

AUTOMATED LIBRARY SYSTEM

Fahd Magrey¹, Sourav Banik², Sarika Jadhav³, Smita Kulkarni⁴

^{1,2,3}Student, Electronics and Telecommunication Engineering, MIT Academy Of Engineering, Pune, Maharashtra, India,

⁴Professor, Electronics and Telecommunication Engineering, MIT Academy Of Engineering, Pune, Maharashtra, India.

¹fahdmagrey@gmail.com, ²sourav.banik09@gmail.com, ³sarika.jadhav@yahoomail.com,

⁴sskulkarni@entc.maepune.ac.in

Abstract: Our project involves bringing of an advanced library system into use which would help to ease the maintenance of library records as well as the entries on the issue and return of the various books available in order to save time and human effort involved. With the help of embedded microcontrollers the automated library system would be constructed which will assist in the search of the books and their entry into the feed on issue and return. In spite of multiple database record management tools available, Our project involves bringing of an advanced library system into use which would help to ease the maintenance of library records as well as the entries on the issue and return of the various books available in order to save time and human effort involved.

1. INTRODUCTION

We are building a system which going to reduce time of all the works related to Book Libraries like Starting from entry security, searching books, issue, Return, Schedule for submission of books, Authentication etc. Our objective is to reduce maximum time while searching books in library; also at the point of security we are providing identity to each user that can help us out for secure transactions.

We are building a Wireless system to control the overall activities in BOOK LIBRARIES in such a way that there should be only users (student) in the LIBRARY with our system for controlling the overall activities. We are implementing our project using I2C BUS first. Because we want to know wired communication between uC first & then only we will go for Wireless uC communication.

2. REQUIREMENT OF THE MODULES / COMPONENTS:

2.1.1 Controller requirement for door unit:

- In door unit we are interfacing the LCD , RELAY and RTC to the controller also this controller will be connected serially to the PC in the library unit hence the controller with serial and maximum no. ports will be most appropriate
- We have to also interface the keypad and card reader/writer to the controller & so ADC is required to convert the input from the card reader to the digital signal. However the controller having inbuilt ADC can reduce the overall size of the soldier unit making it

more compact. Also the complications regarding the interfacing with ADC can be avoided.

- The controller which we are going to use should have power saving mode it will be used only when anyone enters the library and it should have the USART module to support RS-485 and RS-232 standards.

2.1.2 Controller requirement for unit in library:

- In the library unit we are interfacing PC and GSM modem to the microcontroller through serial port. So like the controller in the door unit we prefer the controller having serial port. The reason being the connectivity of controller with the GSM is momentary so that we can use the switching IC to connect both, PC and GSM modem which will lead to minimum specification of controller. [1][5][6]

2.1.3 Card reader/writer requirement:

- In our project we will be providing each and every member of the library with a specific card which will contain all the information regarding the members of library. Whenever the user wants to enter into library he/she has to swap this card at the door unit and if the card is a valid one then only the user will be allowed to enter into library.

2.1.4 LCD requirement:

- The system will consist of LCD to display different messages such as insert card, valid card, invalid card; access allowed and balances, only after the card is inserted in the card reader/writer. [4]

2.1.5 Keypad requirement:

- In our project along with the specific card to every user we are also providing a specific PASSWORD to every user and hence keypad is used to

enter the password only after the 'ENTER THE PASSWORD' message is displayed.[4]

2.1.5 RTC requirement:

- The time keeping is done using RTC. When user enters the card for the access that time will be stored. When user wants to exit from the library he/she again needs to enter the card for door access. This card entry time will be also stored. Then by comparing entry time and exit time total time spend by user in library will be calculated and that time (or accordingly the balance in terms of money) will be deducted from his account and new balance will be written to the card.[4]

2.1.6 GSM requirement:

- The GSM unit is required to send the SMS to user to give him/her reminder about the due date of the book.[1][5][6]

2.1.7 Relay requirement:

- Relay circuit will be connected to the main door of library, if the authenticate user has inserted the card and entered the password correctly then only the door will open automatically using relay.[4]

2.1.8 Another AT89C51RD2 requirement:

- PC will be kept at the unit in library, the main function of the pc is to store the information about the user as well as about different books in library.[1][5][6]

Selection of the modules/components and their details:

2.2.1 Controller for door unit:

2.2.1.1 Selection of Controller:

- Relying on an intimate knowledge of a particular microcontroller architecture and instruction set.
- Increasing trend towards Programming in High-level languages and particularly C
- Availability and Quality of tools such as C-compilers.
- On-chip peripherals, including 10/100 Base-T Ethernet, Macs, CAN bus interfaces, USB, RF transmitters and graphics drivers.
- Serial Interfaces.
- Memory architecture
- Whether the Memory is On- or Off-chip, and Size of memory,
- Power consumption figures for various devices.
- The final factor in the choice of a microcontroller is perhaps the most important one is the cost.
- Most micros now have a variety of idle and sleep modes and careful consideration needs to be given to how to maximize the use of these modes to reduce power consumption.

