

# RFID BASED LIBRARY MANAGEMENT SYSTEM

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*Abstract—RFID systems are becoming very popular nowadays as they play a very vital role in reducing thefts with less human effort. Industries, shopping malls and departmental stores have started using RFID tags and readers in order to reduce the theft. Nowadays RFID systems have become an integral part of 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 the present systems employed there are special methodologies for arrangement of books, journals, DVDs and so on. These techniques need to be strictly followed in order to help the users find their book or their requisites. This paper helps in finding a solution to this tedious problem faced by most libraries in an easy way.*

*Keywords— RFID-Radio Frequency and Identification, GSM-Global System for Mobile, LCD-Liquid Crystal Display, RS-232-Standard for serial communication, Tag-A small label consisting of a piece of information*

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## I. INTRODUCTION

RFID was invented in 1969 and is now being used in numerous applications. When used in industries or retail shops they generally hold the cost of the good. Also in a grocery shop the goods once left have least chances of coming back again. This is not the case when used in a library, as the books are issued and given a specific period of time within which the book needs to be returned. The same book may be taken again and again depending on the requirement of the users. Also the users are also provided with unique identification codes. The users may use the library more than once. So the reader will have to read the same tag more than once.

RFID is an automatic identification technique used for the fast transaction of books, journals or DVDs using RFID tags and readers. The RFID technology helps in fast issuing, returning, and reissuing of books. The technology helps in direct transaction of information from the tags to the PC of the librarian and in automatic updation of transactions in the users account. The RFID tags can be programmed unique code. This code gets read when passing through the RFID reader. When a tag crosses the reader the reader recognizes the unique code and updates the account of the user. Modern readers have the capability of reading upto 15 tags at a time. The frequency range is upto 13.5 Hz and has a wide read range of about 2 meters.

The RFID tags are embedded into the books and are not visible for detection. The readers since they have a wide read range unlike bar code readers have the capability to read the tags even when they are embedded within the books. Special care and attention should be given in programming the tags since they are mostly programmable only once. These tags can store stack number, accession number, book number, author information etc., but the bar code technology is limited to only the identification number. The programming cost of RFID tags are much costlier than the barcodes but it should be noted that the same tag can be reprogrammed if necessary. Depending on the applications added the cost of tag increases.

## II. EXISTING SYSTEM

An easy way to comply with the conference paper formatting requirements is to use this document as a template and simply type your text into it. The current library systems are employed with barcode technology. Every book in the library is provided with a barcode. The uniqueness of the barcode varies with the thickness of the lines. This type of library management requires manual control. All the major functions of the library such as issuing, reissuing and returning of books needs to be monitored and controlled manually. The barcode readers have the capability to read only one code at a time and therefore at most occasions it leads to a long queue at the issue and return counters. The barcodes need to be programmed at the time of manufacture and these codes can be programmed only once. Once defined the properties of the codes cannot be altered. The codes are printed on a piece of paper and pasted on the books.

During both issue and return of the books the bar-code reader should have direct line of contact with the bar code. For making this possible it is compulsory to make the operation manual. Even under manual operation it is very tedious and time consuming process since each time the reader needs to be placed very near to the barcode tag for the book to be read properly. The bar-code readers have a very small read range of about very few centimetres to make the job tiresome.

### DRAWBACKS OF BARCODE TECHNOLOGY

- Barcode readers require a direct line of sight, using laser technology
- Scan and read one tag at a time and also time consuming
- Human intervention is required to scan a barcode
- It should be visible on the product for scanning
- Does not have read/write memory

- The readability of the barcode can be impaired by dirt, moisture, abrasion and packaging etc..
- Less read range & Holds fixed and Limited data
- Cannot read a bar code if there is any obstacle between the reader and the bar code

### III.

### PROPOSED SYSTEM

The proposed system is based on the RFID technology where RFID tags are embedded on the books and on the user cards and RFID readers are used to read these tags for proper, efficient and theft controlled operation of libraries. Most of the drawbacks associated with the bar-code technology can be overcome using the proposed system. GSM technology is used in the proposed system in order to alert the user with the books taken, due date for return and the fine to be paid if not returned on time.

