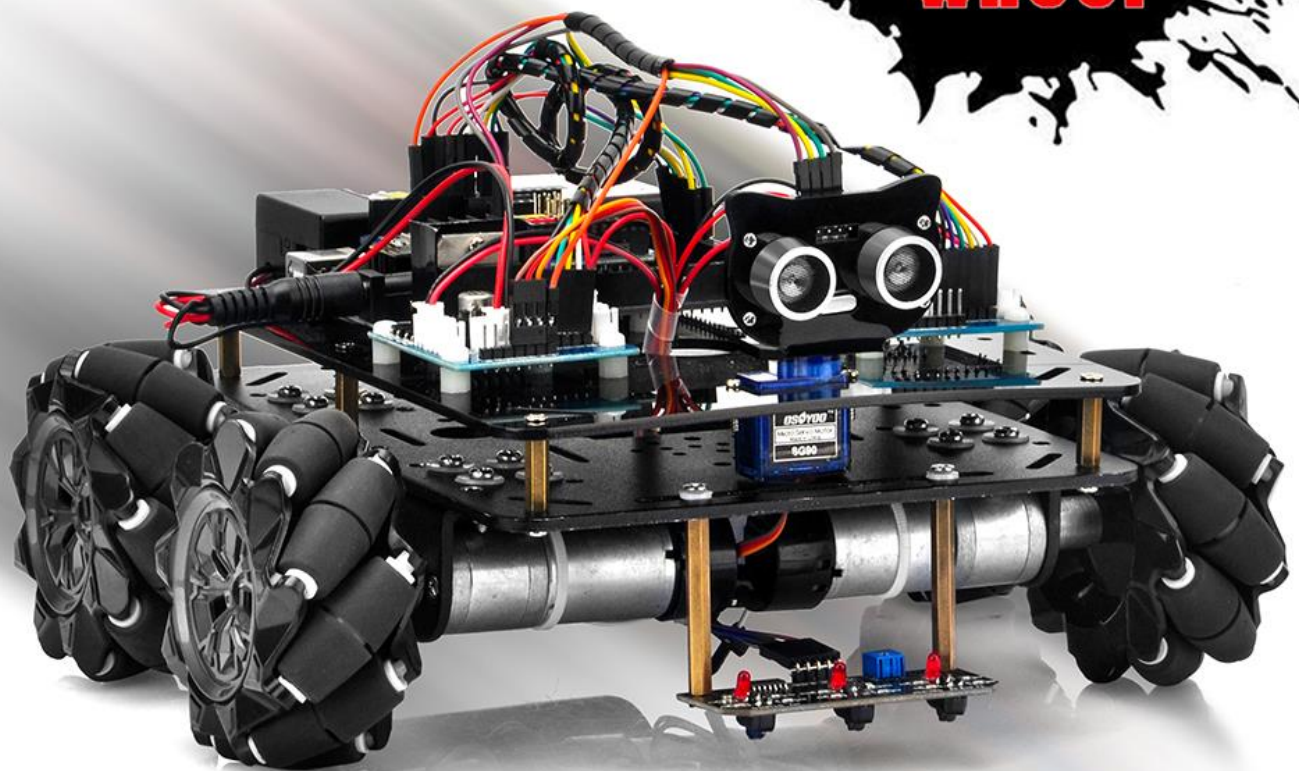




Omni-wheel



Easy Assembly



Omni-wheel



Wifi Control



Obstacle Avoidance



Line Tracking

More information: <http://osoyoo.com/?p=30022>

INTRODUCTION

Mecanum wheels, also known as omni wheels or Ilon wheels, consist of a hub with rollers oriented 45 °to the axis of rotation. The mecanum wheels are wheel hubs fitted with integrated rollers that move passively and independently.

Depending on which wheels rotate in which direction, the platform will move forward, backward, sideways, diagonally, or spin in place. This range of maneuverability enables the Omni Platform to efficiently navigate any space, particularly around tight corners, narrow lanes, and complex pathways.

This Arduino Omini Direction Robot Car learning kit is developed our Japan and Canada engineer team. It has all features a traditional Arduino Robot car should have, including remote control by Bluetooth, IoT through Wifi, Line tracking and Obstacle Avoidance auto driving. With the help of powerful Mecanum wheels, the car can make much more complicated movement such as sideway shifting and digeaonally movement controlled by Cell phone APP.

The kit comes with OSOYOO MEGA2560 board(fully compatiabile with Arduino MEGA2560) and OSOYOO ESP8266 Wifi Shield. Besides, we have designed five step by step lessons which help students to learn Arduino robot programming from scratch. If you are an experience DIY player or Arduino programmer, you can also get a lot of knowledge from this kit's open source code and hardware to make interesting DIY project of your own.