So regarding the requirement of controller for our project we are choosing PIC18f452 controller which

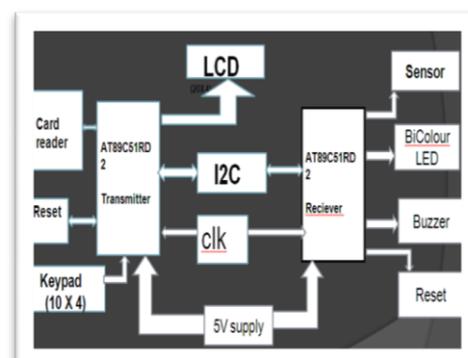
has following features which makes it suitable to be used in our system.

- The PIC18f452 has USART port which supports both RS-485 and RS-232 modules.
- This controller also has inbuilt ADC so that we can interface any sensor directly.
- Power consumption of PIC18f452 is low compared to other controller. It has wide operating voltage range (2v to 5.5v) which makes it suitable for our project.
- The PIC18f452 has a high performance RISC CPU.
- It has programmable code protection and power saving sleep mode, also programmable low voltage detection.
- High speed FLASH/EEPROM technology.
- C-compiler optimized architecture and instruction set.
- It has Master Synchronous Serial Port module which has 2 modes of operation
 - 3-wire SPI mode
 - I2C Master and Slave mode.
- Low power consumption :
 - < 1.6 mA @ 5V
 - 25 uA @ 3V

Other features of AT89C51RD2:

- Secondary oscillator clock option – Timer1/Timer3
- Two capture /compare/PWM modules
- Programmable Brown-out Reset (BOR)
- Power-on Reset (POR), Power-up Timer (PWRT) and Oscillator Start-up Timer (OST)
- Watchdog Timer (WDT) with its own On-Chip RC Oscillator for reliable operation
- High current sink/source- 25mA.[2][3]

WORKING DIAGRAM:



From above block diagram we get an idea that how the system look like.

It consist of

- 1) Power supply
- 2) Reset circuit
- 3) AT89C51RD2
- 4) LCD 20 X 4
- 5) Keypad 10 X 4
- 6) Card reader & writer
- 7) I2C Bus
- 8) External Clock circuit
- 9) Buzzer
- 10) Bi-color high flashing LED
- 11) Photodiode

We will explain one-by-one as follows:

- 1) Power supply required for our design is 5V. In case if MSEB light goes OFF we are providing battery cell's.
- 2) External RESET circuit is required for ON/OFF the transmitter & second RESET is required as an indication of Completed the task of Issue & Borrow of book.
- 3) We are using two uC for transmission of data & receiving of data.

Both the uC are of same type because the clock frequency required should be same as I2C requires high synchronization.

AT89C51RD2 is a Atmel Wireless uC having additional NIC support so that we are using the same.

4) LCD display required here for displaying the Tasks like

Student:

- 1) Issue book
- 2) Return book
- 3) Display Index

Administrator:

- 1) Add record
- 2) Display recent record
- 3) Update record
- 4) Delete record
- 5) Display index

The user will enter the options what they want & process next task.

5) The keypad we required here is 10X4 means 40 pin.

For 0 to 9=10 pins

A to Z=26 pins

Enter=1 pin

Cancel=1 pin

Delete=1 pin

Backspace=1 pin

Total=40 pins.

We can also use Generic Laptop/Computer's keyboard.

6) The card reader/writer required for security purpose.

When user enters into libraries we have to read Card first & then we are able to enter otherwise door will not open. The same card we have to again insert into the Transmitter unit to have an authentication, that will help you out while returning book. The Transmitter sends message 3 days before last date of submission of the book on user mobile number. And for this purpose user must be authentic person of particular institute.

7) I2C BUS required for communication between two or /more uC .

It is 2 wire connector as Data & Clock. We are doing communication between 2 AT8951RD2 uC with this. The max speed is 400kbps. so for high speed communication we are using I2C Bus.

