

Complete Library Control Robot

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ABSTACT: Present world faces lots of problems and they have no time to concentrate in each and every work in their busy schedule, our robot is designed to perform the application of library control operations. It is mainly focused on detection of book and check for the availability of the book and by using GSM technology the user being in membership can be able to check out whether the book is present or not without their arrival to the library. when the person enters the required book in the PC by using line following sensor the book from the shelf is searched through RFID tag and the arm of the robot is made to extend were the book is fetched using the gripper which is designed by sensor operated motors and give it to the person also when the person returns the book the robot keeps the book back to its respective place book here the process of searching the book is made easier without the help of human. In case if the book is not available it can be identified in the database system the information of non-availability of the book is sent as message in the mobile to the user. Since we maintain database system we ensure that the library items stored properly in order to maintain their security thus the main purpose of the robot is to manage library daily operations efficiently.

I. INTRODUCTION:

Robotics is the branch of mechanical engineering, electrical engineering and computer science that deals with the design, construction operation and application of robots as well as computer systems for their control, sensory feedback and information processing. Throughout the history robotics has been often seen to mimic human behavior and often manage tasks in similar fashion. Robotics is a rapidly growing field as technological advances continues; researching designing and building new robots. Nowadays robot systems have been applied in factory automation, dangerous, hospitals, surgery, space exploration, forest, farmland military and security system. Simultaneously industry and technology process in various fields are entirely changed modern world feature and human life. Development of research and scientific fruition from one side and utilize the practical results of these researches in industrial world is provided plenty of possibilities for development of environment. Robots are seen most similarity with human system in robots mechanical arms, which are used for doing various activities. Traditionally, most mobile robots are have been equipped with wheels. The wheel is easy to control and direct. It provides a stable base on which a robot is easy to build. Recent development in embedded controller technology has yielded very sophisticated computing devices in relatively small, easily programmed modules. With these advanced components, it is now possible to control complex devices. One of the main research challenges in robotics is ensuring the safety and dependability of robots during the

Interaction / cooperation with humans. This effort is motivated by the growing interest in employing robots in human everyday activities such as service robot, office robot and security in the busy environment. Our robot is mainly focused on doing applications of library control operations. Libraries across the globe started to use RFID to speed up the self check in/out process to indentify the required book and to ease the inventory control in libraries so that time saving, fast accessing of books, theft control and eliminating the manual errors are the main benefits in our library robot. Developments of RFID technology continue to yield larger memory capacities, wider reading range and fast processing. The robot should posses the following characteristics:

- **SENSING:** First of all the robot should be able to sense its surroundings. It would do this in ways that are not similar to the way that humans sense our surroundings.
- **MOVEMENT:** A robot needs to be able to move around its environment whether through rolling on wheels, walking on legs or propelling by thrusters.
- **ENERGY:** A robot needs to be able to power itself. A robot might be solar powered, electrically powered; battery powered the way the robot gets its energy will depend on what the robot needs to do.
- **INTELLIGENCE:** A robot needs some kind of "smarts". This is where programming enters the pictures. The programmer is the person who gives the robot its smarts.

II.EXISTING SYSTEM

There are many advancement in the field of engineering, robotics in particular many robotic system have been developed for various purposes. There are also certain systems which are used for automotive motion of vehicles in road and wheel chairs which can be used for defense purposes. In addition to these advancements there are also robotic systems which can combat in war times. This robot is named "Security warriors". Our robot is capable of detection of book and checks for the availability of the book in libraries. In the existing system all the transaction of books are done manually, so time taken for a transactions like borrowing a book, returning a book and also searching for the required book by the user, the major disadvantage is that preparing the list of books borrowed and the and checking for availability books in the library will take more time. Some of the problems being faced in manual system is as follows;

- Fast report generation is not possible.
- Tracking a book is difficult.
- Information about issue/return of the books is not properly maintained.
- No central database can be created as information is not available in database.