AUTHORIZED ONLINE RETAILERS

Mecanum Wheel Robot Car Kit Metal Chassis (without 18650 batteries)

Buy from US	Buy from UK	Buy from DE	Buy from IT	Buy from FR	Buy from ES	Buy from JP
 BUY NOW	 BUY NOW	 BUY NOW	 BUY NOW	 BUY NOW	 BUY NOW	 BUY NOW

Mecanum Wheel Robot Car Electronic Parts Kit (without 18650 batteries)

Buy from US	Buy from UK	Buy from DE	Buy from IT	Buy from FR	Buy from ES	Buy from JP
 BUY NOW	 BUY NOW	 BUY NOW	 BUY NOW	 BUY NOW	 BUY NOW	 BUY NOW

Mecanum Wheel Robot Car Full Package (without 18650 batteries)

Buy from US	Buy from UK	Buy from DE	Buy from IT	Buy from FR	Buy from ES	Buy from JP
 BUY NOW	 BUY NOW	 BUY NOW	 BUY NOW	 BUY NOW	 BUY NOW	 BUY NOW

CONTENT

Lesson 1 Basic Robot Car Assembling.....	- 1 -
Lesson 2 Obstacle Avoidance Robot Car.....	- 17 -
Lesson 3 Line Following Robot Car.....	- 24 -
Lesson 4 Bluetooth Controlled Imitation Driving ..	- 30 -
Lesson 5 Wifi Controlled Robot Car	- 36 -

Lesson 1 Basic Robot Car Assembling

OBJECTIVE

Mecanum Omni wheel is a very powerful wheel technology which allows robot car make omni-directional movement (parallel shift to left and right).

In this project, we will show how to use Arduino to control an Osoyoo Brand Mecanum wheel robot car.

PARTS & DEVICES

OSOYOO Mecanum Wheels Robotic Car Chassis x 1 (2x left-wheels/2x right-wheels and 4x Motor)

OSOYOO MEGA2560 board fully compatible with Arduino

OSOYOO V1.3Wifi Shield x 1

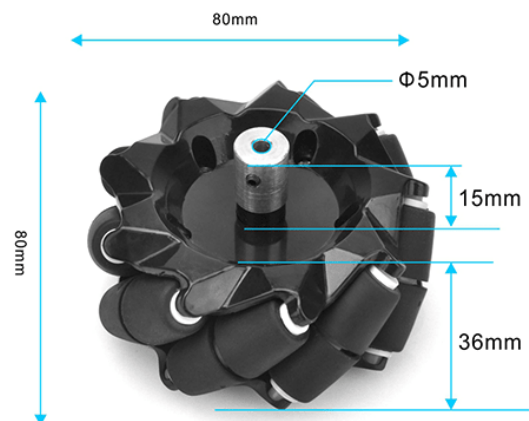
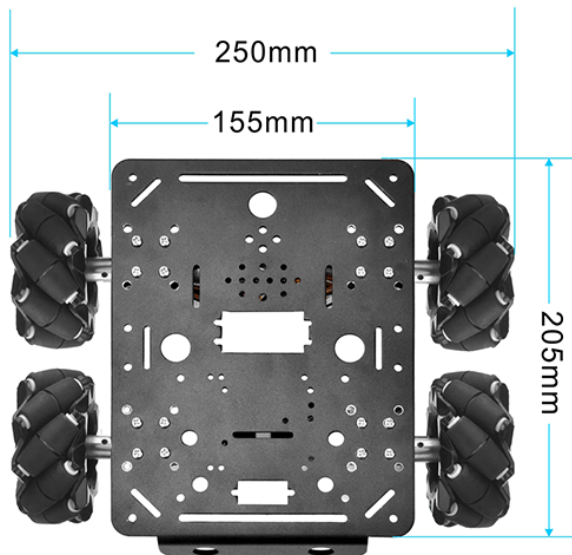
OSOYOO Model X motor driver x 2

