

RFID Based Library Automation

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Abstract- An embedded system is a computer system which performs a variety of functions. The system performs a variety of tasks; design engineers can increase its efficiency, reducing the size and cost of the product. Embedded system is made of both hardware and software. Embedded system is used in different fields like industrial automation, home appliances, automobiles, aeronautics etc. Embedded technology uses a controller to do the required task and it is programmed using assembly language programming or embedded C. Radio frequency identification (RFID) is a term which describes a system that transfers the identity of an object or person wirelessly using a radio medium. It is an automatic identification technology. This paper proposes an RFID based library management system which increases the speed of transaction flow and simplifies the issue and return of books from the library with little or no manual intervention of book keeping. The system uses RFID readers and passive RFID tags that store the information which can be read with the help of the RFID reader.

Keywords- RFID, Theft detection, Office automation

I. INTRODUCTION

Radio Frequency Identification (RFID) is a succeeding generation of automatic data collection and identification technology which helps to automate business operations and allows verification of a number of labeled objects like books, using radio waves. Library Management System (LMS) which is based on RFID will increase the transaction flow for the library and will provide instant and long standing benefits to the library in traceability and security. This system is based on UHF RFID readers, at gate and transaction section supported with antennas, and library cards containing RFID-transceivers which are capable of storing the information electronically which can be read / written without any physical contact by making use of a radio medium. This paper presents the experiments conducted to set up an RFID based LMS. The RFID based LMS facilitates the fast issuing, returning of books with the help of RFID enabled modules. It immediately provides the book information and information regarding library members to the management system of the library and does not need manual typing. It also provides record and searching systems. The recorded module will continuously record the movement of books across the gates, so that books that are taken out from the rack which are not issued will be traced out easily and the librarians will be alerted. The searching module provides the fast searching of books using an RFID reader.

II. EXISTING SYSTEM

A barcode is a visual representation of data which can be used for scanning and is interpreted by a scanning machine. Here data is represented by the width and spacing of parallel lines. Lately, barcodes have become the main standard to identify and trace objects in supply chains, wherein the objects range from food items to books. A barcode scanner can interpret the data from barcode tags. Fig 1 shows a barcode scanner.

Limitations of existing systems are

- It is read only.
- Needs direct visible contact to reader.
- Scans only a single item.
- It propagates along the line of sight.
- Limited lifetime due to printing.
- Stock verification takes time because of the fact that each book has to be taken out from the shelf and then scanned with the scanner.



Fig 1: Barcode Scanner

III. PROPOSED SYSTEM

The proposed system is based on UHF RFID readers, supported with antennas at gate and transaction sections, and library cards containing RFID-transponders which are able to electronically store information that can be read / written even without the physical contact with the help of radio medium. RFID based Library Management system (LMS) would allow fast transaction flow for the library and will prove immediate and long term benefits to library in traceability and security. In this project we are going to monitor the light and temperature of the library and maintain those conditions in the library when a user is in the library. The number of person count is displayed in the LCD.

and fans are more, a driver IC in between these and the microcontroller.

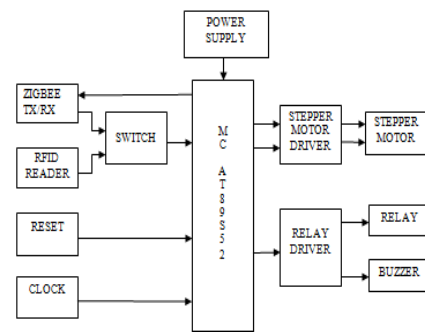


Fig 3: Rack Side

b) Rack side

ZigBee is used to transmit and receive messages to and from the door side. RFID reader is used to verify the user's while issuing and return of books. Stepper motor is attached to all the racks for automatic opening and closing of racks. Buzzer is used to alert when a wrong book is showed to the reader at the time of return.

IV. METHODOLOGY

The main concern is on the theft detection. A microcontroller interfaced with two RFID readers is used, one at the librarian side and another at door side. Each book will be having its own RFID tag.

A person enters a library by showing his card to RFID reader located at the door side, that is the door opens only when it detects a card. Lights will be switched on automatically by sensing the presence of a person. Fans will be turned on by sensing the temperature conditions.

LCD display at the door side displays the count of people entering the library. The user is asked to enter the code of book which he requires.

This information is sent to the rack side through the Zigbee Tx/Rx. The rack side LCD will display the information received from the door side. The user is asked to show his/her RFID card for verification. If he/she was a legitimate user then the requested book will be pop out from the rack and the user takes the book. The rack side LCD displays that the book was issued and this information is sent to the door side through another Zigbee Tx/Rx. After receiving this information the LCD at the door side displays the updated count of books. The whole issuing of books process can be done in the absence of librarian.

