

## Raspberry Pi and Arduino based book management system

<sup>1</sup>Deepak V. Thambi, <sup>2</sup>Ankit A. Patil, <sup>3</sup>Pranay V. Shah, <sup>4</sup>TAnas Ahmed,  
<sup>5</sup>Prof. Manoj Mishra

<sup>1</sup>(Electronics and Telecommunication, Atharva College of Engineering, India)

<sup>2</sup>(Electronics and Telecommunication, Atharva College of Engineering, India)

<sup>3</sup>(Electronics and Telecommunication, Atharva College of Engineering, India)

<sup>4</sup>(Electronics and Telecommunication, Atharva College of Engineering, India)

<sup>5</sup>(Electronics and Telecommunication, Atharva College of Engineering, India)

**Abstract:** As the world is becoming digital, a book management system will help to reduce the human efforts. By using the system that we have created, one can easily check the availability of books in any library, bookstore, etc. In this system that we are implementing, an Android based application is used at the user end to check for the availability of books. Primarily, the user is required to go at the issue desk if one wants to borrow any new book. Here a fingerprint module is interfaced with a microcontroller (Arduino UNO) to authenticate the user in order to give access them to the books database. Only users that are authenticated can borrow a fixed number of books for a predefined duration. An RFID (Radio Frequency Identification) tag is embedded in books to prevent theft. The user needs to scan the book before exiting the room. A Raspberry Pi board is used for linking fingerprint module with the user database.

**Keywords-** Android app, Arduino UNO, fingerprint module, Raspberry Pi, RFID

### I. INTRODUCTION

A library is defined a huge collection of information source such as books. This collection can also be of print, audio and visual materials in different formats such as maps, prints, and documents. As technology is the faster-growing trends, computers nowadays are being part of our life. Through computers, organizations can interact with their clients in a much easier way using advanced technologies. By using a sophisticated book management system libraries can manage their functioning in a more efficient way. The system that we have designed reduces the load on employees and it will also be possible to handle large inventories [1]. The following features are present:

- Admin login: Admin is the one who controls or looks over the entire system by updating the databases of books, fingerprints, etc.
- User login: Users have to add/enroll themselves into the system to create an account.
- Updation of database: Database can be changed/updated as per the changes periodically.
- Search option: Admin and Students can search for books available by entering the name of the book.

### II. LITERATURE SURVEY

The library can be considered as the brain of an institute. Acquisition, cataloging, circulation are the basic requirements of a library.

An LMS consists of database, software and graphical user interfaces. Most LMS bifurcate the software functions into smaller modules, and all of them are integrated together with a unified interface. Earlier, the library functions were done manually and separate from one another. People used to order materials and they had to manually catalogue the items.

Earlier in the card catalog system, users needed to sign the books out manually, and indicate their name on these cards which were then placed on the circulation desk. The mechanization first came at the Texas University in 1936 where they began using a punch card system to manage book circulation in the library.

The major growth in Library management systems came in the mid to late 2000s. The LMS vendors started increasing the prices and small libraries were not happy with that so after open source systems were developed, many libraries started to switch to them. The reason for which small libraries were attracted to open source LMS was due to zero cost as there was no subscription fee. Freedom from LMS sellers allowed libraries to prioritize their needs according to urgency required, as opposed to what their sellers could offer. As more and more libraries migrated to open source solutions vendors were forced to provide quality service and to avoid strict contracts to keep their customers. An annual survey which was done by the organization Librarytechnology.org of about 1500 book libraries noted that year after year, the libraries using open source systems increased from 2% to 12% from 2008-10.

### III. RELATED TECHNOLOGY

#### A. Raspberry Pi 3B

The Raspberry Pi Model 3B is a small debit card sized computer that over here is used to hold and manage the database.

The purpose of using this specific board is its good computing power which is capable of handling larger database and at 35 dollars it's also cheap and can also be used in small libraries to implement this book management system

#### B. Arduino UNO

Atmel's ATMEGA8 and ATMEGA168 microcontrollers are on which Arduino UNO is based. It is a development board that is cheap, works cross-platform and is also open source. Hence the development support is also good.

#### C. Fingerprint module

Fingerprint module R305 is used here for user authentication purpose. It is one of the most secure forms of the authentication system that is used nowadays. It provides a unique identity to the user as well as provides security to the book management system.

#### D. RFID module:

Key Specification:

Power requirements: 7V – 9V DC

Current requirements:<110mA

Communication: RS-232 Serial at 9600 baud (8N1)

Dimensions: 63mm x 98mm x 5mm

Operating temp range: -40° C - +185° C

### IV. THE FLOW OF PROJECT

- There will be two steps for issuing the book from a library, 1st issue desk, and 2nd exit gate.
- On issue desk, Arduino Uno controller board is present to control the processes.
- Arduino is interfaced with fingerprint module for student authentication and RFID reader module for book identification as all books will have RFID tags.LCD is interfaced so that user can see the running status.
- Arduino will send all the data of students fingerprint and RFID tag information to raspberry pi through Wi-Fi module.
- Raspberry Pi will have the entire database into it and when data comes from Arduino board, it will update it in the database.
- While exiting from the library student need to scan RFID tag of the book with RFID reader interfacing with Raspberry Pi, if the student does not scan it then it will be interpreted as book theft and buzzer will on.