OSOYOO HC02 Bluetooth Module

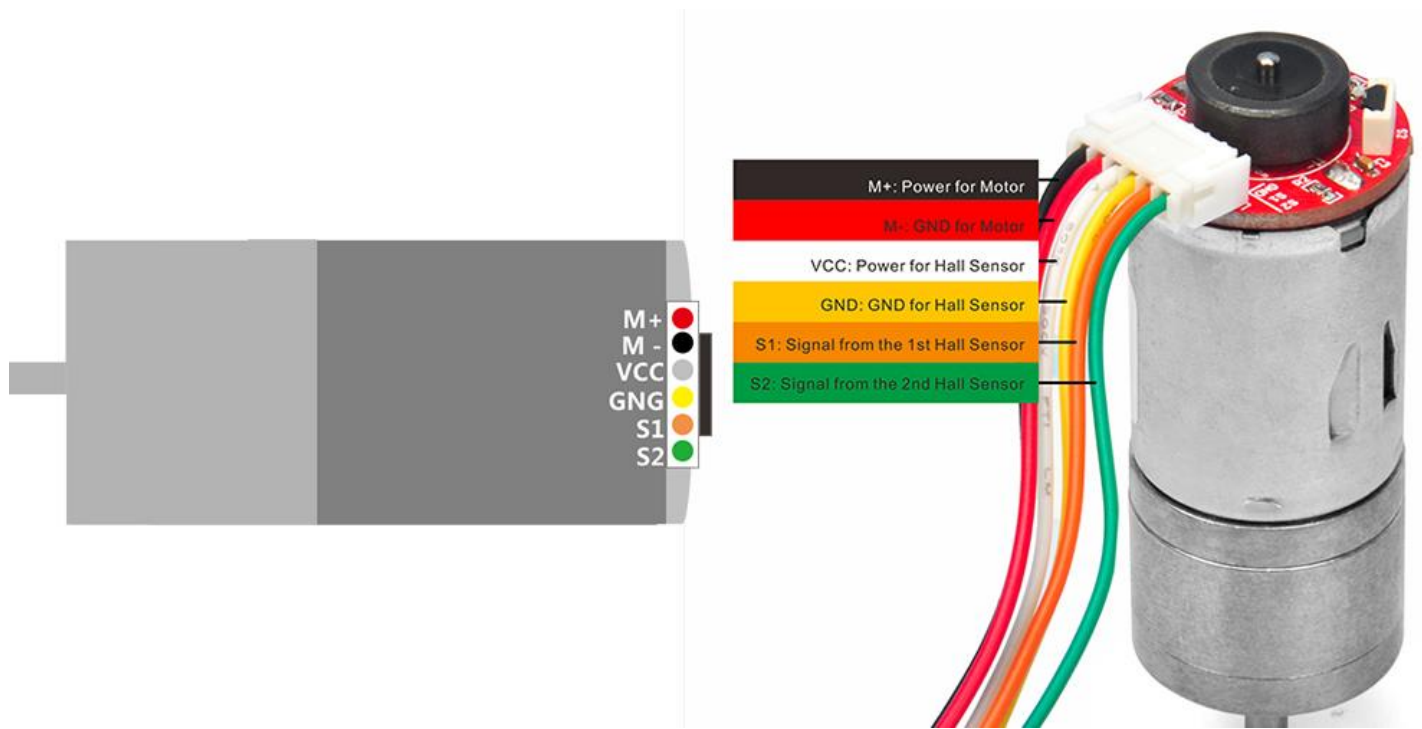
OSOYOO battery box x 1

18650 batteries(3.7V) x 2

Specifications:

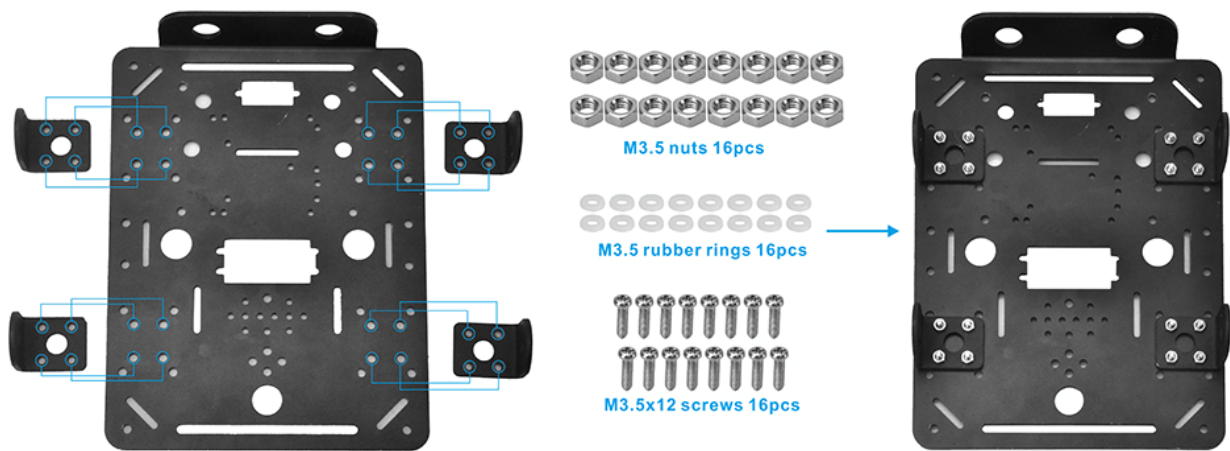


Now the latest version of the motors come **without protection caps** as the attach picture. The motor protection cap peels off easily, so we remove this cap.

