# VOICE CONTROLLED ROBOT

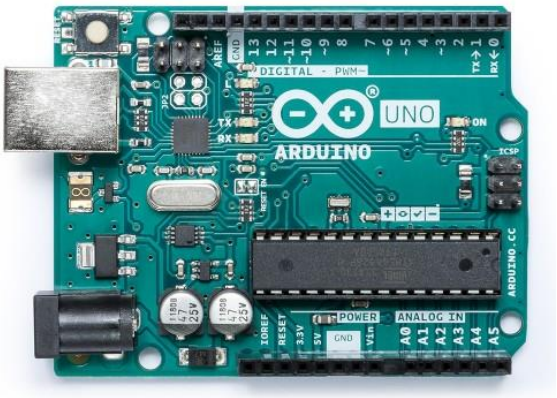
# USING ARDUINO

**Introduction:** In this project the robot is controlled with voice commands received from your phone. Here your command is transferred is transferred in the form of a string via a Bluetooth Module to the Arduino where the information regarding the distance to be covered and the direction of motion is processed and is sent to the speed sensor monitored DC-motors. The voice commands to be sent in the form "20 forward" in response to which the robot has to move 20cm forward.

## ➢ Required Components:

1) **Arduino UNO with cable:** Arduino Uno is a microcontroller board based on the ATmega328P (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator (CSTCE16M0V53-R0), a USB connection, a power jack, an ICSP header and a reset button. Simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

**THE ARDUINO UNO MICROCONTROLLER AND ITS TECH SPECS SHEET**




| | |
|---|---|
| Microcontroller | ATmega328P |
| Operating Voltage | 5V |
| Input Voltage (recommended) | 7-12V |
| Input Voltage (limit) | 6-20V |
| Digital I/O Pins | 14 (of which 6 provide PWM output) |
| PWM Digital I/O Pins | 6 |
| Analog Input Pins | 6 |
| DC Current per I/O Pin | 20 mA |
| DC Current for 3.3V Pin | 50 mA |
| Flash Memory | 32 KB (ATmega328P) of which 0.5 KB used by bootloader |
| SRAM | 2 KB (ATmega328P) |
| EEPROM | 1 KB (ATmega328P) |
| Clock Speed | 16 MHz |
| LED_BUILTIN | 13 |
| Length | 68.6 mm |
| Width | 53.4 mm |
| Weight | 25 g |

2) **HM-10 Bluetooth Module:** The HM-10 is a readily available Bluetooth 4.0 module. This module is used for establishing wireless data communication. The module is designed by using the Texas Instruments CC2540 or CC2541 Bluetooth low energy (BLE) System on Chip (SoC). Every commercial

device like headphones and mice are now using HM-10 because of its low power consumption. Most of the laptops also have 4.0 Bluetooth. In IoT continuous data sending devices also have HM-10 because of its no limit feature.Every two ways communication device like robots, remote control cars uses the HM-10 at developing level.

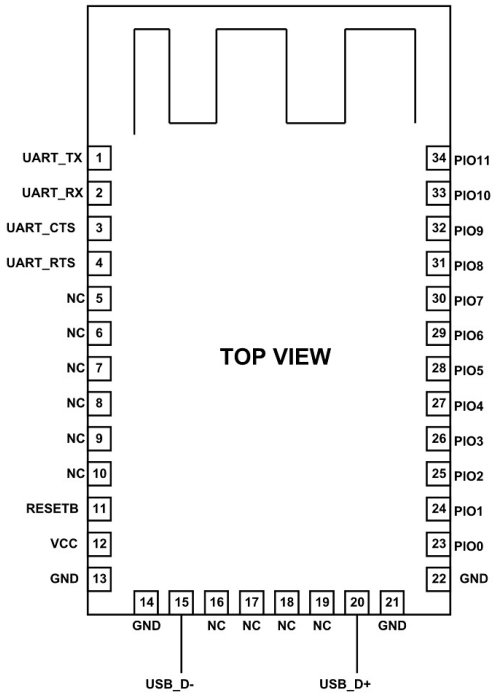
## Pin Configuration Details:

