NOTE:- This is sample tutorial you do not need to follow this tutorial if you have idea of making it but your bot must follow the specification mentioned in Problem Statement

TUTORIAL

Step 1: Parts

First Of all You need to know what are you dealing with.

Robots = Electricity + Hardware + Software

1- Electricity: batteries have many specs you should only know how much Current and Voltage you need.

2- Hardware: " Body, Motor, Motor Driver, Sensors, Wires and The Controller " you should only get the important parts that do the task, no need to get a fancy expensive Controller for a simple task.

3- Software: The code is all about logic. Once you understand how the controller works it will become easy for you to choose the functions and to make the code more simple. The code language is determined by the controller type.

Part List:

1.   Arduino UNO
2.   12v DC motors (x2)
3.   Wheels (x2)
4.   Motor Driver (L298N)
5.   Distance Sensor (Ultra Sonic)
6.   Wires
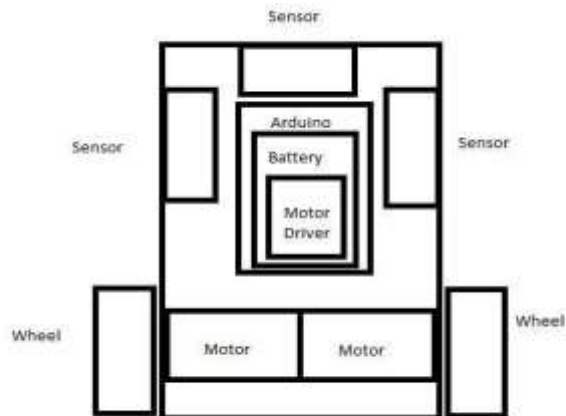7.   12v Lithium-ion Battery (1000 mAh)

Tools List:

1.   Battery Charger
2.   Acrylic sheet (Check what's available in your local store)
3.   Soldering Iron
4.   Wire cutter

5. Nylon Zip Wrap

For Extra fun you can use LEDs to light it up but it's not very important.

Step 2: Body Design

The main Idea was to stack the parts above the body and use the Nylon Zip Wrap stabilize the Arduino and Wires will stabilize the rest thanks to their lightweight.

I used CorelDRAW To design the body And I made extra holes in case of any future changes.

I went to a local workshop to use the laser cutter then I started to build it all together.

Later On, I made some changes cuz the Motors were longer than I expected.

I want to say that your robot does not have to be built in the same manner as mine.
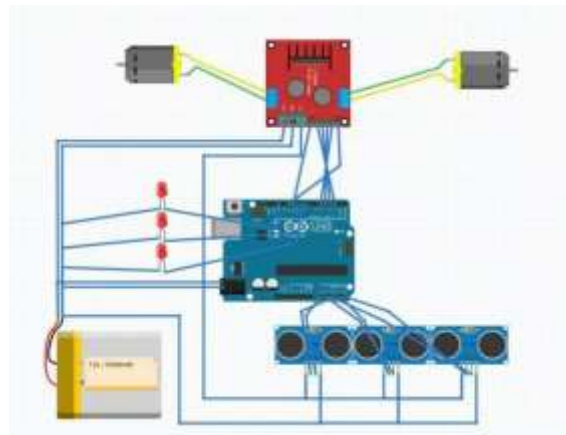
PDF file and The CorelDRAW File are attached.

If you are not able to laser cut the design, do not worry. As long as you have an Arduino, the same sensors, and motors then you should be able to get my code to work on your robot with minor change

Step 3: Implementation (building)

Step 4: Wiring

Here is a schematic diagram of the robot. these connections are related to the code.

You can change the connections but make sure to change the code with it.

The parts.

Sensors

I would like to explain "The Ultrasonic sensor"

An Ultrasonic sensor is a device that can measure the distance to an object by using sound waves. It measures distance by sending out a sound wave at a specific frequency and listening for that sound

wave to bounce back. By recording the elapsed time between the sound wave being generated and the sound wave bouncing back.This seems similar to the working of Sonar and Radar.

The connection of the Ultrasonic Sensor to the Arduino:

1. GND pin is connected to the Ground.
2. VCC pin is connected to the Positive (5v).
3. Echo pin is connected to the Arduino. (choose any pin and match it to the code)
4. TRIG pin is connected to the Arduino. (choose any pin and match it to the code)

You will make a common Ground and connect all GNDs to it (sensors, Arduino, Driver) all grounds should be connected.

For Vcc Pins also connect the 3 Sensors to a 5v Pin

(you can connect them to the Arduino Or the Driver I recommend the Driver)

Note: Don't connect the Sensors to a voltage higher than 5v or it will be damaged.

Motor Driver

The L298N H-bridge: it's an IC that can allows you to control the speed and direction of two DC motors, or control one bipolar stepper motor with ease.

The L298N H-bridge driver can be used with motors that have a voltage of between 5 and 35V DC.

There is also an on-board 5v regulator, so if your supply voltage is up to 12v you can also source 5v from the board.

Consider the image – match the numbers against the list below the image:

1. DC motor 1 "+"
2. DC motor 1 "-"
3. 12v jumper – remove this if using a supply voltage greater than 12v DC. This enables the on-board 5v regulator
4. Connect your motor supply voltage here, maximum of 35v DC.
5. GND
6. 5v output if 12v jumper in place
7. DC motor 1 enable jumper.Remove the jumper and Connect to PWM output for DC motor speed control.
8. IN1 Direction Control
9. IN2 Direction Control
10. IN3 Direction Control
11. IN4 Direction Control
12. DC motor 2 enable jumper. Remove the jumper and Connect to PWM output for DC motor speed control
13. DC motor 2 "+"
14. DC motor 2 "-"

Note: This Driver allows 1A per channel, draining more current will damage the IC.

Battery

I used 12v Battery with 1000 mAh.

The table Above shows how the voltage drops when the battery discharge.

you should keep it in mind and you have to recharge the battery constantly.

Discharge time is basically the Ah or mAh rating divided by the current.

So for a 1000mAh battery with a load that draws 300mA you have:

1000/300 = 3.3 hours

If you drain more current the time will decrease and so on.

Note: Make sure that you don't exceed the Battery Discharge Current or it will be damaged.

Also again make a common Ground and connect all GNDs to it (sensors, Arduino, Driver) all grounds should be connected.

REF:

http://ijsetr.org/wp-content/uploads/2016/09/IJSETR-VOL-5-ISSUE-9-2844-2848.pdf