

Automated Library System using Android Based Robot



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Abstract: This paper predominantly focus to lessen the consumption of power and manual work. The prototype system uses the robot to detect the book. The input will be given to the robot. The user can search the book by giving the book name and name of the author. This functionality can be aggrandizing using android application, which aids fast usability, remote accessibility. LED in the robot will blink if the searched book is identified. This is achieved using RFID tag and RFID reader. Power efficiency is achieved by providing light only to the area where the book is detected. In case of any rearrangement of books, the process of searching a book will become tedious. Monitoring whether the students is placing the book in the appropriate place is also not possible. For this process it is easy to place a robot to check whether all the books are in right order.

Index Terms: Android Application, RFID Tag, Robot, MySQL.

I. INTRODUCTION

A library is a place which contains collections of books, information and knowledgeable resources to enhance the accessibility for students in learning process. There are different works done by librarian like adding new student, issuing the books, entering the information about the books. It takes long time to the student to get a book from the librarian. The task of issuing the book should be completed student by student. It involves much time and more manual work. As information changes day to day the librarian has to do more work. In this situation it is worthwhile to take lead of new technologies. Robot is an electronic gadget which acts like a human. In this paper links of the robots are considered to be as human arm. There are many types of robot in existence. Depending on the need by using various sensors, the robot can be designed. In this paper line follower Robot is used. The Line follower robot recognizes the path and

searches for the book. Books are arranged in a disciplined manner. This will help the librarian to replace the misplaced book in the right place. The power consumption in the library should be minimized. In normal libraries all the lights have to be switched ON for the entire day, even though there is no user in the library. This directs to unwanted consumption of power. This can be lessening by illuminating the lights at required place. Hence in this paper lamp is illuminated at the shelf where it searches the book. So that the remaining lamps which is not under the uses is switched off.

II. EXISTING SYSTEM

In [1], Ashutosh Tripathi have proposed a paper "Online Library Management System". This system works on the java platform. This paper contains the basic information of the book. The work of the students is minimized. This paper used 32 bit windows operating system. The advantage of this paper is the student will know the information of the books. The disadvantage is the work of librarian side is high.

In [2], Shane Curran have proposed a paper "Libramatics". The databases of the books are stored in the cloud network for the easy retrieval. Depending on the need the databases are retrieved from the cloud. The main component of this paper is barcode reader. The barcode scanner scans the barcode and displays the detail of the book.

In [3], C.Srujana, B.Rama Murthy have presented a paper "RFID based Library Management System". This paper uses RFID technology which means Radio Frequency Identification. It uses RFID tags. One tag is fixed in the book and another tag is placed in the student ID card in order to know the details of the book. The disadvantage of the paper is the initialization cost is high.

In [4], Sree Lakshmi and Sree Gowri have presented a paper "Library Management Using RFID technology" in Feb 2015. In this paper the student uses an interface page which asks for the login details. The RFID reader scans the RFID tag and sends the detail of the book. If the login details are wrong it does not give the authorization to the user to enter in the page.

In [5], Prasanna Pillai have proposed a paper "Android Application for Library Automation". This paper uses an android application for the library management access. This application consists of all the details of the book and students. The access to the library for the students became easier through this application.

In [6], Anita Gade and Yogesh Angel have proposed a paper "Development of Library Management Robotic System". This is done using Lab view software. The barcode reader is used to scan the books.

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Once the Barcode Reader senses the searched book, the Robotic arm will pick the book and places in the conveyor. The advantage of this is time used for the book searching will be reduced.

III. PROPOSED SYSTEM

A. Robot systems

Robot is a gadget which is capable of doing complex works in easier manner with the help of small manual work. Robotics is associated with electronically, mechanical and software. Here the arm of the robot is viewed as the upper arm and fore arm. The input is given to the robot via software. The complete block diagram is shown in Fig.1.

B. Android Application

Android Application is employed in this paper. The student uses the android application to access the books. The student should enter the phone number, register number and Password. If all details are correct then they can select the book. When they selects the “submit” button. The Robot will move to search the book. Once the book which is searched is identified the Led will indicate it. The return date of the book will be intimated to the student through text messages. This can be made using GSM.