### V. BLOCK DIAGRAMS

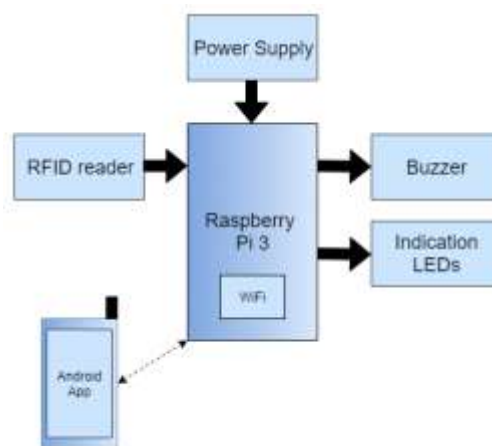
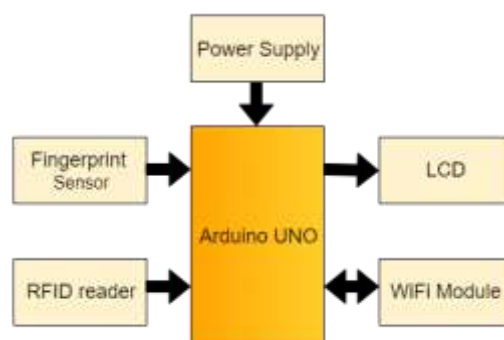


Fig. 1

In block diagram given above (Fig. 1) Raspberry Pi 3B is used to manage the database. It has an onboard Wi-Fi chip which is used to communicate the changes made to the database wirelessly to the android app. The fingerprint module and RFID interfaced with Arduino sends the data over Wi-Fi to the raspberry pi. The raspberry pi on receiving the data updates the same in the database. Another RFID is also interfaced with a Raspberry Pi which is used to confirm that the book is taken by the student and if the book is not scanned a

buzzer gets triggered. Thus we can say that the system is also secured and should deter anyone from stealing the books. The Android app also notifies the user when the return date is about to come by displaying a notification in the android app.



**Fig. 2**

Block diagram of microcontroller Arduino UNO is shown in the figure above (Fig. 2). Fingerprint sensor, RFID and a Wi-Fi module is connected to it. The fingerprint module is for student authentication and RFID module is for book identification as all the books will have RFID tags. As the Arduino UNO is not having an onboard Wi-Fi chip, a separate Wi-Fi module is used for communicating with the Pi. The running status is shown on the LCD.

## **VI. ADVANTAGES**

- The system manages all the book information electronically there by reducing paperwork.
- Administrator can keep the system up-to-date by adding information about when new books are added in the system and whether they are available or not. Thus it is not necessary for the students to go to the library in order to issue the book
- The books in the system are arranged in various different categories. Thus allowing the users to easily search and find the book needed.
- Thus, it saves human intervention and resources like time.

## **VII. APPLICATIONS AND FUTURE SCOPE**

- It can be used in local libraries also.
- By adding Robot for picking and placing the books we can completely remove the human labor.
- Surveillance camera and IR sensor can be added to remove watchman from exit gate.

## **VIII. CONCLUSION**

Thus in this setup a raspberry pi 3B is used to manage the database. An android app is also implemented, the content of which will be updated as the database present in Raspberry Pi board updates. The fingerprint and RFID is used for authentication of user and identification of book respectively. They are interfaced with the Raspberry pi which in turn updates the database. Another RFID is also interfaced with the Raspberry Pi which is used to confirm that the book is received by the student and if the book is not scanned a buzzer gets triggered. Thus the system is also secured. The Android app also notifies the user when the return date is about to come.

## **ACKNOWLEDGEMENT**

We are grateful to ATHARVA COLLEGE OF ENGINEERING for giving us the opportunity to do the BE project work in Department of Electronics and Telecommunication Engineering. We feel privileged to express our deepest sense of gratitude and sincere thanks to our Project guide Prof. Manoj Mishra and Project Co-ordinator Prof. Gauri Salunkhe for their continuous support and guidance throughout our project work. We would also like to thank our H.O.D. Prof. Jyoti Kolap for approving our BE project. We also wish to thank them for their patience and co-operation, which proved beneficial for us.

## **REFERENCES**

- [1]. "RFID Based Library Management System", Discovery, Volume 19, Number 55, pp. 6-5, 2014.
- [2]. John A. Stankovic, "Research Directions for the Internet of Things", Internet of Things Journal, IEEE, Volume 1, Issue 1, pp. 3-9, 2014.
- [3]. [https://lj.libraryjournal.com/2011/08/industry-news/open-source-reality-check/#\\_](https://lj.libraryjournal.com/2011/08/industry-news/open-source-reality-check/#_)

- [4]. S.-K. Youm, J.-H. Kim, and S.-K. Cho, "A study on the methodology for testing of RFID system at library," in Proc. Int. Conf. MUE, Apr. 26–28, 2007, pp. 1071–1079.
- [5]. Cheng Feng, Research for Application of RFID in Library, 978-1-4244-6947-5/10 ©2010 IEEE
- [6]. KiyotakaFujisaki, An RFID-based System for Library Management and Its Performance Evaluation, 978-1-4799- 8870-9/15 © 2015 IEEE.