A librarian is required when returning of books in order to check whether all the pages are intact. The user chooses the key for return at the door side, this information

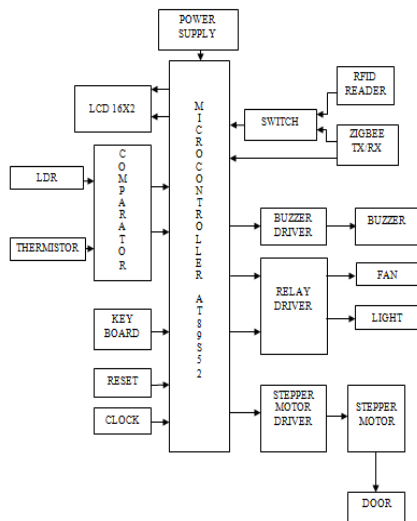


Fig 2: Server/Door Side

a) Server/Door Side

When a RFID reader detects a RFID card at the door, the door opens by the operation of stepper motor. Comparator compares the present value with predefined values and determines whether the lights and fans should be switched on. LDR senses the presence of a person and switches on the lights. Depending on the temperature condition the fans will be switched on. ZigBee is used to transmit and receive information to and from the rack side. The required information is displayed on the LCD. The required code words for books are given with the help of keypad. Buzzer is used as an alarm whenever somebody tries to take a magazine/reference book out of the library. The maximum operating voltage of microcontroller is 5V, since the operating voltages of stepper motor, buzzer, lights

is transmitted to the rack side by Zigbee Tx/Rx. The LCD near the rack side asks for both the librarian RFID card as well as user RFID card and if both the RFID cards are detected only then the rack opens and the user can return the book. This information is again transmitted back to the door side with the help of another Zigbee Tx/Rx and the information is updated. And the stepper motor is used to show that rack door is opening and closing. In this project the library door monitors both the persons and books at the library. Each card will be having its own identity no and microcontroller will store these card numbers. Then the microcontroller will compare information's from door side and if it finds any unregistered books like reference books and magazines then it switch on the buzzer, so that we can capture the thief. Even librarian is having the own ID card which he can use to retrieve the books back from students.

a. Issue of Books:

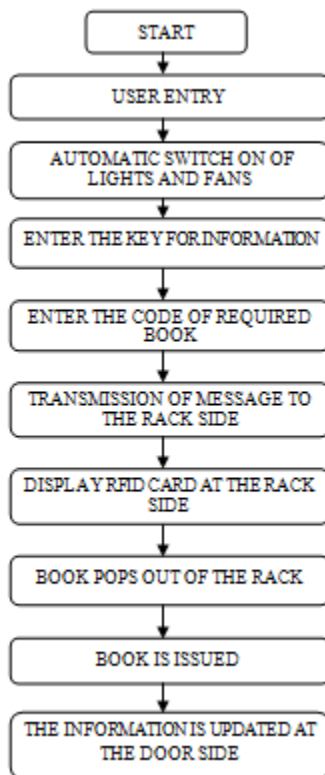


Fig 6: Flowchart of issuing books

User enters the library. Lights and fans will be switched on automatically depending on the surrounding conditions. User has to press ENTER key to know the information about the books available. The information is displayed on the LCD and he/she is asked to press the code of required book. This information is transmitted to rack side using ZigBee. The corresponding rack door opens and the user takes the book. This information that the book is issued to

the user is transmitted to door side using ZigBee. The LCD at the door side displays the updated information.

b. Return of books:

