

SMART LIBRARY ASSISTANT ROBOTIC SYSTEM

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ABSTRACT:

The goal of this project is to fully automate library operations through the use of robotics, the Internet of Things (IOT), RFID technology, and artificial intelligence (AI). A pick-and-place robot, a book repository, and a book withdrawal area make up the system. The robot is programmed to issue the book in the user's name in accordance with his needs. It will proceed to the section where the book is located, scan the RFID using a scanner, and select the book if the RFID matches. The user is required to return the book within the allotted time by placing it in the withdrawal box, where the book's RFID is scanned and the book is taken out of the user's possession.

INTRODUCTION:

Modern society is embracing the new technology of robotics. Robotics is most frequently used in automation since robots can complete a variety of jobs with little to no human involvement. Tracking library inventory is an illustration of how robotics may be used to automate activities. Many books can

be found in libraries, and they are frequently borrowed and returned. Books must be put in specified locations and sequences based on call numbers to maintain track of these books and make them simple to find. For library personnel, this procedure is frequently time-consuming and tiresome because they have to personally look for lost volumes, grab them, and place them in the proper spot. Robotics can be used to automate this process. Robots that can recognise books with the necessary tags and bring them to the desk can be programmed to do so. By doing this quickly and correctly, time and effort that would have been required for manual search and retrieval are saved. Moreover, the robot can be trained to lend books to customers. In order to keep track of the availability of books, the robot may be utilized as well to scan books and update the library's database. Robots can assist libraries in their transition to an automated and more effective system of inventory tracking. It can cut down on the amount of time needed for manual book retrieval and lending. In addition, it can be used to scan books and update the library's

database with the status of their holdings. This will make it easier and more accurate for libraries to keep track of their inventory. Additionally, other tasks like book sorting, book shelving, and even customer service can be automated using robotics.

Hardware Requirement:

1 System : Intel i3 2.1 GHZ

2 Memory : 4GB.

3 Hard Disk : 80GB

4 Wifi Module : Node MCUESP8266

5 Microcontroller : Arduinio UNO

6 Sensors and Modules : Relays, 12v Battery, DC Motors, Robotic Arm, RFID 5.5

Software Requirement:

1 Operating System : Windows 10.

2 Language : JAVA / J2EE, C

3 Database : MySQL

4 Server : Tomcat Server

5 Tool : NetBeans, Navicat, Arduino UNO.

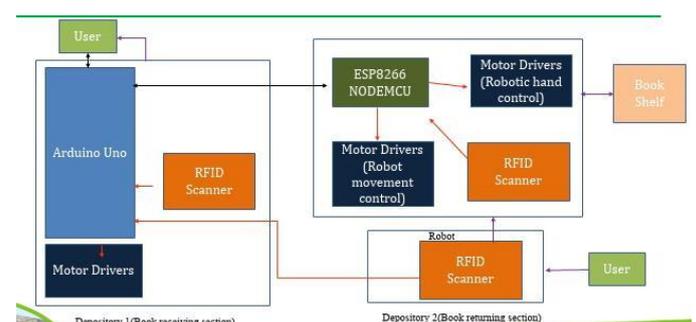
METHODOLOGY :

The library admin is responsible for entering the book details into a mysql database, which includes the book id, name, author, shelf number and RFID

tag number. Students can then log in to the web portal and search for books they wish to borrow. Once they have selected the books they want to borrow, they can send a request to the server. The server will then check the eligibility and send the request to the robot, with the RFID tag number and shelf number. The robot will then move towards the shelf and scan the RFID tags. If there is a match, it will pick up the book and take it to the conveyor belt. When the student goes to the library to collect the books, they will log in to the portal and send a request. The server will then verify the student and send a request to the controller of the conveyor belt. The conveyor belt will then rotate so that the assigned slot is at the collection desk, allowing the student to collect their books. This process is made possible through a combination of robotics, Internet of Things (IoT), RFID technology and Artificial Intelligence (AI).

BLOCK DIAGRAM OF THE PROPOSED SYSTEM:

The proposed system is a robotic system which automates the library management process by using RFID technology, IOT, and AI to issue, withdraw and keep track of books.



RELATED WORK:

Libraries with large collections of books often struggle to keep track of where each book is stored. To address this issue, many libraries have implemented computer systems that maintain a database of the book and its location. This allows an experienced librarian to quickly locate a book by knowing its book number, rack number, and shelf number. In this section, a summary of related works is provided.

OBJECTIVES:

1. Designing a system for automation of library that issues, withdraws, and keeps track of the library books.
2. Implementing a pick and place robot, a book depository section and a book withdrawing section to allow users to collect books from the depository by providing the QR Code received as an input.
3. Introducing a robot to automate the process of book finding, picking and issuing, and making it easier to locate a particular book by placing books in specific locations and arranging them in a sequence based on their call numbers.

WORKING:

The working of the robot can be divided to different layers:

- Admin can add book details and tag numbers.
- Admin can add student details.

- Students can log in and search for books.
- Students can order books to read.
- Robot can collect books from the shelf and place them on the table.
- Students can scan QR code to collect books.

APPLICATION:

- Use of robots in libraries of schools, colleges and public libraries.
- Use of robots in sales and book fares.
- Use of robots in industries to pick different items.

CONCLUSIONS AND FUTURE WORK:

In today's world, automation is essential in order to save time and money. Implementing robots to do certain tasks instead of human labor can help achieve this goal. The proposed library automation technique can effectively manage and store library materials without any human intervention. With the robot's knowledge of the location and availability of all the books, searching time is drastically reduced. Additionally, cameras and advanced image processing techniques can be used to make the automation smoother and more flexible, as well as detect any damaged books.

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