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Synopsis Report submitted on

Development of automated book handling system for libraries

as

FINAL YEAR PROJECT

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1 Introduction

Despite the increasing availability of digital platforms like Kindle, e-Books etc, people still favor reading physical books. In large libraries, people need to invest a lot of time in searching for a book, getting it issued, or return while standing in a long queue. This is because people nowadays are not interested in going to the library to Search for the book, wait for issuing and return the books in the queue.

A librarian must maintain a huge record of all the books and borrower's details and the details of books present in the library. It is difficult to manage such huge records of books, and there is a possibility of human error. Automation and technology can help to overcome this issue.

The libraries that contain large numbers of books require considerable effort to arrange the books in the place correctly and quickly, repeatedly during a day. Manual arrangement of books will result in human errors apart from the requirement of having to hire someone. But if this process is automated there is no chance of committing mistakes without the need of any human intervention.

In large library it is difficult to search so it takes time for users to search and get that book from shelf. Nowadays smart libraries are adapted where user authentication, getting book location, book name and their different edition information is easy. Again, after book management book searching is also time-consuming task. This problem can be solved with the help of bar code reader, RFID tags are used for book number and shelf number identification.

Now the libraries are equipped with different sensors and modules for library management to manage many books. A robot is designed to keep track of the book location in the library using sensor driven motors so the position of the book can be identified in several ways like line follower bot or using IR sensor color detection etc. With the help of the gripper the book will be placed in the corresponding shelf.

1.1 Problem statement

Issuing and returning a book and maintaining the data about a book is a tedious process for a librarian, we can avoid this using automation.
Misplacing a particular book from its shelf is a serious and common issue in every library. Therefore, this alternative method is designed to overcome these drawbacks.

1.2 Objectives

The main objectives of our proposed system are as follows:

1. A website is to be created to handle the books. The availability of the book is updated on the website. This helps the borrowers to get book information easily.
2. Each book is interfaced with RFID tag. This tag contains the necessary details. This is helpful in issuing and returning the book. So, the RFID tag of a book can be scanned to issue or return, which will be reflected in the website.
3. A bot with robotic arm can be utilized to place the book in corresponding shelf. This reduces human error.
4. Interfacing ultrasonic sensor to the racks to avoid misplacing of the books.

2 Methodology

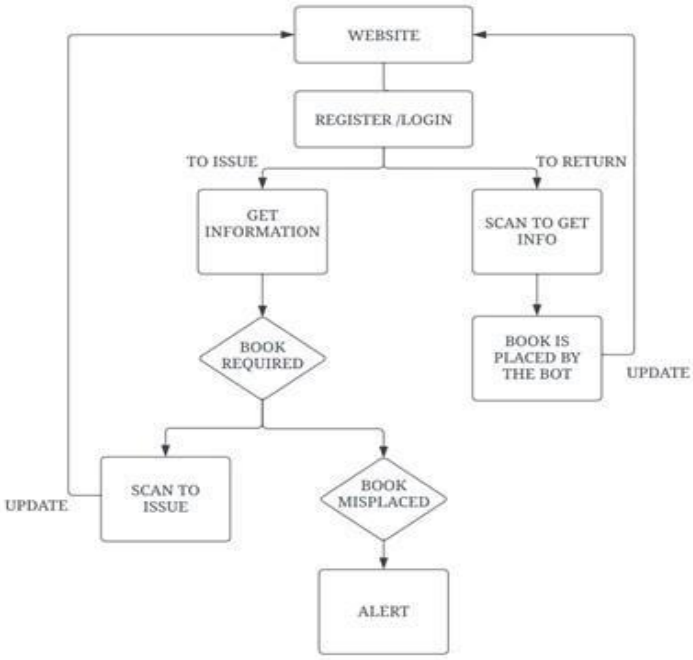

fig 1 Block diagram of proposed system

In this project, library administration and view of the user are considered for better system design. This system is based on the database of the library for checking availability of books, position of the books, issuing and returning of books, all this is handled by a website. Initially, the user has to register to the website with valid credentials. After successful registration the user can login to the page to get book information like availability and the position of the books.
RFID tags are initially configured with the book data and are attached to the corresponding books.
To issue the book, the user must scan the RFID tag and issued data will be updated in the database.
Once the user has returned the book, the bot scans the RFID tags to know the position of the book.

