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RFID Based Smart Library System

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Abstract

The aim of this system is to find an alternate solution to the pre-existing library systems. The concept of automation of libraries through RFID mechanism and extended use of IoT (Internet of Things) to devlope a system which will tackle the problems faced by the librarians in maintaining library records ,issuing and returning of books and keeping the books in their desired shelves. Unlike the previous ones, this is smart system is well connected to internet which allows the user and librarian to simplify the process of issuing books, returning them and maintaining records on day to day basis. This library system smartly combines the RFID technology and concept of IoT to ensure smooth functioning of library activities and digitalization of the library records. The records can be viewed on a mobile application and PC system. This ensures that a transparent system is maintained in the working of the library and also reduces the workload of a librarian to a great extent. The use of internet and the setting up of android applications enables the student to check the returning date and thus inculcates discipline among the students. Student Id-cards contain unique RFID cards so does the books in the library. The students swipes his card to register his account which is displayed on the Reader Module and then the book to be issued is swiped and the book is issued in his account. The same is updated on the PC system and the android application. The same procedure is followed by the student to return his book and the same is updated on both the application as well as the system PC .This system can also be successfully applied in maintaining office records and important documents in government offices. The initial setting up cost is the only roadblock of this system which can be a significant step towards the notion of 'DIGITAL INDIA'.GPS systems can be further connected to devlop an even well connected effective smart library system.

Index Terms:- RFID Reader Module, RFID Tags, IoT, Library systems, Mobile Application, PC System *etc.*
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1. Introduction

In the modern electronics, there is a growing need of smart library system. The current library is an old outdated system of physical issuing, returning and maintaining of the library records .Several attempts have been made to reduce the workload of the librarian and maintaining discipline in their activities. This smart library system is developed mainly on the RFID mechanism which is further connected to the internet on the subsequent mobile application and PC system. The books in the library have a unique RFID Tag placed on it, the student Id-cards also have a unique RFID Tag on them. The subsequent tags have their unique information details written into them. The RFID reader module detects these tags and displays the information on the LCD display .These details are stored when the tags are swapped on the RFID reader module. The android mobile application and the user PC system is well connected to the Reader module and instantly shows the data stored in the reader. Student can check the following on the application and the librarian and the authority incharge cab also display it on the PC system. The main purpose of this paper is to describe in detail the practical working model of a library system using RFID mechanism and as well as the combining of Internet of Things to devlope a well connected smart library system. This paper can also be a source of basic idea to implement similar systems in various institutions and at various office level purposes.

2. Need Of Project

In this project, we aim to improve on the practical shortcomings of the existing library system. The basic purpose is to introduce the use of technology in library system to reduce the workload on the librarian and maintain a disciplined working structure of the library. A well connected student-library relationship is also achieved. The barcode system is outdated and hence is replaced by RFID based Smart Library System.

3. Literature Review

The table shows literature shows for the project :

| Paper Name	Author	Hardware	Conclusion
Smart Library Management System using RFID	Dr.Annaraman1, P. Thamarai, Dr. T.V.U. Kiran Kumar	PIC Microcontroller, RF Module and RFID tags	The whole system was designed to overcome the disadvantages of barcode systems and thus demonstrated. The entire project was planned to reduce the need of skilled librarians.
An Iot Based Secured Smart Library System With NFC Based Book Tracking	A. Larsan Aro Brian L. Arockiam P. D. Sheba Kezia Malarchelvi	RF Module, RFID tags, NFC tags, LPS tags	In this paper, they have exploited IoT and mobile technologies for easy and efficient library management.
Enactment of Smart Library Management System	C. Saranya, Veeramuthu Venkatesh	.Android Smart Phone, RFID Module, RFID tags	The proposed system really helps to reduce the burden for students in the academic institution for physical searching of book/articles/ magazines in the library.
Best SQE Practices for Libraries with an Emphasis on Scientific Computing	Mark C. Miller, James F. Reus, Robb P. Matzke Quincey A. Koziol, Albert P. Cheng	microcontroller 16x2 LCD,RFID module ,RFID tags MAX232 GSM, GPS	In this system a MAX232 used for GSM, GPS and microcontroller. This system is directly linked to a RFID Technology is applicable in various Tracking System.
SLMS : a smart library management system based on an RFID technology	Mohammed I. Younis	RFID Tags, Reader Module, Microprocessor	Introduction of passive RFID technology into the library management system.

