

D-Robot

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Abstract: A machine resembles a human being and able to replicate certain human movements and functions automatically. It is designed to execute one or more tasks automatically with speed and precision. Without human error, they can more efficiently perform tasks at a consistent level of accuracy. Everywhere we see officials circulating information through notices with the help of some peons or attenders etc., which needs manpower. Now-a-days we find very few people working as attenders. This robot will be a perfect replacement for the tasks done by the attenders. The information sent by the sender will be carried to the receiver without the human control. Once the input is given, the robot should work without the human control and circulate the information given by the sender to the destination. The input given by the user can be a keypad entry, text input or voice commands. The input can also be sent by means of wireless communications like Bluetooth or Wi-Fi. The processor processes the input and sends the signal accordingly. The user will place the hardcopy on the panel and provides the address of the destination. The processor will make the robot move towards the destination. When the receiver collects the notice, the robot will return back to the starting point if the push button is pressed. Once the input is given, the robot should work without the human control and circulate the information given by the sender to the destination.

Keywords: Arduino IDE, Arduino Uno, Bluetooth module HC-05, DC motors, L293D motor driver, Ultrasonic sensors.

1. Introduction

A bot is a machine that is programmed to do certain tasks. They are automated, which means they run according to their instructions without a human user needing to control them. Bots often imitate or replace a human user's behavior.

Everywhere we see officials circulating information through notices with the help of some peons or attenders etc., which needs manpower. Nowadays we find very few people working as attenders. This robot will be a perfect replacement for the tasks done by the attenders.

The information sent by the sender will be carried to the receiver without the human control. When the input is given by the user, the robot should work without the human control and circulate the information given by the sender to the destination, which is D-ROBOT.

The term 'D' in D-ROBOT is the class where attenders belong.

2. Hardware

The hardware components detail that is required for this project is given below.

A. Arduino Uno



Fig. 1. Arduino Uno

The Arduino Uno is developed by Arduino.cc. It is an open-source microcontroller board. It is based on the microchip ATmega328P microcontroller. The board has a set of analog and digital input/output pins, and it can be interfaced to different expansion boards and other circuits. The board has fourteen digital input/output pins, out of which six are capable of PWM output, six analog input/output pins. It is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable. It can be linked with the different expansion boards and other circuit. Power can be given by the USB cable or by an external 9-volt battery; it accepts voltages between 7 and 20 volts.

The word 'Uno' means 'one' in Italian. To mark the commencing release of Arduino Software, the word Uno was chosen. The ATmega328 on the board is preprogrammed with a boot loader that allows to upload new codes to it without the use of an external hardware programmer. The Uno board is told to be the first in a series of USB-based Arduino boards. Version 1.0 of the Arduino IDE were the recommendation versions of Arduino, which now have been evolved to various newer releases.

1) The technical specifications are

- Micro-controller used is: Microchip ATmega328P
- Input voltage is: 7 to 20 volts
- Operating Voltage is: 5 Volts
- Number of UART pin is: 1, which has only one UART interface found on pin 0(RX0) and pin1 (TX0). The

Arduino pins 0 and 1 can also be used for communicating with the Arduino IDE via the USB.

- Number of I2C pin is: 1, but it provides SDA and SCL lines at two different locations.
- Number of SPI pin is: 1
- Digital I/O Pins: 14 (6 out of 14 can provide PWM output)
- Analog Input Pins: 6
- SRAM: 2 KB
- EEPROM: 1 KB
- DC per I/O Pin: 20 mA
- DC for 3.3V Pin: 50 mA
- Flash Memory: 32 KB of which 0.5 KB used by boot loader
- Clock Speed: 16 MHz