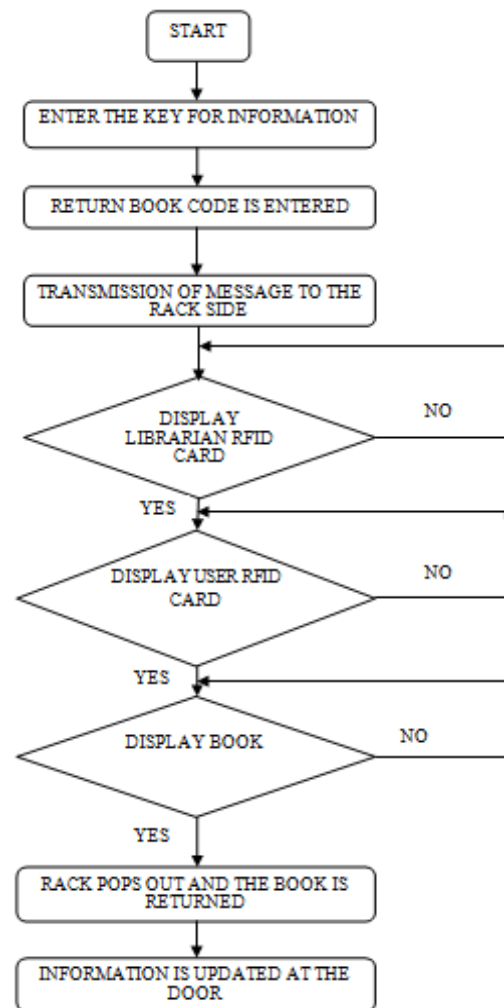


Fig 7: Flowchart of returning books

User is asked to press ENTER key to know the information about the books available. The information is displayed on the LCD and he/she is asked to press the code of the book he/she wants to return. This information is transmitted to rack side using ZigBee. The librarian is asked to display his/her RFID card, then the user is asked to display their RFID card and then the user is asked to display the RFID card of the book he/she wants to return. If all these are showed correctly then that particular rack door opens and the user places the book back. This information is transmitted to door side. The door side LCD shows the updated information.

V. RESULTS

The following figure shows the complete model of RFID based library automation along with rack and door side circuits.



Fig 8: Model Of RFID based library system

a) Issuing of books

The information about the availability of books is maintained.

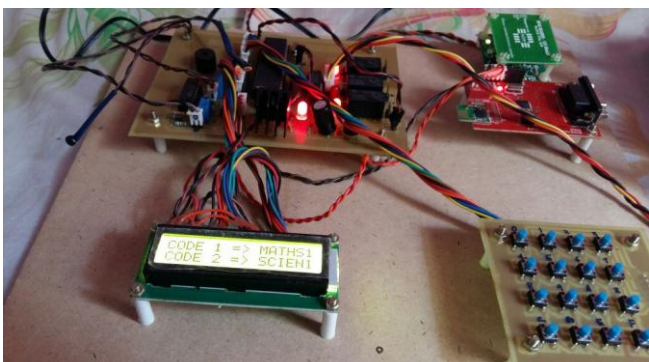


Fig 9: LCD displaying the codes assigned to the books.

The ZigBee Tx/Rx at the rack side sends information to that at the door side that a book was issued to a particular user.

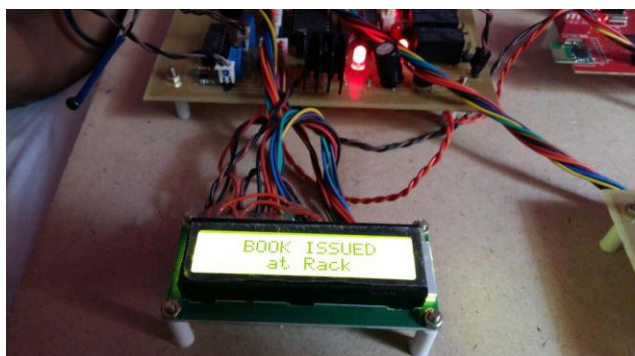


Fig 10: LCD displaying that the book was issued at the rack.

b) Returning of books

After verification of the user, the rack opens so that the user can return the book back and closes after he/she places the book back.

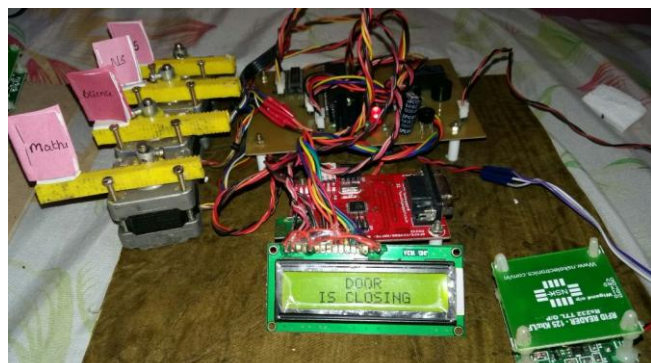


Fig 11: LCD displaying that the door is closing

After the book is returned the information at the door side is updated by sending a message to it using a ZigBee Tx/Rx.



Fig 12: LCD displaying that a message was sent to the door side.

VI. CONCLUSION

RFID in the library speeds up borrowing, monitoring and searching of books, and thus frees staff to do more user-service tasks. But the execution varies with respect to the merchants of RFID readers and tags. The efficient use of the technology will also depend upon the information to be written in tag. The experimental results with respect to effectiveness of RFID reader position and tag position are presented in this paper. Developments in RFID technology will continue to yield higher memory capacities, wider reading ranges, and faster processing. The complete light and fans are automated in this paper. Lights and fans will automatically sense people and switch on when they enter the library and switch off when they leave. This project will also automate the book racks. The books will be popped out and popped in .Hence this results in automatic issuing and return of books. It will also maintain record of total number of books in the library and number of people.

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