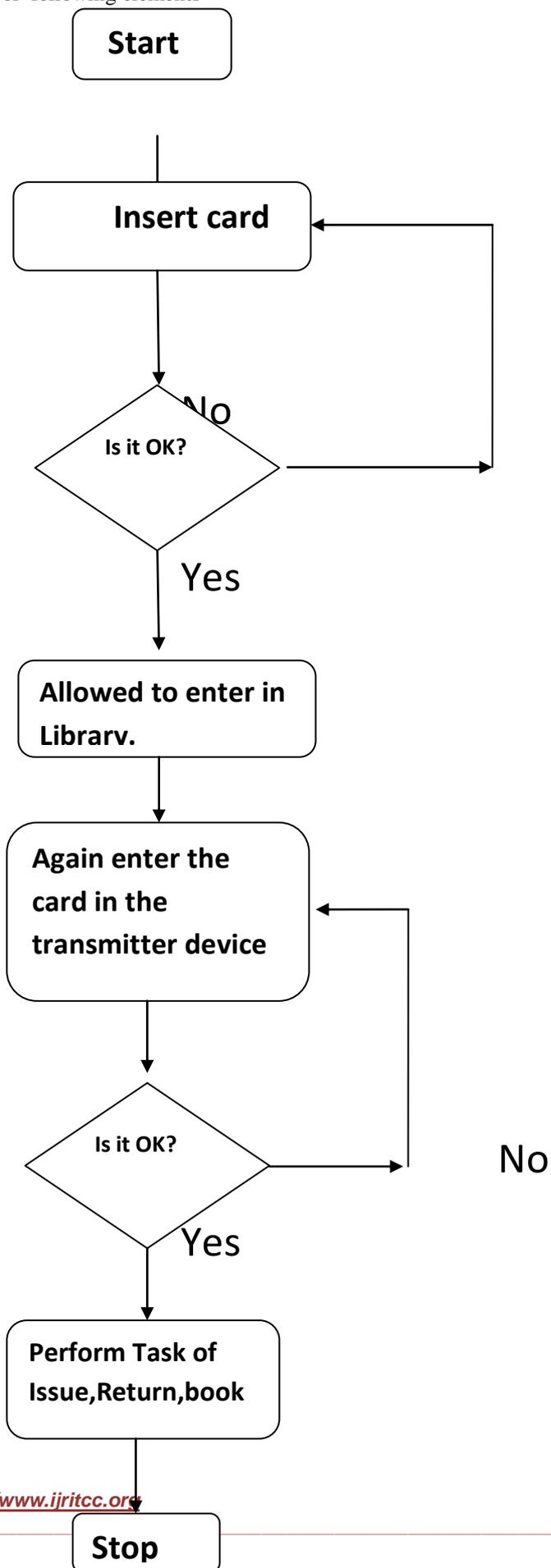
8) External clock circuit is required to give clock pulses to uC. The maximum frequency of AT8951RD2 uC is 60MHz, but its is on our risk. Normally 40MHz frequency is sufficient for operations in RTOS environment.

9) Buzzer is required for identification purpose like when we listen something we can point out that. In our project we have used it for book searching.

10) Bi - color high flashing LED are used for identification purpose like when we look something we can easily point out that. In our project we have used it for book searching.

11) Photodiode used as a sensor. We have used it for book presence/absence. Working principle is when the book is present the Photodiode will be OFF otherwise it will be OFF.

FLOWCHART:The Flowchart consist of following elements



APPLICATION:

- The main application of our project is in all BOOK LIBRARIES.
- The BOOK stores will have advantage of saving time of searching book.
- Since it is an application specific system it can be implemented in various college as well as in commercial libraries.
- When the user wants to return books or borrow new books, he needs to choose the right option from the display on the screen provided in the library and insert the name in the space provided at the display.
- The main advantage of the automated library system is that it works effectively and efficiently taking very less time. In comparison to this if a skilled and experienced person does the same work manually than it will take more than a hour but by using library management system the record of books and balance updating can be done within seconds.

FUTURE DEVELOPMENT

- In spite of multiple database record management tools available, we manually need to access, obtain and record the library issues.
- This project will enable us and the users to automatically search for the required book and obtain it

thus recording the issues and returns more or less like an airport check-in without the assistance of any human.

- Our project involves bringing of an advanced library system into use which would help to ease the maintenance of library records as well as the entries on the issue and return of the various books available in order to save time and human effort involved.

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