2) *The General pin functions are:*

- **LED:** There is an incorporated LED which is driven by the pin 13, which is a digital pin. Whenever this pin is low, the LED is off and when this pin is high, LED will be on.
- **V_{IN}:** The V_{IN} pin in the Arduino board is used when it is in need of an external power source. We can get voltage through this pin, or voltage can be supplied by-way-of the power jack, and can be retrieved it through this pin.
- **5V:** This pin gives an output of a regulated 5V from the regulator on the board. The board can receive the power either from the DC power jack (7i-20V), the USB connector (5V), or the VIN pin of the board (7-20V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator and can damage the board.
- **3V3:** A 3.3-volt supply can be developed by the incorporated regulator. Highest current drawn is 50 mA.
- **IOREF:** The microcontroller operates by the voltage reference that is provided by this pin on the Arduino board. IOREF pin voltage and selection of the suitable power source, or authorize voltage translators can be read by suitably organized shield on the outputs to run with the 5V or 3.3V.
- **Reset:** This is same as unplugging the board and plugging it back in. It restarts the program from the beginning.
- **GND:** Ground pins.

B. Chassis

A chassis is a framework that physically supports the object in its construction and function. It is a load bearing frame work of artificial objects. An illustration of a chassis is a vehicle frame which is a under part of a motor vehicle on which the body is mounted.

C. Ultrasonic sensor

Ultrasonic sensor is the device that generates or sense

ultrasound energy. It works by means of emitting sound waves at a frequency too high for humans to hear. Later it waits for the sound to be reflected back and calculates the distance based on the time required. Its working resembles to the working of radar.



Fig. 2. Ultrasonic sensor

Ultrasonic ranging module HC - SR04 provides 2cm - 400cm non-contact measurement function, the ranging accuracy can reach to 3mm. The module includes ultrasonic transmitters, receiver and control circuit. The basic principle of work:

- 1) Using IO trigger for at least 10us high level signal.
- 2) The module automatically sends eight 40 KHz and detect whether there is a pulse signal back.
- 3) If the signal is back, through high level, time of high output IO duration is the time from sending ultrasonic to returning.

Test distance = (high level time × velocity of sound (340m/sec)/2).

D. Bluetooth Module: HC-05

The Bluetooth technology manages the communication channel of the wireless part. The Bluetooth modules can transmit and receives the data wirelessly by using two devices.

The Bluetooth module can receive and transmits the data from a host system with the help of the host controller interface (HCI).

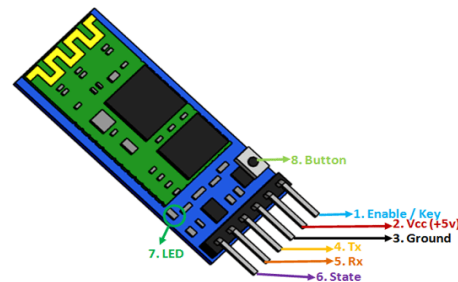


Fig. 3. Bluetooth module HC05

It's actually simple to pair the iHC-05 module with microcontrollers since it works using the Serial Port Protocol (SPP). Just power the module with i+5V and connect the Rx pin of the module to the Tx of MCU and Tx pin of module to Rx of MCU.

E. Buzzer

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical or piezoelectric.

Typical uses of buzzers include alarm devices, timers and

confirmation of user input such as a mouse click or keystroke.

F. DC motors



Fig. 4. DC motors

DC motor (BO) helps to convert electrical energy into mechanical energy. DC motor is assembled with multiple gear setups. Speed of motor is calculated in terms of revolutions per minute which is called as RPM. The arrangement helps to increase the torque and reduces the motor speed which is called as gear reduction. For all micro-controller based Robots, this type of DC motor can be used.

Some of the features are:

- Input voltage: 3-9v
- RPM – 60
- Torque- 0.5 kgcm/sec
- Current: 0.01 A (NL)

G. L293D Motor driver

- L293D is a Motor Driver IC which permits DC motor to drive on any direction.
- L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. Which means controlling of two DC motor with a single L293D IC can be done.
- This is generally used to control the motors in a self-directed robot.