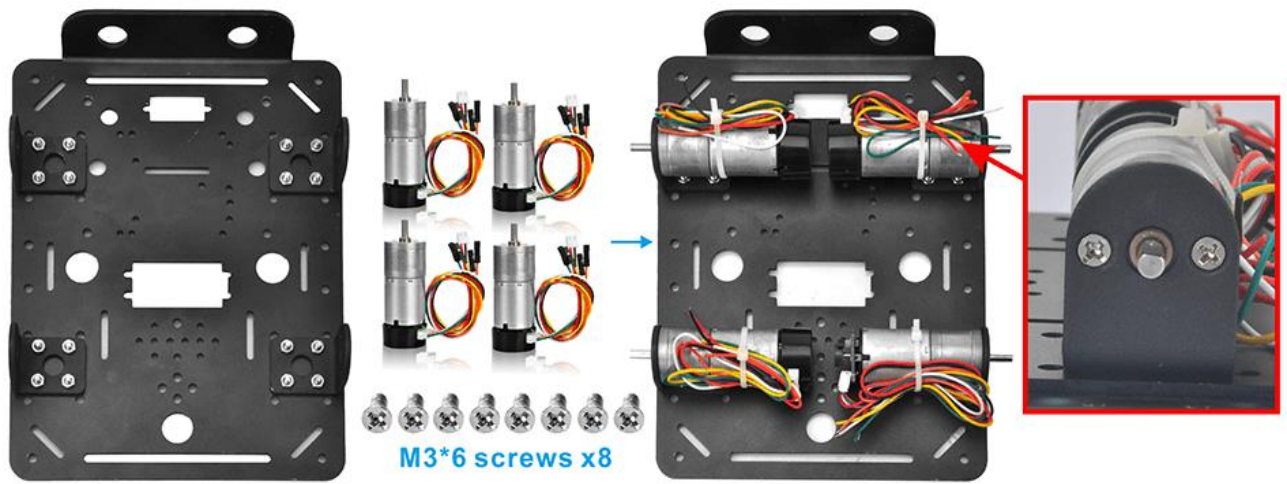


HARDWARE INSTALLATION

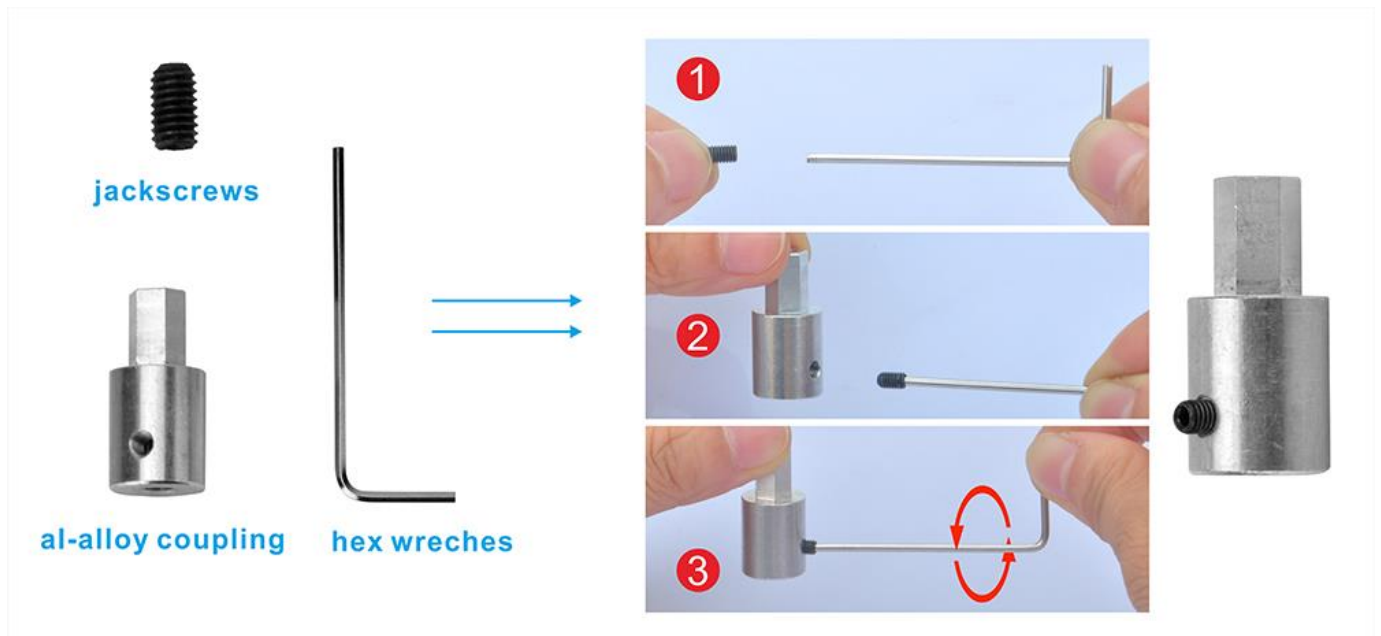
STEP1. Install the metal holder on metal chassis with 16pcs M3.5*12 screws, M3.5 rubber rings and M3.5 nuts.