C. Replacement Module

Replacement of book can also do in this paper. The maintainer of the library is provided with a specified number, once the number is given the robot starts running through all the books. This will make the robot to run efficiently while searching the book.

D. Power Efficiency Module

The power consumption of the library can be reduced by placing a light source on the top of the robot. This does not demand any power source to search the book which will greatly reduce the power consumption.

directly. It has a span of 3 to 300 feet. The bar codes are still in existence because the RFID costs more and the tag has to be identified individually.

2. RFID Tag

The data is transmitted from the tag to the reader using integrated circuit with an antenna which is placed in the RFID tag which is otherwise called as an interrogator. The magnetic coil inside the tags helps to generate the radio frequency waves. RFID tags are passive. RFID tags can senses a distance of 10 to 15 cm.

3. IR Sensor

An infrared sensor is a detecting sensor, which helps to compute the physical quantities like heat and it also senses the motion of an object. IR sensor usually contains IR LED with certain wavelength and voltage of its own. The magnitude of IR light received changes in appropriate to the obstacles and its output voltage.

4. GSM Module

A GSM is one of the wireless modem, which is integrated to work with GSM wireless network. GSM uses the frequency of 900 MHz, 1800 MHz and 1900 MHz. TDMA technology is used as an air interface standard. GSM works by receiving a digital command through SMS from any cell phone and send that data to the mobile centre through serial communication.

5. AT89s5

AT89s5 is a microcontroller of low power. The built in features are 8 bit microcontroller which is made of CMOS with flash memory of 8k bytes. CMOS technology is used to build the controller. This is an advantage over 8051 because 8051 is PMOS or NMOS. AT89s5 has extra timer and flash memory.

6. Motor driver L293D

In order to rotate the motor in both directions L293D is used which is a IC to drive the motor. It can control 2 DC motor concurrently, it has 16 pins. It can be rotated in bidirectional ways such as both clockwise rotation and anti-clockwise rotation

7. Wi-Fi Module ESP8266

SP8266 is an integrated protocol which enables microcontroller to access Wi-Fi modules. It can unload all Wi-Fi networks function from another processor. It has enhanced feature of fetching data from anywhere in World Wide Web, pushing data to cloud or any specific server for storage, computation or monitoring. The external hardware has protocol stack, RF front end, encryption and decryption algorithm build in it. It is user friendly, low cost in market. It is supported by a larger user community. The data is converted in to radio signal by computer wireless adapter and the converted signal is transmitted using antenna. More data can be carried using high frequency signals.

C. Software Components

1. JAVA JDK

JAVA JDK is platform to code for android applications and applets. All android app are made using Java, since Java is core foundation. The Java Development Kit is a combination of Java Virtual Machine (JVM) and Java Run Environment (JRE).

IV. SYSTEM DESIGN

A. Block diagram

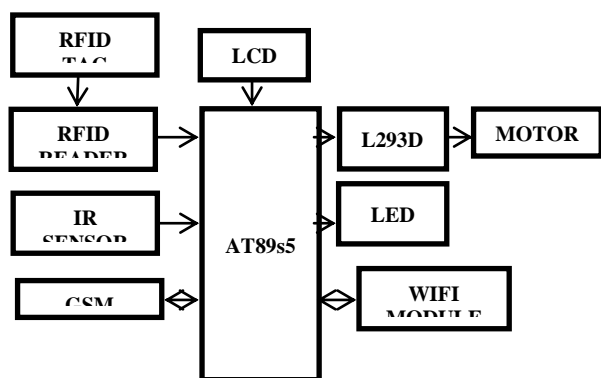


Fig.1 Block diagram for robotic model

B. Hardware Components

1. RFID Reader

Individual objects can be tracked using RFID tag by gathering information from it. The information can be gathered using a RFID reader which means radio frequency identification. The data is transferred from the tag to the reader by radio waves. Bar codes and RFID reader has the same mechanism. But the RFID tag does not required to scan

The virtual part of android app are developed under JVM (Java Virtual Machine). JVM actually converts byte code into machine language and execute it. It helps to interact with many computers physically and also with their operating systems. JVM is a software layer which resembles on hardware platform. JVM consists of byte code verifier, class loader, executive engine, garbage collector, security manager.