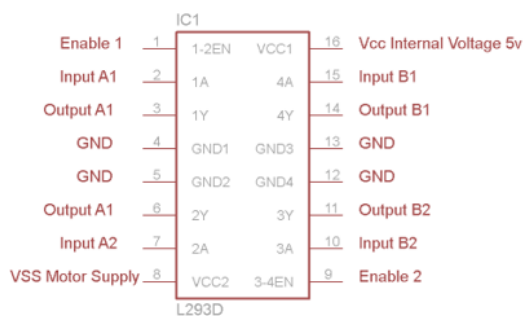


Fig. 5. Pin illustration of motor driver L293D

Working of L293D are:

- L293D motor drive IC contains four input pins. They are: pin 2 and 7 on the left, pin 15 and 10 on the right; as exposed on the pin illustration 3.
- According to the inputs given across the input pins, the rotations of the motors are completed. The values provided across the input pins can be logic 0 or logic

1.

- Rotation of the motor connected across the left side is controlled by the left input pins and the rotation of the right side of the motor is controlled by the right input pins.
- In simple words we can say that, for rotation of the motor logic 0 or 1 value has to be provided.

H. Push button



Fig. 6. Push button

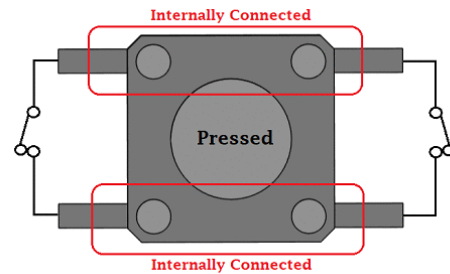


Fig. 7. Internal connection of push button

A push-button is a simple switch whose mechanism is to control some aspect of a machine or a process. Buttons are typically made out of hard material, usually plastic or metal. The surface is usually flat or shaped to fit the human finger or hand, so that it can be easily pushed.

Push button switch is a type of biased switch, which involves a mechanism that springs it into another position when released by an operator.

Push-Buttons are normally open tactile switches. They permit us to power the circuit or make any certain connection only when we press the button. Basically, it makes the circuit connected when pressed and breaks when released. We can see this push buttons in our daily life electronic equipment's.

3. Software

Arduino IDE is the software that is used to upload the program for this project.



Fig. 8. Arduino IDE

- A cross-platform application (for Windows, mac OS, Linux) that is written using the functions from C and C++ is called as Arduino Integrated Development Environment (IDE).
- With the assistance of 3rd party cores and further vendor development boards, writing and uploading of programs to Arduino boards can be done.
- Using the special guidelines of code structuring, the Arduino IDE supports the languages such as C and C++.

4. Project Implementation

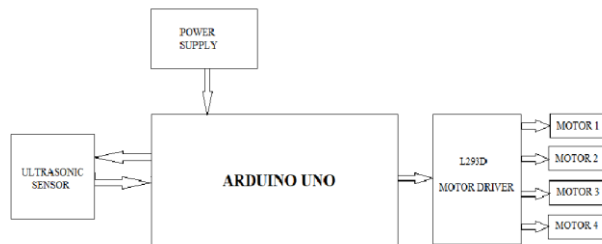


Fig. 9. Block diagram

Connections are done as shown in above block diagram.

- Then the bot is made to move forward, reverse, turned left and right. It is done by uploading code using Arduino IDE.

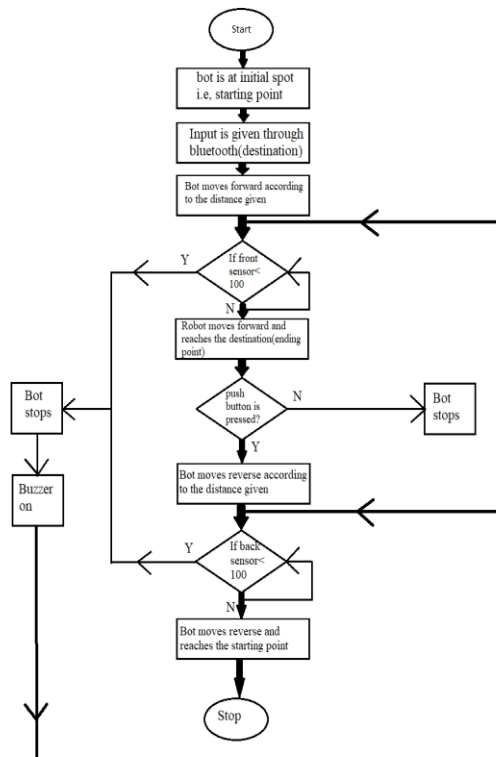


Fig. 10. Flow chart

- To detect the obstacles, two ultrasonic sensors are placed at the front and back of the bot.