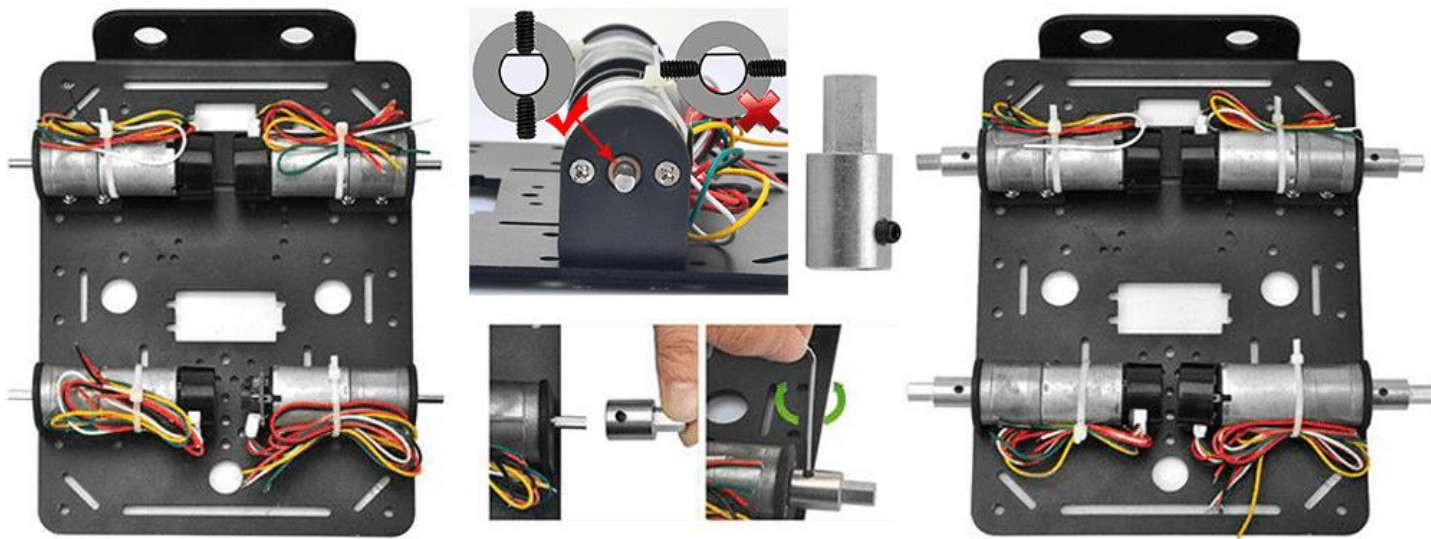
STEP2. Installing 8pcs M3*6 screws as per the following red box.



STEP3. Install the jackscrews on al-alloy coupling, please tighten jackscrews to fix the al-alloy coupling on motor.



The shaft from the motor has a flat area on it. Make sure that the jackscrew was positioned on this flat, and tightened both screws on the shaft.



STEP4. Install the 4 mecanum wheels on al-alloy coupling with 4pcs M2.5*10.



The Mecanum wheel has some sub-wheels on the main wheel. The four Mecanum wheels have two types by the sub-wheel directions. Check the type left wheel and right wheel by following **picture left side**. You must 100% sure that correct type of wheel is installed into correct position as per **picture right side**, the rolling direction of each wheel will determine the whole car moving directions showed in the picture.

A correct configuration requires each of four wheels is set in the way as shown below, where the rotation axis of each wheel's top roller points to the center of the platform. Please notice that all the dynamic analysis and prewritten codes are based on this configuration.