Java Run Environment is implementation JVM. The programs which are compiled for a JVM implementation can be run in this software. The main work of JRE are compile code necessary to run java programs, dynamically link native method, manage memory and the handle exceptions.

2. Android Studio

All the android software’s are present in android studio which is required to debug, test and profile the applications. Android Studio is the world's popular operating system and also dominating one. The features of android studio are powerful code editing, smart editing code refactoring, grade-based build support; templates based wizards and Lint tools analysis. The android studio has an advantage of most advanced IDE goggle official support current version 0.51.

3. MySQL

Data Base Management System is software technology used for retrieving and storing data stored by the user with utmost efficiency along with required security measures. The users of a DBMS can be classified as administrators, designers and end user. MySQL is branch of relational SQL database management system. Web based applications are developed using this. The database is developed by using components like tables, column, rows, redundancy, primary key, foreign keys, compound key, index, referential integrity.

A database can be modeled in two categories such as collection of entities and relationship among entities. Entities are necessary to differentiate objects among same specific domain. The entities that shares same properties are grouped under single entity set. In this way paper has three main entities such as general admin, student, and librarian.

.D. Flowchart

This flow chart explains about the working of the robot for issuing of books. Fig.2 shows the flow chart for the presented paper.

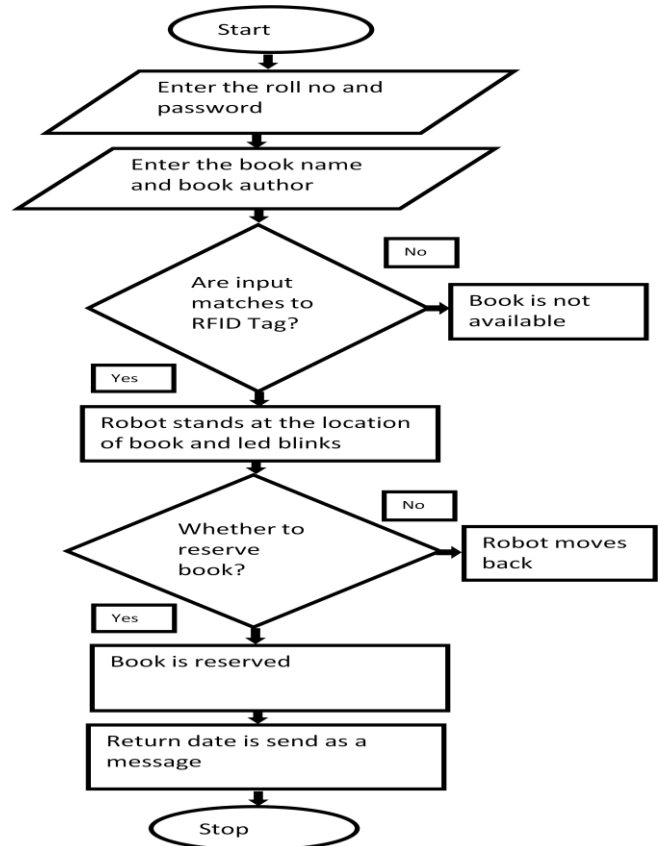


Fig.2 Flowchart for issuing books

V.RESULTS

A. LOGIN PROCESS

It is used by user and also by librarian. They need to login to the application using their roll number, mobile number, password. Fig.3 shows the login page. The user can access to different functionality when successfully login.

