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Libot-Librarian Robot

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Abstract: *In this paper a ROBOT named "LIBOT - LIBRARIAN ROBOT", for the efficient delivery of books in a library is proposed. The robot is designed using sensor controlled geared motors to keep track of the library book shelf arrangements, that would help the students in acquiring the requisite book from the library with the help of Bluetooth user interface. LIBOT consists of Arduino board, Johnson motors, and chassis cum wheel setup (line follower), L clamp and sliding mechanism. The proposed work aims at reducing human effort and labour required in libraries.*

Keywords: *Bluetooth Module, Book-Tray, L Clamp, Rfid System, Slider, Sliding Mechanism.*

I. Introduction

Robotics is a very fast growing technology and has been widely used in a variety of applications to reduce human effort and to save time. In particular, the use of robots in library is becoming popular. Library management is one of the domains where humans takes time and effort to issue books. Although books are arranged in racks, in well-defined order, librarians have to perform rack reading and search for books to issue to the person who has demanded the book. This task can be quite difficult if the library is large. There are also chances that the demanded book may be overlooked by human eye. These issues can be solved if the entire process of searching for a book, picking the book from the library rack and issuing it to the concerned person can be automated using robots.

There has been different works related to library management using robots. Most of the works have focused on the overall design of the robot and its control systems [1]. A few of the works have looked particularly into the design of book picking mechanism. For example, the design of a pick and place robotic arm has been proposed in which links have been designed to correspond to human arm [2, 3]. There have been works that have looked into the design of a clamp instead of an arm for picking and placing books. A few works have looked into a combination of line follower robot and shelf modification to achieve automation in libraries [4]. A few works have concentrated on different technologies to identify the book on demand. For instance, books can be recognized using the pre-programmed data in the system using RFID [5]. Furthermore, robot can carry a barcode reader which collects the barcode data from the books arranged in a vertical manner and compare the decoded barcode data with its input database [6].

In this paper, a robot for searching and picking books from libraries, LIBOT (LIBRARIAN ROBOT) is proposed. The LIBOT receives the book details from the user via a Bluetooth interface and thereafter moves toward the rack where the demanded book has been placed using line follower methodology. To identify the required book, RFID technology has been utilized. Once the book is found it is pulled from the library rack into the collection box. The novelty of the proposed work lies in the unique design of picking part, i.e. a motor operated L-shaped clamp to pull the book out of the rack into the collection tray. The proposed librarian robot resolves to address the problem of timely issue of books.