Two types of mecanum wheel and their installation position in the car

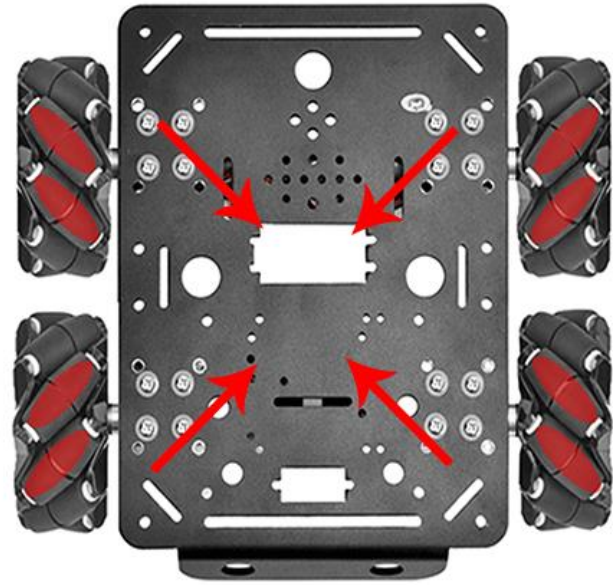
Left wheel



Right wheel



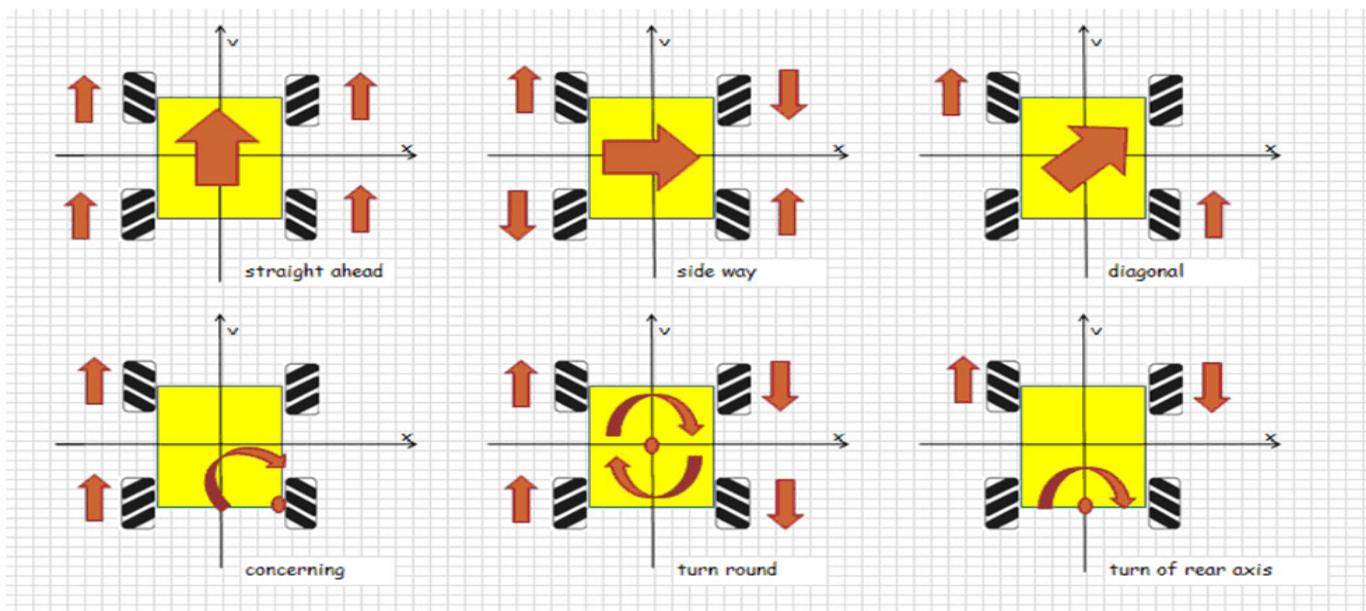
Front



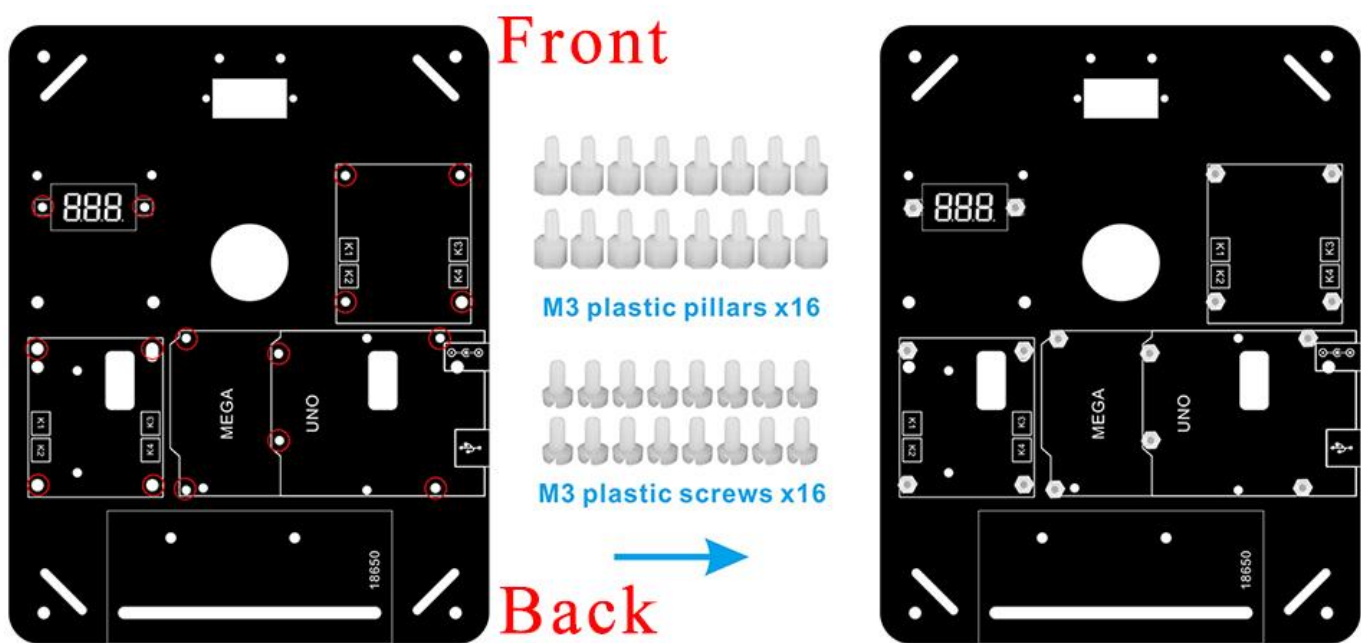
Back

Different rotation combination of 4 wheels will result in different car movement directions.

Following pictures shows how they works.