ZIGBEE TECHNOLOGY

Zigbee is the technology designed for wireless control and sensors. It operates in personal area networks (PAN'S) and device-to-device networks which provide connectivity between small packet devices such as control of lights, switches, thermostats etc. The main disadvantage of this is its short range and it is less in speed let's see their drawbacks in detail.

• DISADVANTAGE

The main disadvantages of zigbee include short range, and low data speed. Due to their high cost, GSM and GPRS are normally used in concentrators to transmit data to the main station, or in high end multi-function meters. Zigbee is used mainly in the concentrators, data collectors, repeaters, and meters installed in the urban distribution ARM systems and prepayment systems. Because of the good real time capability of RF, meters are often equipped with a remote control function.

BARCODE READER

A barcode is a visual representation of data that is scanned and interpreted for information. Each barcode which works as a tracking technology for products; and it is represented in a sequence of lines or other shapes. Initially this technology was symbolized by the width and spaces between parallel lines that were one dimensional. This barcode technology can be scanned by barcode readers along with newer technology on devices such as smart phones and desktop printers .

• DISADVANTAGES

- ❖ Barcode scanners need a direct line of sight to the barcode to be able to read
- ❖ In order to read the barcode, the barcode scanner needs to be quite close; around no more than 15ft.

- ❖ Barcode have no read/write capabilities; they do not contain any added information such as expiry date etc. They only contain the manufacturer and product.
- ❖ They are very labor intensive; as they must be scanned individually.
- ❖ Barcode have less security than RFID; as they can be more easily reproduced or forged.
- ❖ Barcodes are more easily damaged; as the line of sight is needed to scan, the printed bar code has to be exposed on the outside of the product.
- ❖ If a barcode is ripped or damaged there is no way to scan the product.



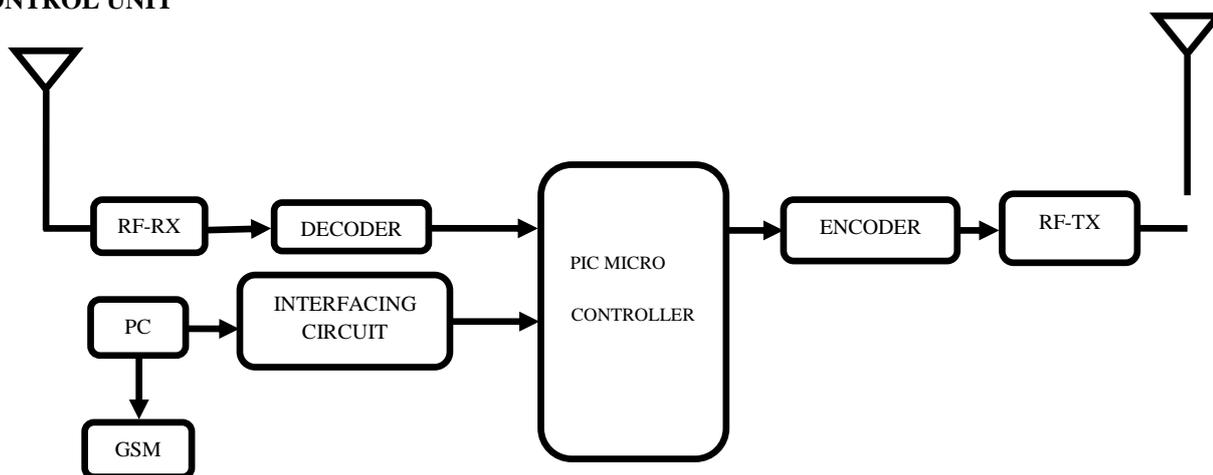
The robot is designed using sensor operated motors to keep track the library book from only one shelf. If the book is not available the line following robot will be just moving along the path repeatedly without any intimation. There is no database system is maintained in the software. The robot is designed to track the book from only one rack. If the book is not available the intimation of the situation is not possible. Due to technological advancement and less cost and in order to obtain accurate operation we are designing using new technology RFID which is cheap and effective. In the existing system the accuracy of robot navigation is very less so that we cannot move the robot in accurate direction.