#### BLOCK DIAGRAM

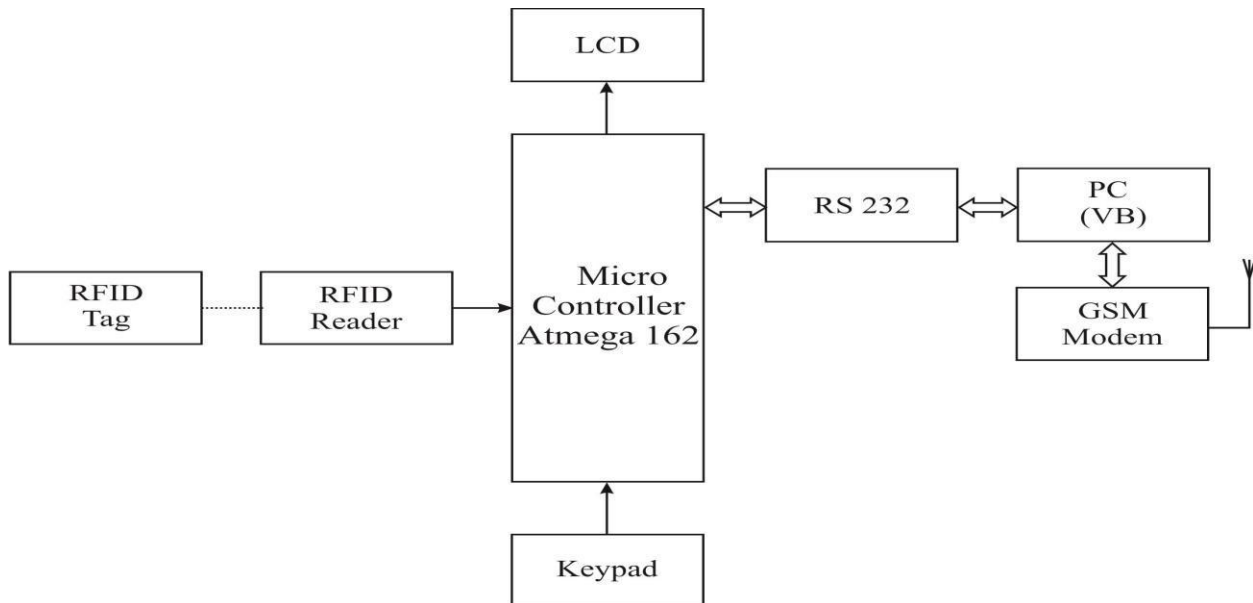


Fig 1. BLOCK DIAGRAM

The RFID tags are placed on every book and on the ID card of the user. Attention is given while programming these tags as they consist of unique codes. A unique 16 digit code is programmed such that the first seven digits are same for the users of a batch (say first year) the next nine digits will vary from person to person. Similarly the books of the same category will have same code for the first seven digits and unique id for the next digits. Thus by looking into the first seven digits it is possible to find the category of books as well as identify the batch of students. The readers are mounted on the entry and exit doors. As the tags pass through the doors they are read and communicated to the PC of the library administrator through the RS-232 cable after the computation process of the microcontroller Atmega 162. The identity of the people entering into the library is displayed in the LCD display. As the user leaves the library after picking a book a SMS alert is given to the user regarding the book issued and the date of return. Similarly a SMS is sent after the person returns the book. If failed to return within the due date, daily reminders are given along with the fine amount to be paid to the library. Two or three members shall be appointed in the library in order to arrange the books returned and to collect the fine amounts. The misplacement of books in any shelf can be easily identified and arranged properly by using the RFID handheld reader. Keypad is used in order to view the history of books taken returned by the user through a period of time. Separate keys are provided for issue, return and stock check in case if passive tags are used. If active tags are used keypad shall be used only for checking the history of each user.

#### COMPONENTS USED:

##### MICROCONTROLLER

The microcontroller used in our system is ATmega162. It is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega162 achieves throughputs approaching 1 MIPS per MHz allowing the system designer to optimize power consumption versus processing speed.

## RFID TAGS



FIG 2: RFID TAG

RFID tags are generally of two types namely active tags and passive tags. Active tags have a very wide read range and hence they are costly. These are very efficient to use. Passive tags need to be energised through a power source in order to improve their range for reading through the reader. Passive tags are inexpensive compared to active tags. Tags are generally programmed with unique codes for the user and the books.

## RFID READERS



Fig 3: RFID READER

RFID readers are mounted on the entry and exit doors of the library. These readers have the capability to read up to 15 tags at a time even if direct line of contact between the reader and the code is provided. They can read tags even if the books are carried in bags.

## RFID HANDHELD READER



Fig 4: RFID HANDHELD READER

The handheld readers are employed in order to easily identify the misplaced books in a shelf by simply making a swipe across the books. Since the tags have similar seven digits code it is easy to find out if misplacement occurs.

## RS232

In communications, RS-232 is a standard for serial binary data interconnection between a DTE (Data terminal equipment) and a DCE (Data Circuit-terminating Equipment). It is commonly used in computer serial ports. In the proposed system RS 232 is used for communication between the reader and the PC as shown in the block diagram.

## LCD DISPLAY

The LCD's are lightweight with only a few millimetres thickness. Since the LCD's consume less power, they are compatible with low power electronic circuits, and can be powered for long durations. The LCD does not generate light and so light is needed to read the display. By using backlighting, reading is possible in the dark.

The LCD's have long life and a wide operating temperature range. LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on.

## ADVANTAGES OF RFID TECHNOLOGY

- *Patrons will spend less time waiting in check-out lines by using Self Check in - Check out systems.*
- *Patrons find what they are looking for quickly & easily.*
- *Reminders for due dates allows patrons to submit borrowed materials in time.*
- *Use of book drops & return chutes for returning library material allows for flexible timings.*
- *RFID enabled patron cards allows for easy patron identification.*

## IV. IMPLEMENTATION

- Every books in the library and the ID cards of the users must be embedded with the RFID tags
- The readers must be installed at the entry and exit doors of the library
- A PC must be installed and programmed such that it enables for book search or availability of books
- A hand-held reader must be programmed to detect and identify if any misplacement of books happen

## V. CONCLUSION

The cost of initialisation of RFID based library is high but the cost of maintenance and time consumption of these libraries are reduced. RFID technology is believed to take off in libraries at an increasingly rapid pace. The RFID tag contents will increase in power, prices are expected to decline and tag will dramatically improve its efficiency, security and accuracy.

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