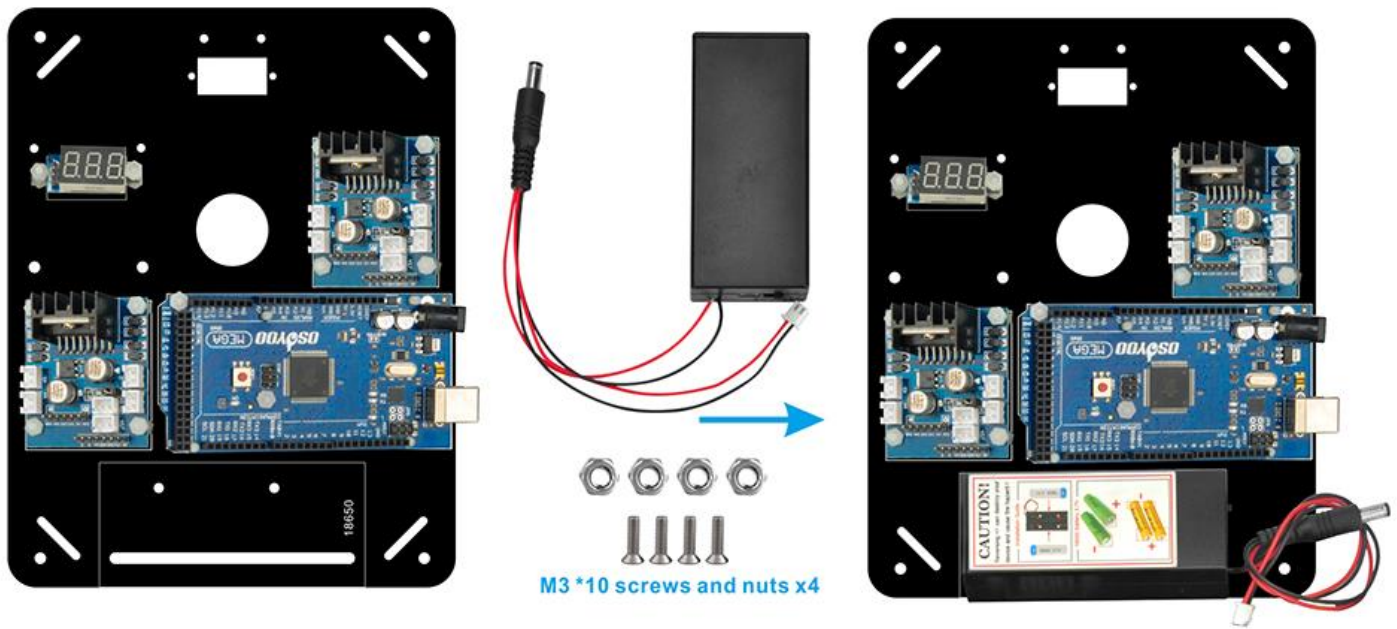
STEP5. Install the 16pcs M3 plastic pillars and screws on acrylic chassis.



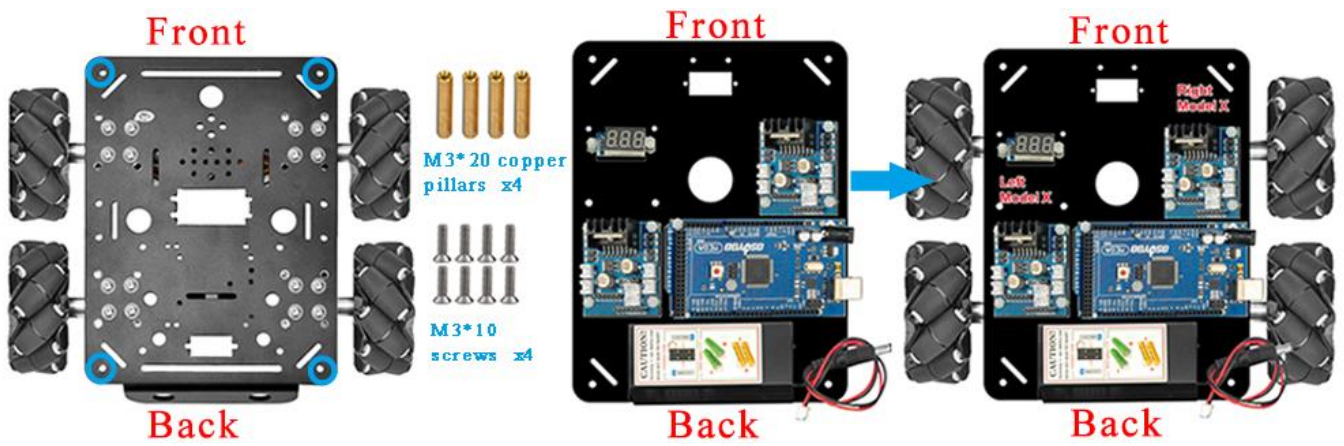
STEP6. Install 1pcs osoyoo mega2560 board, 2pcs model x motor driver board and 1pcs voltage meter on acrylic chassis with 12pcs M3 plastic nuts.