SOFTWARE TECHNIQUES

National instruments have developed a quickly graphical programming language called LAB VIEW specifically designed for data acquisition, analysis and control. It is easy to learn and use, powerful, flexible, efficient and self-documentation. It resembles no other significant computer language. Execution is determined by the structure of a graphical block diagram (LAB VIEW source code) on which the programmer connects different function nodes by drawing wires

III.PROPOSED SYSTEM

The proposed system consists of two main units. **Fig.III.a**
CONTROL UNIT



I. PIC MICRO CONTROLLER

The name initially referred to “ Programmable Interface Controller” which is popular with both industrial developers and hobbyists due to their low cost wide availability, large user base, extensive collection of application notes and serial programming capability. Most frequently used controllers are as follows: PIC16F873A, PIC16F874A, PIC16F876A, PIC16F877A here in our project we are using PIC16F877A.

Special features of PIC16F877A controller

- ❖ 1000,000 e/w enhanced flash & 1,00,000 e/w data EEPROM cycle program memory typical.
- ❖ Data EEPROM retention > 40 years.
- ❖ Self –reprogrammable under software control.
- ❖ Single-supply 5v in – circuit serial programmable.
- ❖ Programmable code protection.
- ❖ Power saving sleep mode.
- ❖ Selectable oscillator options.

Here 16 is serial number, F in a name generally indicated the PIC micro controller uses flash memory and it can be erased electronically, it contains 8 bit and the product number 77, A is analog/ advanced. MPLAB includes a software emulator for the PICS, however software emulation of the micro controller will always suffer from limited simulation of the devices interaction with its target circuit. Proteus is a commercial software product developed by lab centre electronics, which allows simulation of

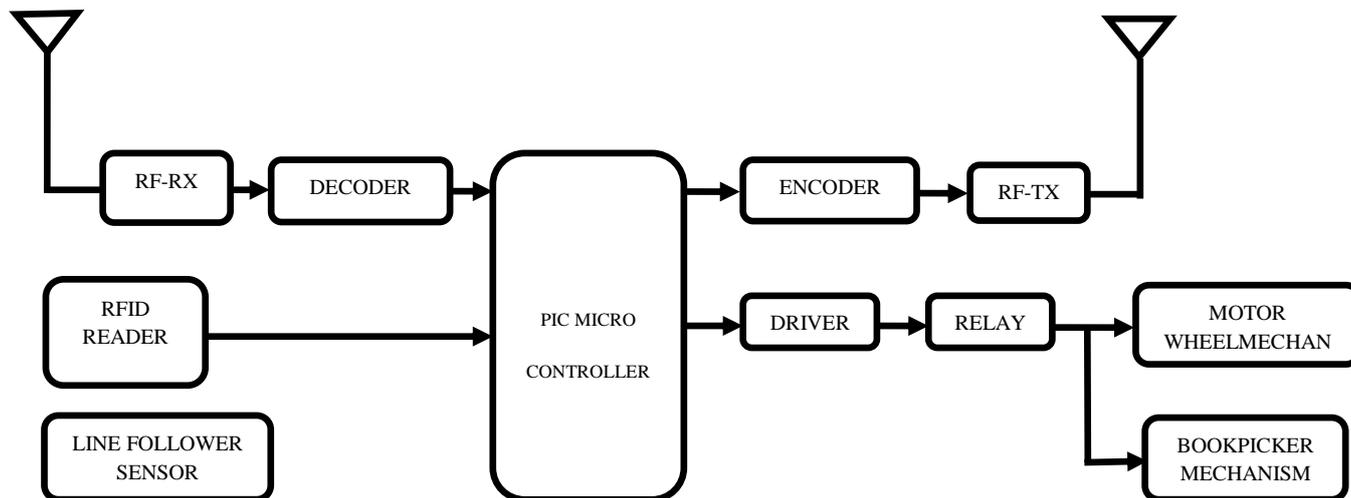
many PIC micro devices along with a wide array of peripheral devices. This method can help bridge the gap between the limited peripheral support offered by MPLAB

to offer a schematic display of signals and peripheral devices.