- With the certain amount of distance under consideration, the robot will be made to move to the destination.
- User input: Text or voice input is given by the user from the mobile phone through the Bluetooth controller application, which will be connected to the microcontroller through the Bluetooth module HC-05.
- According to the input given by the user, destination is set for the bot. The notice that has to be circulated is given with the bot.
- It starts to move forward according to the distance given in the program.
- If any obstacle is found within less than 100cm distance, then the bot stops and the buzzer will be on.
- If there is no obstacle found on its way, then the bot reaches the destination. Here the notice is made to reach the destination with the help of the bot.
- Push button has been connected in the bot. If this push button is not pressed, then the bot stays in the destination itself.
- If this push button is pressed, then the bot moves reverse according to the distance given in the program.
- Meanwhile if it encounters any obstacle on its way, the sensor that is connected behind the bot will detect it and the bot is made to stop and the buzzer is kept on. If not, the bot reaches the starting point.
- Therefore, the notice has been circulated by the bot without the human control.

5. Applications

Can be used in,

- Manufacturing of wireless robots
- Restaurants
- Offices
- Schools and colleges
- Hospitals
- Industries

6. Advantages and Disadvantages

A. Advantages

- Labors can be reduced.
- Cost effective.
- This robot will be a perfect replacement for the tasks done by the attenders. The information sent by the sender will be carried to the receiver without the human control.
- Bots can work a long time without service or maintenance and they can be more productive than the people.
- Robots don't require rest, sleep or take breaks. They can work without stopping.

B. Disadvantages

- If any mistakes or error occurs, they cannot respond as humans can.
- Accuracy is less.
- job losses.
- Small variation in distance can lead to a change in destination.

7. Result

The information sent by the sender will be carried to the receiver without the human control. Once the input is given, the robot should work without the human control and circulate the information given by the sender to the destination.

8. Conclusion and Future Scope

In this project, we have designed a bot which helps to circulate the information to different classes autonomously. Once the input is given, the bot should work without the human control and circulate the information given by the sender to the destination.

This bot is actually a replacement for attenders or clerks. The

main goal of this project is, it reduces the labour work and time. Bots can work a long time without service or maintenance and they can be more productive than the people.

It can be improved and made to work more precisely by using camera, raspberry pi, gyroscope etc., and by image processing.

References

- [1] Vito M. Guardi, "Design of a Bluetooth Enabled Android Application for a Microcontroller Driven Robot," May 2014.
- [2] Jorge Kazacos, "Android Controlled Mobile Robot."
- [3] Ranjith Kumar Goud, B. Santhosh Kumar, "Android Based Robot Implementation for Pick and Retain of Objects," Oct. 2014.
- [4] M. Selvam, "Smart phone based robotic control for surveillance applications," IJRET 2014.
- [5] Kishan Raj K. C., "Controlling a Robot using Android Interface and Voice," 2012.
- [6] Gyula Mester, "Motion Control of Wheeled Mobile Robot," SISY 2006.
- [7] J. C. Basilio and S. R. Matos, "Design of PI and PID Controllers with Transient Performance Specification," IEEE 2002.
- [8] Xiao Lu, Wenjun Liu, Haixia Wang, Qia Sun, "Robot Control Design Based on Smartphone," IEEE, pp-2820-2823, June 2013.
- [9] Arpit Sharma, Reetesh Verma, Saurabh Gupta, Sukhdeep Kaur Bhatia, "Android phone-controlled robot using Bluetooth," IJEEEE, vol. 7, pp-443-448, Nov. 2014.
- [10] Namitha Shinde, Shreya Srivastava, Vineet Sharma, Samarth Kumar, "Android controlled Arduino based robot car."