4. Design

The method used for implantation is as follows:-

4.1 Block Diagram & It's Description

The design of a system is given by its architecture. The block diagram represents the architecture of a system. Given below is the block diagram of "IoT based Smart Library System".ARM7 is the microprocessor around

which the system is based. The RFID Reader Module, IoT, is interfaced over the ARM-7 processor. The LCD displays the entries made by the tags when swiped at the Reader Module. The reset and buzzer provide additional features to the system. The block diagram of the proposed system is as given below:-
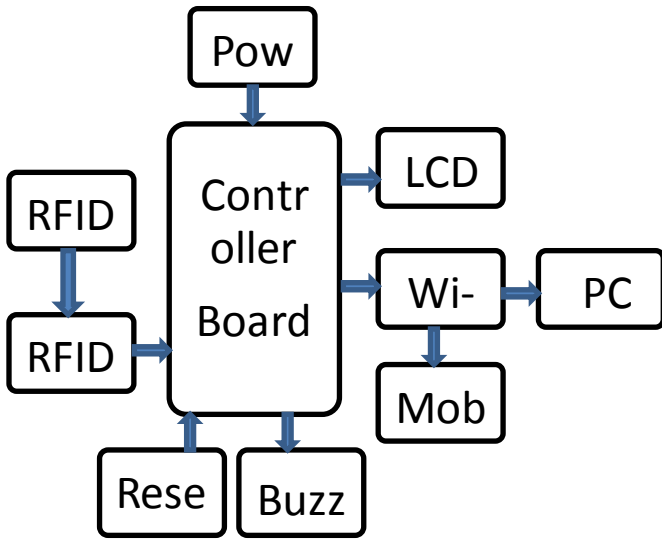

4.1 Figure of Block Diagram

Controller board: The controller used is Kiva Atmega328p.This is a single chip microcontroller created by Atmel in the mega AVR family. This 8-bit AVR-RISC-based microcontroller combines 32kB ISP flash memory with read-write capabilities,1kB EEPROM,2kB SRAM and 32 GPWR. It has low power requirement and thus offers low heat and a good temperature range .It operates at 1.8-5.5V range.
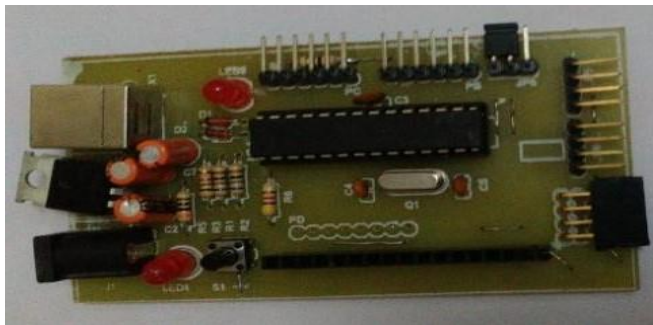
4.2 Figure of Controller Board

Wi-Fi Module:-The Wi-Fi module used is Esp8266-01.It is a self contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. Each ESP8266 module comes pre-programmed with an AT command set firmware. It is an extremely cost effective module with a huge and growing community. Its high degree of on-chip integration allows for minimal external circuitry. This module has a powerful on-board processing and storage capability that allows it to be integrated with sensors and other applications.
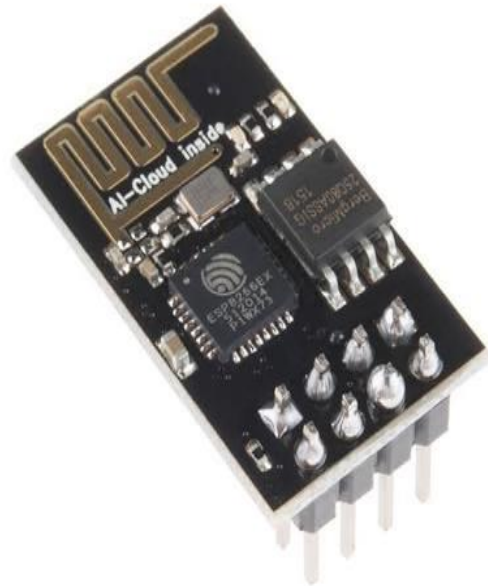
4.3 Figure of Wi-Fi Module

RFID Reader Module and tags:-The RFID Reader Module used is RFID RC 522.These RFID Modules can read and write RFID tags effectively. These are comparatively cheaper in cost and are used in most starter kits for various experiments. It is a microcontroller card reader that uses SPI for communication. This chip also supports I2C and UART protocols. The card reader communicates using a 13.56 Mhz electromagnetic field. The RFID tags hold the unique data about the user and books. They are swiped and detected at the Reader Module.