2. GSM TECHNOLOGY

GSM which stands for global system for mobile communication reigns as the world’s most widely used cell phone technology. Cell phones use a cell phone service carrier’s GSM network by searching for cell phones towers in the nearby area. It is approximated that 80% of the world uses GSM technology when placing the wireless calls, according to the GSM association (GSMA), which represents the interests of the worldwide mobile communication industry. This amounts to 3 billion global people. For practical land everyday purposes, GSM offers users wider international roaming capabilities than U.S network technologies and can enable a cell phone to be “world phone” advanced GSM incorporates the earlier TDMA standards. By using this technology in our project the person can check out the availability of the book in the library through the mobile without their arrival. GSM network operates in a number of different carrier frequency ranges (separated into GSM frequency ranges for 2G and UTMS frequency bands for 3G), with most 2G GSM networks operating in the 900 MHz or 1800 MHz where these bands are already allocated, the 850 MHz and 1900 MHz bands were used instead (for example in Canada and United States of America). In rare cases the 400 and 450 MHz frequency bands are assigned in some countries because they were previously used for first-generation systems.

IV ROBOT UNIT



1.RFID

RFID is used for many applications such as Automated electronic toll stations which can identify vehicles passing through without having to stop and then debits their account. Identify and monitor railcars and containers. RFID stands for Radio Frequency Identification it is one member in the family of automatic identification and data capture (ADIC) technologies and is a fast and reliable means of identifying objects. There are two main components the interrogator (RFID reader) which transmits and receives the signal and the transponder (tag) that is attached to the object. An RFID tag is composed of a microchip and come in a variety of sizes, shapes and forums. Communication between the RFID reader and the tags occurs wirelessly and generally does not require a line of sight between devices. The RFID reader can read through most anything with the exception of conductive material like water and metal, but with modifications and positioning, even these can be overcome. The RFID reader emits a low power radio wave field which is used to power up the tag so as to pass on any information that is contained in the chip. Libraries have materials arranged in a specified order according to a library classification system, so that items may be located quickly and collections may be browsed efficiently through RFID.

2.LINE FOLLOWER SENSOR

Line tracking through line follower sensor is a very important notion in the world of robotics as it give to the robot a precise, error less and easy to implement navigation scheme. In our library control robot also sensor plays a major role where it is used to identify the white and black color surfaces.

3.MOTOR WHEEL AND BOOK PICKER MECHANISM

Motor wheel and book picker mechanism is carried out using motor. Here motor is handled by using driver and relays.

❖ DRIVER USING IC ULN 2803

It is an integrated circuit (IC) chip with a high voltage /high current Darlington transistor array. It allows you to interface TTL signals with higher voltage/ current loads. In English, the chip takes low level signals (TTL, CMOS, PMOS, NMOS-which operates at from 0-5 V, with everything between 0.0 to 0.8V considered “low” or off, and 2.2 to 5.0V being considered “high” or on. The maximum power available on a TTL signal depends on the type, but generally does not exceed 25mw (~5mA@5V), so it is not useful for providing power to something like a relay coil. Computers and other electronic devices frequently generate TTL signals. On the output side it is generally rated at 50V/500mA, so it can operate small loads directly. It is frequently used to power the coil of one or more relays, which in turn allow even higher voltages/ currents to be controlled by the low level signal. In electrical terms, the ULN2803 uses the low level (TTL) signal to switch on/turn off the higher voltage/current signal on the output side.

The ULN2803 comes in an 18-pin IC configuration and includes eight transistors. Pins 1-8 receive the low level signals; pin 9 is grounded (for the low level signal reference). Pin 10 is the common on the high side and would generally be connected to the positive of the voltage which we are applying to the relay coil.pin 18, pin 2 drives 17,etc).