- VCC→To power input of the module, the VCC pin connects to the positive terminal of the power.**( connected to 5v Vcc of Arduino)**
- GND→The ground pin is always important for every DC circuit to make the common ground with power and other devices for proper function. GND pin will help to fulfil the requirement.
  **(Connected to GND pin of Arduino)**
- RX→HC10 communicates follows the UART communication protocol for data sending and receiving. RX will help to receiver the data from Arduino/microcontroller.**(connected to DPIO pin 12 of Arduino)**
- TX→TX will send the data from the Bluetooth to the Arduino/microcontroller.**(connected to DPIO pin 11 of Arduino)**
- State→this pin is just for state representation. There will a HIGH output signal at state pin for established Bluetooth connection otherwise it will be at a low.
- BRK→BRK represents the break, which helps to disconnect the connection of Bluetooth with another module. To disconnect the connection apply the LOW input signal on it.
- Button→there is a button on the device to break the connection just like a BRK pin.
- LED→the on-board led is for visualization. This helps to understand the current situation of the Bluetooth device.

## HM-10 BT Module Features:

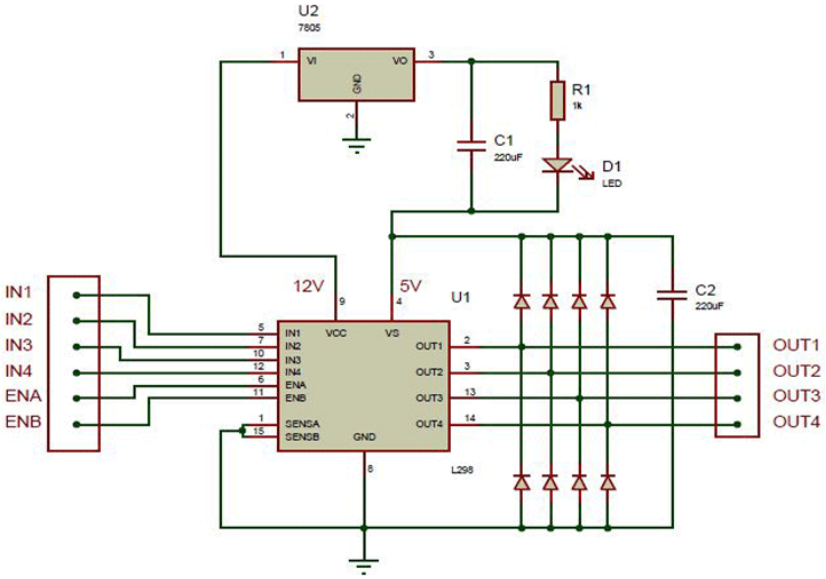
- HM-10 has the latest 4.0 Bluetooth technology.
- There is no limit in sending bytes with HM-10.
- Power consumption is much less even in an operating state with this module.
- The HC10 module uses the 2.5GHz frequency band at the range of 100meter in an open area.
- It is useable as a Master or Slave just by disconnecting the connections.
- The module operates at 2-3.7V only which is common in every TTL/CMOS device.
- A single module has its 256Kb flash memory and 8Kb SRAM.
- There are on-board GPIO pins within the module which are usable through UART communications.
- The GFSK (Gaussian Frequency Shift Keying) helps to transfer the data for the module.
- The device offers data and command mode which helps to set the internal setting according to the project requirement.