4.4 Figure of RFID Reader Module and tags

LCD Display:- LCD screen is an electronic display module and finds wide range of applications .LCD's are economical, easily programmable and have no limitation of displaying special and even custom characters, animations etc. A 16*2 Liquid Crystal Display is used to display the output of the RFID Reader Module when the tags are swiped across it. Each character is displayed in a 5*7 pixel matrix.

4.5 Figure of LCD

Mobile Application:- The Android Mobile application will act as a transparent mediator between the student and the library. It will hold all the data of the books issued by students and their returning date .It can be used by everyone to know the status of availability of a book. Further ,when developed it can also hold the location of books and can be turned into a database for the list of books.

PC Software/App :-This system is developed for the librarian or the head in-charge of the library wherein he can directly see the status of all books on his personal allotted computer. It basically acts as a server and holds all the data of the books, students ,issued books and other important details.
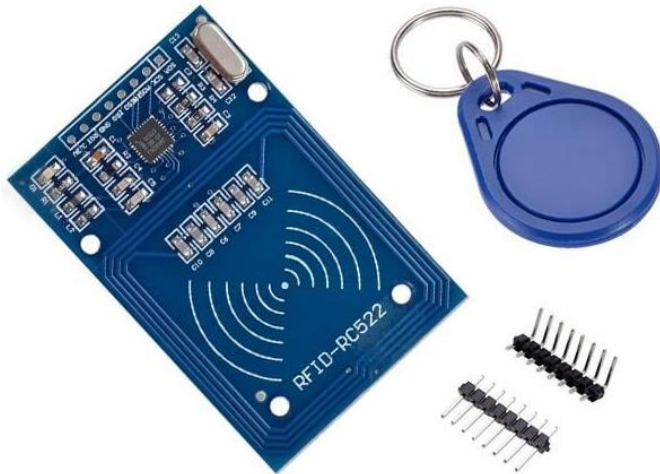
Reset:- Reset button is the direct key provided to reset/restart the system in case of the hardware or software failure. It directly restarts the system and is thus helpful in cases of disfunctioning of the system.

Buzzer:-Buzzer detects the reading of the RFID tag by the RFID Reader Module. The beep sound of the buzzer indicates the smooth functioning of the tags and the reader module.

Power Supply:- A 12 volt power supply is used for the operation.

5. Results Thus the RFID Based Smart Library is implemented. The system is ready for issuing books and locating the books kept in the different shelves and racks. The work load of a Librarian is highly reduced. The database created can be updated with the new books. The students issuing books will now be known easily and can be informed before their returning dates.

6. Future Scope:-Presently this system can be applied on a short-scale depending upon the results ,accuracy and other important factors. But it has a great scope in future, this system can be further applied in Government offices to ensure the safety of official documents. It can also be integrated into e-library .And it can be used as a base to a fully automatic library system. The major scope of this system lies in the office work of the institutions all over the world.

7. References

[1] A paper on "Smart Library Management System using RFID" by Dr.Annaraman1, P. Thamarai, Dr. T.V.U. Kiran Kumar

[2] A paper on "An Iot Based Secured Smart Library System With NFC Based Book Tracking" by A. Larsan Aro Brian L. Arockiam P. D. Sheba Kezia Malarchelvi

[3] A paper on "Best SQE Practices for Libraries with an Emphasis on Scientific Computing " by Mark C. Miller, James F. Reus, Robb P. Matzke Quincey A. Koziol, Albert P. Cheng

[4] A paper on "Enactment of Smart Library Management System" by C. Saranya, Veeramuthu Venkatesh

[5] A paper on "SLMS: a smart library management system based on an RFID technology" by Mohammed I Younis.