2. RELAYS

A relay is an electro-magnetic switch which is useful if you want to use a low voltage circuit to switch on and off a light bulb (or anything else) connected to the 220v main supply. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts. The coil current can be on or off so relays have two switch positions and most have double throw (changeover) switch contacts. There are no electrical connections inside the relay between the two circuits; the link is magnetic and mechanical. The coil of relay passes a relatively large current, typically 30mA for a 12V relay, but it can be as much as 100mA for relays designed to operate from lower voltages.

The relay's switch connections are usually labeled COM, NC and NO:

- ❖ COM= common, always connect to this, it is the moving part of the switch.
- ❖ NC= Normally closed, COM is connected to this when the relay is off.
- ❖ NO= Normally open, COM is connected to this when the relay coil is on.
- ❖ Connect to COM and NC if you want the switched circuit to be on when the relay coil is on.
- ❖ Connect to COM and NO if you want the switched circuit to be on when the relay coil is off.

ADVANTAGES OF RELAYS:

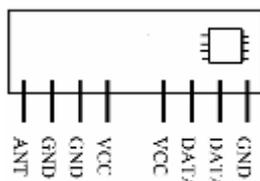
- ❖ Relays can switch AC and DC, transistors can only switch DC.
- ❖ Relays can switch higher voltages than standard transistors.
- ❖ Relays are often a better choice for switching large currents (>5A).
- ❖ Relays can switch many contacts at once.

4. RF TRANSISTERS AND RECEIVERS:

1.433 MHz RF Receiver:

It is an ideal short-range remote control application where cost is a primary concern. The receiver module requires no external RF components except for the antennas. It generates virtually no emissions, making FCC and ETSI approvals easy. The super-regenerative design exhibits exceptional sensitivity at a very low cost. The manufacturing-friendly SIP style package and low-cost make the STR-433 suitable for high volume applications.

PIN DIAGRAM



FEATURES

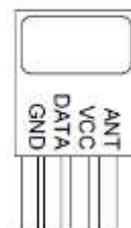
- Low cost.
- 5V operation.
- 3.5mA current drain.
- No external parts are required.
- Receiver frequency: 433.92MHz.
- Typical sensitivity:-105dbm.
- IF Frequency: 1MHz.

2.433MHz RF Transmitter:

It is an ideal for remote control applications where low cost and longer range is required. The transmitter operates from 1.5-12 V supply, making it ideal for battery-powered applications. The transmitter employs a SAW-stabilized oscillator, ensuring accurate frequency control for best range

performance. Output power and harmonic emissions are easy to control, making FCC and ETSI compliance easy.

PIN DIAGRAM



FEATURES:

- 433.92 MHz frequency.
- Low cost.
- 1.5-12V operation.
- 11mA current consumption at 3V.
- Small size.
- 4dbm output power at 3V

APPLICATIONS

- Remote Keyless Entry (RKE).
- Remote Lighting Controls.
- On-Site Paging.
- Asset Tracking.
- Wireless Alarm and Security Systems.
- Long Range RFID.
- Automated Resource Management

5. INTERFACING CIRCUIT

The MAX232 is a dual driver/receiver that includes a capacitive voltage generator to supply TIA/EIA-232-F voltage levels from a single 5V TTL/CMOS levels. These receivers have a typical threshold of 1.3v, atypical hysteresis of 0.5v, and can accept 30v inputs. Each driver converts TTL/CMOS input levels into TIA/EIA-232-F levels.

SPECIFICATIONS:

- Operates up to120 Kbit/s.
- Two drivers and two receivers.
- +/- 30V input levels.
- Low supply current -8 mA typical.

IV.RESULTS AND CONCLUSION:

In this paper using our proposed system it helps to reduce the manual work and time consumption. The core part of the system is RFID and GSM technology. The project was executed and the robot is designed using line following sensor, when the person asks for the book our robot moves

through line tracking and fetch the book in case if the book is not available the message of non availability is displayed in the PC.

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