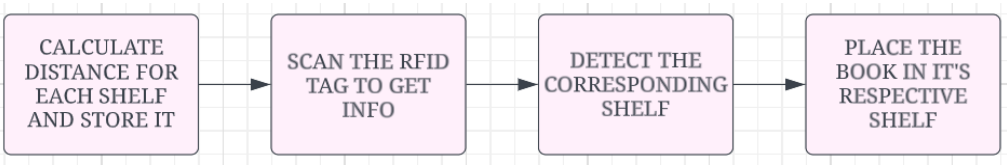

fig 2 flow diagram of shelf detection

Each shelf is assigned for a particular subject. The distance for each shelf is calculated using trial and error method and is stored. Every time the RFID tag is scanned, it maps to the particular shelf, then with the help of the robotic arm, the book is placed in the rack and also the info gets updated in the database.

After the issue of the book, suppose if anyone tries to misplace the book or place it on a different shelf, a buzzer is triggered to alert the librarian. The principle behind this is that each shelf is interfaced with an ultrasonic sensor. It is designed such that if the level in the shelf increases, it triggers the buzzer. So, the user is only allowed to take the book from the shelf. Only the bot is allowed to place the book. This can be done to avoid misplacing of books.

3 Expected Output

The proposed automated smart library system will help the users to get the library resources efficiently with the help of a library database for searching the book and users' details. Library database will be with all the records of all the users. The proposed system is very useful in large and bulky libraries where operations like searching, maintaining and managing the books are difficult. This project also aims to avoid misplacing of books i.e., if an user tries to misplace the book or attempts to keep the book in a different shelf, then the buzzer is triggered and the librarian will be alerted.

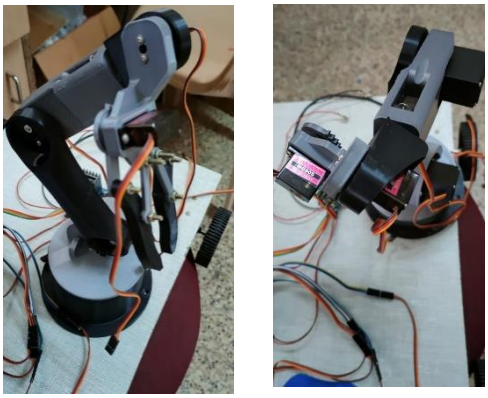

Fig1. Bot

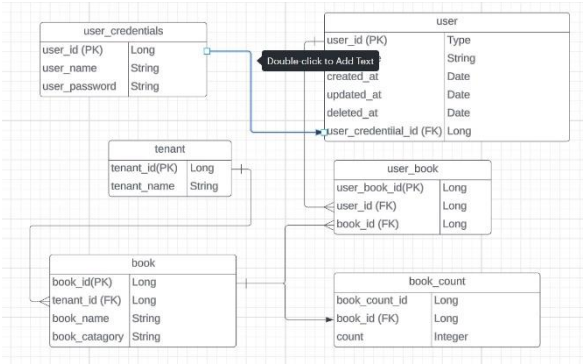

Fig2. Database schema

Fig3. Frontend

4 What is innovation in the project

Everyone who goes to the library with the purpose of learning a lot and making the most of their time there. Typically, searching the books takes a lot of time, and if the books were accidentally lost, the entire plan would be destroyed. This project seeks to prevent such a scenario and ensure that each person who visits the library makes effective use of it. To prevent book loss, we are deploying ultrasonic sensors. Users are limited to taking books off of the shelf. As a result, the height of the books in the rack decreases everytime a book is removed from the shelf. Ultrasonic sensors are used to monitor this. When the student tries to place the book in the rack then the height increases which triggers the buzzer.

To manage such a huge library is a tedious task for a librarian. We also implement the database for finding books and showing user profiles. With the help of IOT and automation we can overcome these problems. This also overcomes human error and reduces human effort.

5 Future scope

For future development and enhancement of the study, the following are recommended.

- To enhance the usability features like mobile application that can be accessed by the user.
- To picking up the required book from predefine place with the help of robot will eliminates the human involvement.
- Providing AI suggestions of the books based on the description provided by the user.
- Providing SMS alerting automated system to alert the user about returning date and all.