II. Overview of libot

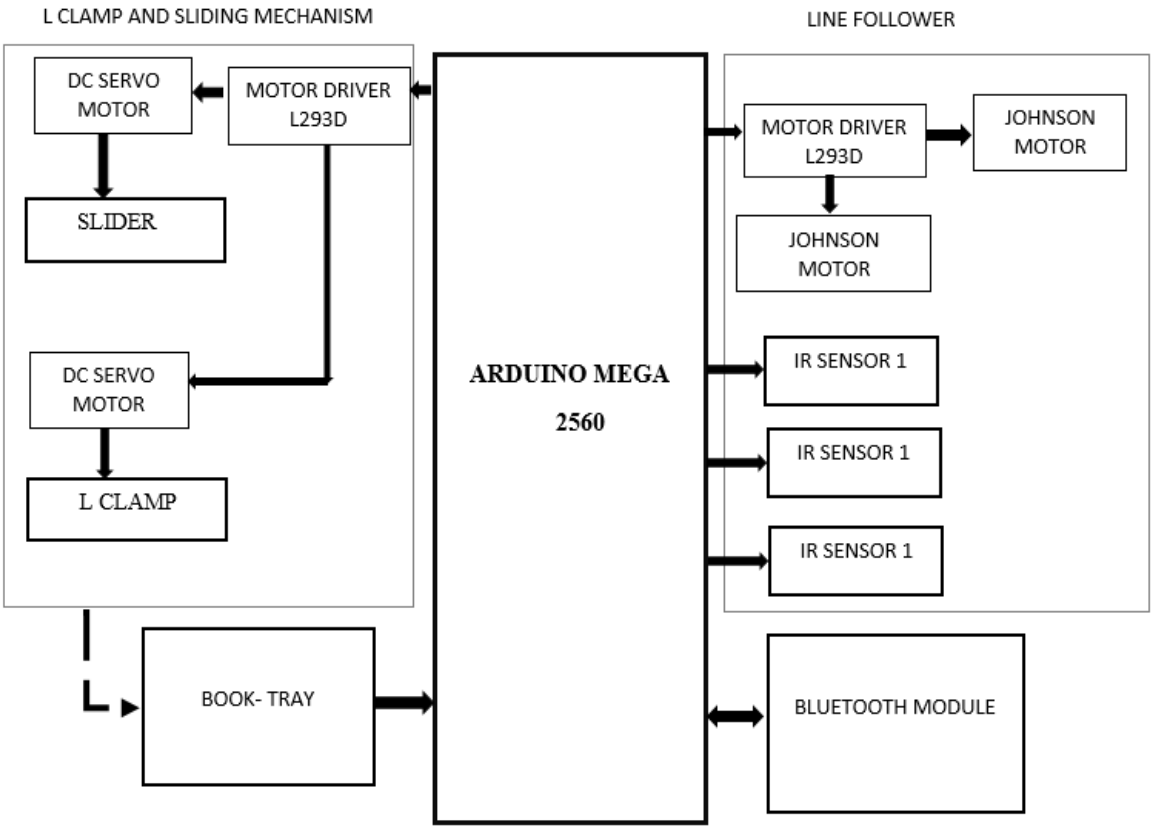

Fig 1: Block schematic of the proposed Librarian Robot

Fig. 1 illustrates the block schematic of the proposed librarian robot (LIBOT) system. LIBOT primarily comprises a Bluetooth user interface, a line follower and RFID part, an L clamp and sliding mechanism and a book collection tray.

User interface: The user interface provides a platform for communication between the user and the librarian robot. The proposed user interface in this work is a Bluetooth application which has to be installed by every user. The application has the database of all the books that are currently available in the library along with its serial number. The serial number provided for each book is pre-programmed with the rack position, shelf number, and the book position. The first set is for the rack position, middle set is for the shelf position, and the last set is for the book position. The user should enter the serial number of the required book in the space provided in the application. Once the serial number is entered, LIBOT receives the signal by using its Bluetooth module.

RFID System and Line Follower Methodology: Once the position is identified after receiving the signal, LIBOTstarts moving through its line follower methodology. RFID tags are provided to each book in the library which is used to identify the exact location of the book. Once LIBOT identifies the exact position of book in the rack, it turns towards the required book.

L Clamp and Sliding Mechanism: An L clamp arrangement and sliding mechanism is used to pick the book from the library rack in to the collection tray. The slider arm of the Libot first moves forward towards the rack followed by the upward movement of the L clamp attached to the slider. The slider will then again be moved forward until the identified book is reached. Once the book is reached, the L clamp will be made to move downward followed by the backward movement of the slider which pulls the book out of the rack into the book collection tray.

Book Tray:The book-tray is having a press button which will send a signal to the ARDUINO MEGA controller when it gets pressed beyond a predefined time period. Once the signal is received, LIBOTwill start its movement back to the user.

The proposed design of LIBOT has been illustrated in Fig. 2.

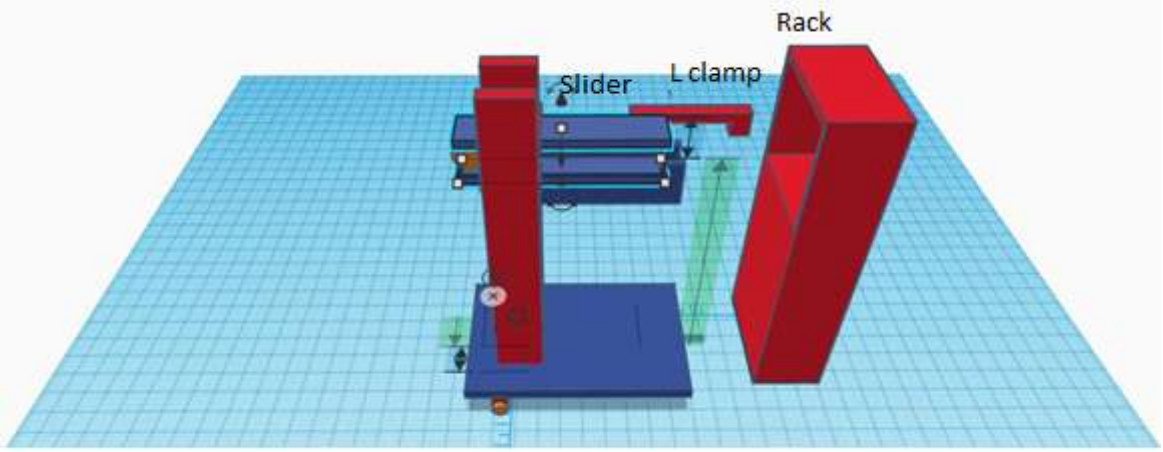

Fig 2: Design of Librarian Robot

III. Conclusion And Futurescope

In this paper, a robot for library application, LIBOT has been proposed to reduce human effort and to save time. The novelty of the proposed work lies in the design of a specialized slider and L clamp arrangement for the picking of books from the library rack. In future, the designed LIBOT will be tested to see how efficiently books can be picked using the novel picking arrangement. The proposed work can also be modified to be used in different applications like in medical shops where a large no of prescriptions are to be maintained in racks. It can also be modified to be used in grocery stores and supermarkets.

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