**HM-10 BLUETOOTH MODULE WITH PINOUT CONFIGURATION**

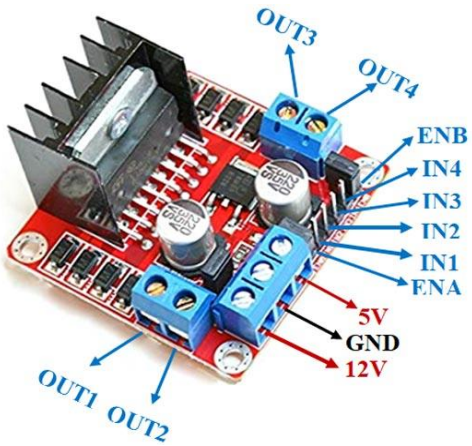




**3) L298N Dual H-Bridge Motor Driver Module:** This L298N Motor Driver Module is a high-power motor driver module for driving DC and Stepper Motors. This module consists of an L298 motor driver IC and a 78M05 5V regulator. L298N Module can control up to 4 DC motors, or 2 DC motors with directional and speed control.

**INTERNAL CIRCUIT DIAGRAM OF L298N MOTOR DRIVER MODULE**




**L298N MOTOR DRIVER MODULE PINOUT**



# L298N MODULE PIN CONFIGURATION

| Pin Name | Description |
|---|---|
| IN1 & IN2 | Motor A input pins. Used to control the spinning direction of Motor A (DPIO pins 9&8 respectively on Arduino) |
| IN3 & IN4 | Motor B input pins. Used to control the spinning direction of Motor B (DPIO pins 7&6 respectively on Arduino) |
| ENA | Enables PWM signal for Motor A (DPIO pin 10 on Arduino) |
| ENB | Enables PWM signal for Motor B (DPIO pin 5 on Arduino) |
| OUT1 & OUT2 | Output pins of Motor A |
| OUT3 & OUT4 | Output pins of Motor B |
| 12V | 12V input from DC power Source |
| 5V | Supplies power for the switching logic circuitry inside L298N IC (5v of Arduino) |
| GND | Ground pin |

**4) Two-wheel robot chassis**

**5) Two dc motors**

**6) Jumper wires**

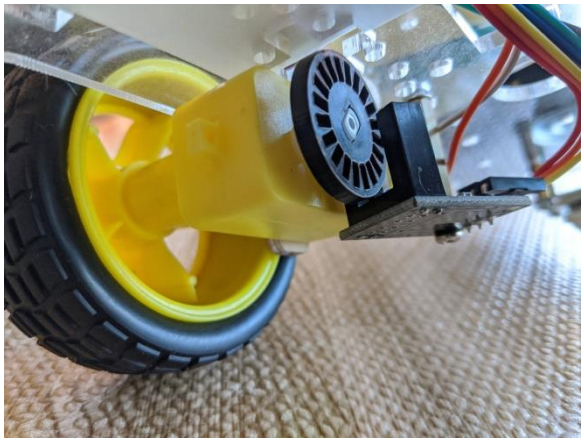
**7) Mini Breadboard**

**8) 9v battery (power bank)**

**9) 2 Battery clip connectors (1 connector must be suitable with dc jack on Arduino)**

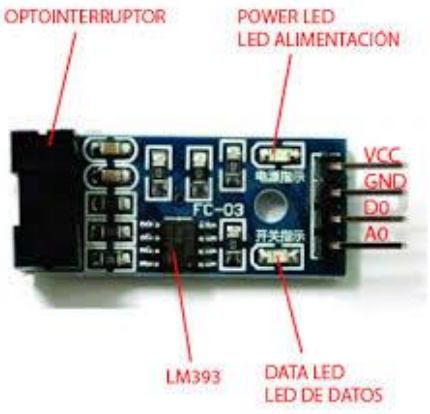
**10) Encoder wheels:** These two plastic disks are meant to mount to the motor shafts, on the opposite sides from the wheels. They have a series of slots in them as they are designed to be used with an optical source-sensor to provide feedback on motor speed and wheel position.

