Design and Fabrication of A Pick and Place Robot for a Library

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ABSTRACT

This project will provide better service at input as well as output of library, in more elaborate form you have to just select the book at book issue counter book will come automatically to your end. This would reduce the user efforts and save time. In this project we will implement practical knowledge of mechanical engineering. The goal of this project, library automation is to automatically issue books and important fact is that it provides security against theft.

Key Words: *Robotic arm, Library automation, RFID reader, conveyor I.*

INTRODUCTION

Introduction : A library is a collection of information resources; it provides invaluable service to its members, to a wider local community. Typically we need a librarian to pick the book and handover it to the person to whom the books are being issued. This might be an easy task in case the library floor area is small. Also, to search for the books by humans take a lot of time as many a times the books gets overlooked the human eye. To overcome this problem we introduce automation in library to fast diction of books and for picking we suggest a robot with an arm with some degrees of freedom which will be able to find out the book with the required tag and then pick it and place it on the table.

HARDWARE AND SOFTWARE

This automated library system becomes a important topic. These systems are very essential and useful to reduce human Effort and save time. Various section of the system is;

• Robotic arm
• Microcontroller (At mega16)
• RFID reader
• Conveyor system

   A) Robotic arm In this project, we are used Pick and place robotic arm to pick a book and place on conveyor and it forward towards counter. They are directed in both X and Y directions to place the book. There are many different types of pick and place systems. Examples include portable material handling systems, industrial manipulators. This pick and place robotic arm with wheels can be easily moved from one place to another.

A pick and place robot manipulator can be used to pick an object and place them in an orderly manner to get a final destination Apick and place requires little operator and provides maximum output with efficiency. It is widely used in different industry to pick a different material and place in desire location

1) **Degree of freedom** Degree of freedom of system can be viewed as the minimum number of coordinates required to specify a configuration. A single object in a space requires three coordinates so it has three degree of freedom.

2) **Joint specification** It consist of following parts

- **Gripper:** Gripper is a front end of robotic arm. It is used to pick the object and placed in desired location.
- **Axis rotation:** It has 3600 of rotation (left, right, up and down)

Fig 1. Axis of Rotation

Fig 2. Robotic Arm With Gripper

Microcontroller: (AT mega 16) AT mega 16 is a low power AVR 8-bit Microcontroller. It is advanced RISC architecture. . AT mega 16 is high performance low power Atmel AVR 8bit microcontroller with 8kb of in system self programmable memory.131 powerful instruction present in AT mega 16 .Most of single clock cycle execution and 32*8 general register are working, fully static operation. Two 8-bit timer/ counters with separate and compare modes, and one 16-bit timer/counter with separate prescaler, compare mode, capture mode. Special Microcontroller features are on power reset and programmable brown-out detection, external and internal interrupt sources. operating voltage 4.5-5.5v for AT mega16.32 programmable I/O lines are present in AT mega 16.

Fig 3. Micro Controller

C] RFID reader: Radio- frequency identification (RFID) reader, The ISC. It operates on different frequency and available in many forms .it can be directly connected to the pc using Rs232 protocol. It gives serial and TTL output
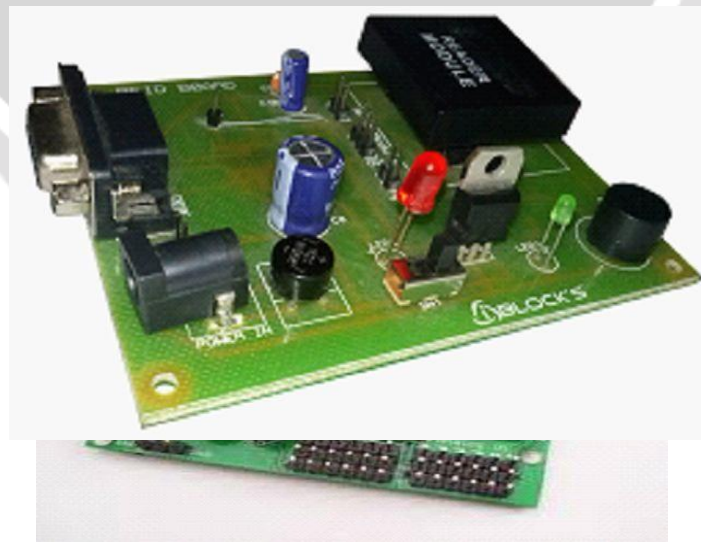
along with two RFID cards. it may have their own processing power and internal storage, and it offer wide range of functionality.

Fig 4. RFID Reader

D] RFID Tags: Radio frequency identification uses tags, attached to the object used to identified. RFID tag has a battery and it transmits ID signal periodically. It has a small batteryon board and it is activated when RFID reader present in the system. A passive tag is cheaper and smaller because it has no battery. The tag stored in non- volatile memory.

Fig 5. RFID Tag

E] Conveyor system: A conveyor belt uses a wide belt and pulleys and is supported by rollers. Many types of belt conveyor system are available. A belt conveyor system consists of two pulleys with an endless loop of carrying medium. The conveyor belt rotates around the system. If both of the pulleys are powered then automatically material on the belt are moving towards counter. The powered pulley is called the drive pulley while the unpowered pulley is called the idler pulley. As per its specification, Conveyors are durable and reliable components used in automated system. due to this conveyor belt used in automation we reduces the labor that allows less time to move rapidly through aprocess.

F] DC motor DC: geared motor 10RPM 12V are used for robotic application. It is very easy to use and available in the market. Motor operation based on electro magnetism . DC motors offer excellent speed and position control, long life, and high torque density. It gives higher efficiency and ability to withstand harsh environments.

Fig 7. DC Motor

SOFTWARE

1. Atmel Studio 6.0 Atmel® Studio 6 is the integrated development platform for developing the microcontroller (MCU) based applications. This Atmel Studio 6 IDP gives the idea how we can easy to write, build and debug your applications written in assembly code.

2. Sinaprog Hex Downloader Sinaprog Hex Downloader is used for burning process. This software converts the program of user language into the machine language.

3. PCB artist For the purpose of designing PCB we used PCB artist software .

3. METHODOLOGY & FUTURESCOPE

When we enter in library first we have to enter the name of book which we want to issue. The input is give through the switch. This information provides to the microcontroller AT mega 16.According to the information motor is moved and because of motor movement whole robotic structure is moved. RFID tag attached to the book and RFID reader is placed in robot grip. RFID reader read the information of book saved in RFID tag. This information is sent to the microcontroller AT mega 16 .Microcontroller again send this information to the motor through motor driver IC L293D.Robotic armpicks the book and put it on the conveyor system then conveyor carries the book to the issue counter. For returning the book the process will be reversed.

4. RESULT

Fig 8. Final prototype of pick and place robot

5. CONCLUSIONS

To pick the specific book and place it on the conveyor this was the first objective of our project which we have achieved. This project implements the concepts of embedded system, robotics and RFID communication. The idea of library automation can be achieved with the help of this project.

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