also available to admin only.
5. Add Student:
In this case Admin can add new student in database by clicking on Add student button provided in application.
6. Search Book:
In this case student as well as admin can search book into database by clicking on Search book button.

V. IMPLEMENTATION

1. Login form:

```

Option Compare Database
Private Sub LOGIN_Click()
Dim password As String
Dim temppass As String
password = Me.ID.Column(1)
temppass = Me.PASS
If password = temppass Then
    DoCmd.OpenForm "HOME_PAGE"
    Me.PASS.Value = ""
Else
    MsgBox "you entered wrong password"
End If
End Sub
    
```

2. Student Form:

3. Book Form:

4. Issue Book Form:

VI. CONCLUSION

RFID technology is found to be a versatile technology in many real time applications, especially in library management system. This provides an intelligent library management, which creates better service quality with quick and effective benefits to both library management and students. This technology can be applied to a system of volume. Either it may be a small departmental library or vast university library its effects are more obvious and applicable. This RFID technology also provides the facility of self check for the library staff and non-returned books effectively. So, it is expected that this RFID technology will soon replace the presently existing technology method. The proposed system successfully implemented in our library and it is satisfactory working. The present work is intended to further, by adding web technology. This web technology can provide additional technology of searching the books present in the library using their computers or mobile devices. For these online services a suitable web based system is under process in our university. For this purpose, the new features available in RFID and internet technologies are to be applied effectively, and planned to develop in this application.

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