**ENCODER WHEEL ASSEMBLY**

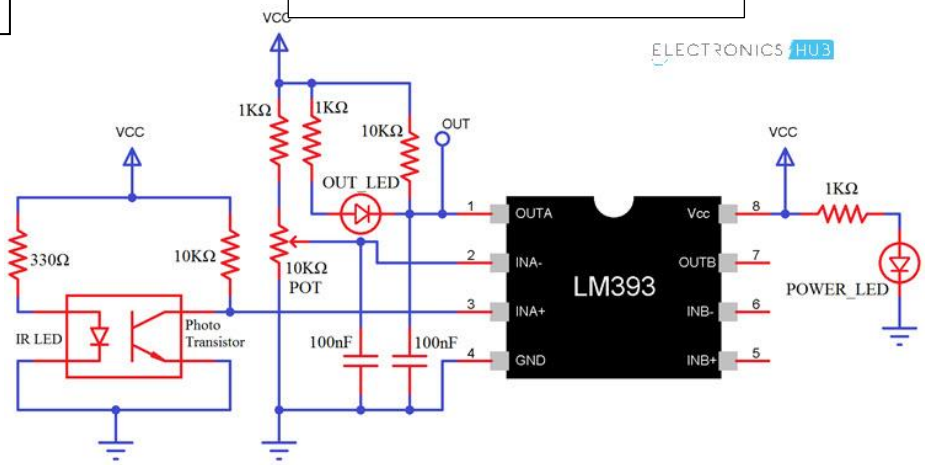


**11) LM393 Speed Sensor (Optical Interrupter Sensor):** An opto interrupter consists of source of light, usually an infrared LED, and a phototransistor sensor. The light source is mounted facing the sensor with a gap between them. In operation, the LED is illuminated and it shines onto the phototransistor, which detects its light and allows current to pass from the collector to emitter. If a solid non-transparent object is placed in the slot between the LED and phototransistor it will interrupt the light beam, causing the phototransistor to stop passing current. In our application the opto interrupter will be positioned with the rotating encoder wheel in the gap between the LED and transistor. As the wheel spins the slots in the wheel will allow pulses of light to reach the phototransistor, causing it to switch on and off in time with the wheel rotation. Each pulse will represent a slot in the encoder wheel, so if your encoder wheel has 20 equally-spaced slots (a pretty common value) then each pulse indicates that the wheel has turned 18 degrees (360 degrees divided by 20).

**LM393 SPEED SENSOR MODULE PINOUT**




**INTERNAL CIRCUIT DIAGRAM OF LM393 SPEED SENSOR**



## LM393 SPEED SENSOR PIN CONNECTIONS WITH ARDUINO

| Pins on LM393 Speed Sensor | Pins on Arduino |
|---|---|
| Vcc | 5v |
| Gnd pin | Gnd pin |
| Digital output pin | DPIO 2 (INT 0) |
| Analog output pin | none |

## ➢ Soft-wares and Mobile applications used:

1) **Arduino I.D.E**: The open-source Arduino Software (IDE) makes it easy to write code and upload it to the Arduino Uno board. It runs on Windows, Mac OS X, and Linux. The environment is written in Java and based on Processing and other open-source software.

2) **Fritzing**: Fritzing is an open-source hardware initiative that makes electronics accessible as a creative material for anyone. It offers a software tool, a community website and services in the spirit of Processing and Arduino, fostering a creative ecosystem that allows users to *document* their prototypes, layout and manufacture professional PCBs, emulate and simulate microcontroller circuits and create schematic representations of the projects.

3) **Dabble:** Dabble transforms a smartphone into a virtual I/O device. It communicates with hardware like evive, ESP32, and Arduino boards (Uno, Mega and Nano) using Bluetooth modules like HC-05, HC-06 or HM-10 (BT 2.0, 4.0 or BLE). The app consists of modules that provide access to different functionalities of the smartphone like sensors (accelerometer, GPS, microphone, etc.), camera, internet, etc. and consists of certain user interfaces for hardware control and project-making.