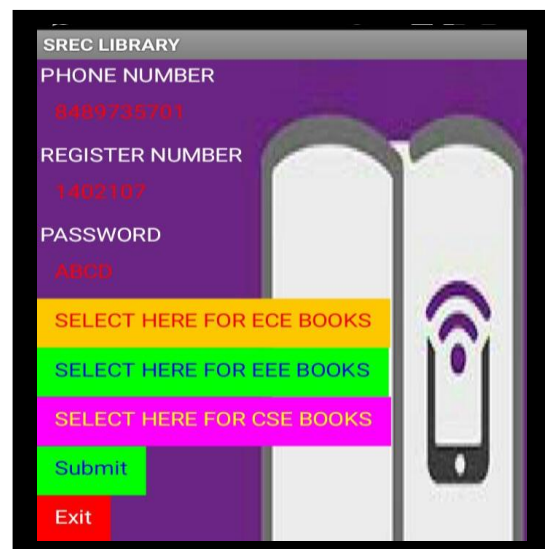


Fig.3 Login Module

B. SEARCH FOR A BOOK

This helps user to search for a book, so that user can know whether the book is available or not just by using application. Fig.4 shows the searching robot. If book is available it returns shelf number and number of books available. If it is not available then it gives return date.

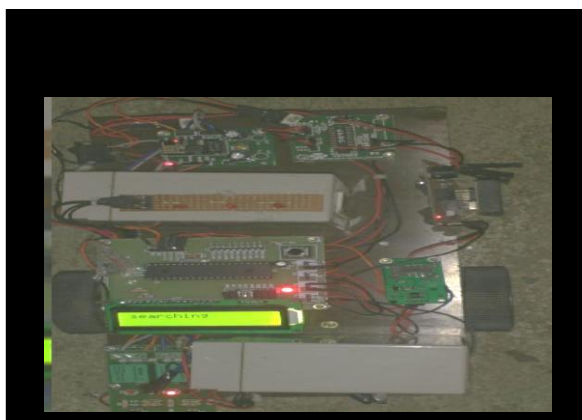


Fig.4 Searching Module

C. ISSUING BOOK TO ID CARD

It helps user to take books without help of librarian, once input is given to robot using android application. The issuing of the book is shown in Fig.5. It moves to the location and asks to get added to ID card.



Fig.5 Book issuing module

D. POWER EFFICIENCY

It helps in reducing power consumption. It illuminates light only at the required row instead of illuminating the whole library. The power efficiency is shown in Fig.6.



Fig.6 Power Module

E. REPLACEMENT OF BOOKS

It helps in arranging in books in order which are dislocated. Replacement of books is displayed in Fig.7. Replaced books are indicated using application. Thus enhances the ordered arrangement of books in library.

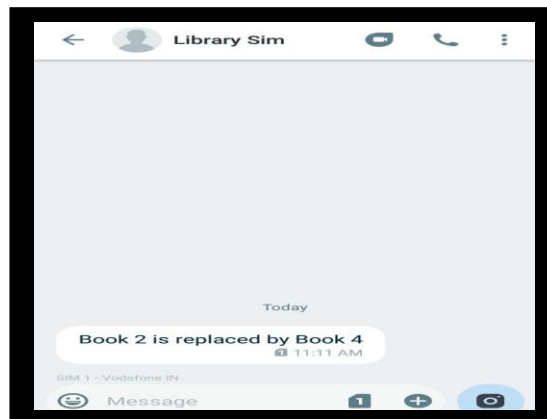


Fig.7 Replacement Module

VI. CONCLUSION

This system provides an automated and improved library system. It simplifies the manual work done by a librarian to issue a book. This proposed system will provide an easy and efficient way to search the books. This makes the library system more reliable. This system also easily finds the misplacement of book. The book search software is designed in MySQL platform. Besides the book searching system this system also provides an easy way for book retrieval. This can be done with the help of RFID tags and RFID reader. This system makes the students to take the book and return the book without the help of librarian. The replacement of book mechanism reduces the search time and manual interventions. This System uses cloud for storing the book databases. The searched book details are retrieved from the cloud. Using GSM technology the date in which the book has to be returned will be intimated regularly to the user. The approached system is also helps to lessen the power utilization in the library. Using mobile application the presence of the book in the library can be identified without going to the library.

VII.FUTURE WORKS

This system can be improved in the ways of using auto placing robot. The conveyor belt is used in this system. The searched book is placed in the conveyor belt. The belt moves the book the user. This will reduce the manual work to a great extent. The time consumption is reduced. The demanded books for library are auto purchased. In library there are books with high demands, demand of the books are noted using rating application and the purchasing order for highly demanded books are done automatically. This system enhances the availability of all books for user requirement.

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