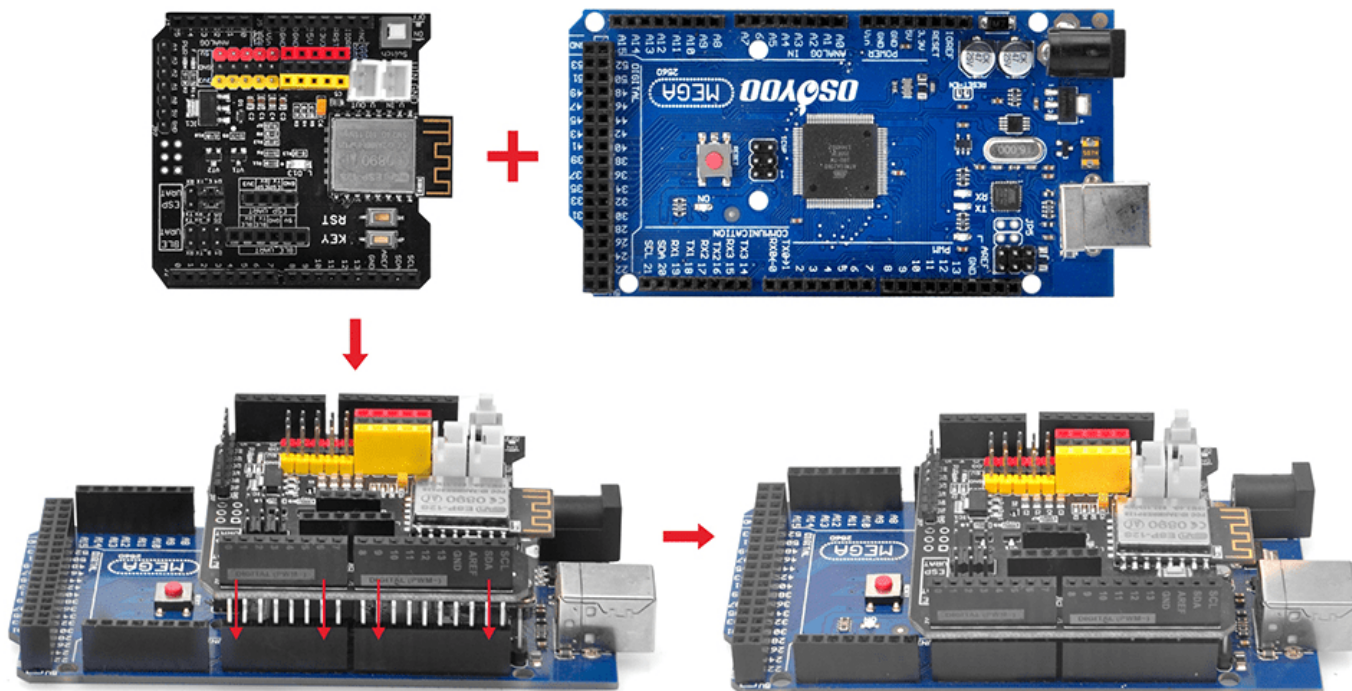
STEP7. Install battery box with 4pcs M3x10 screws and nuts.



STEP8. Install the acrylic chassis on metal chassis. Please note the front and back of acrylic chassis and metal chassis.



STEP9. Insert OSOY00 wifi shield into arduino mega2560 board as following pictures.

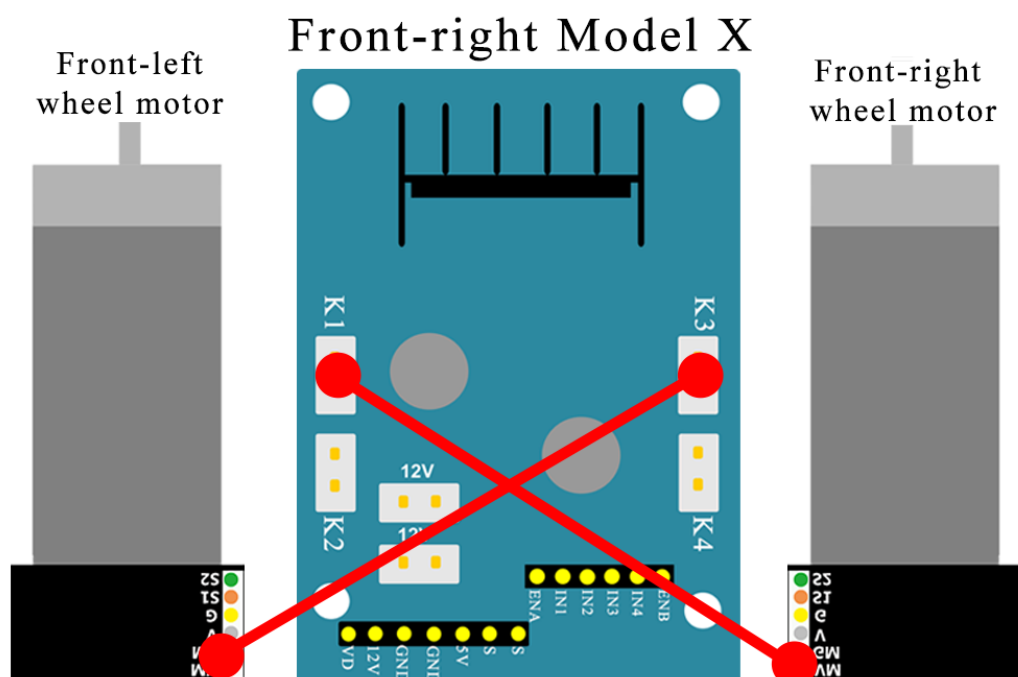


CIRCUIT CONNECTION

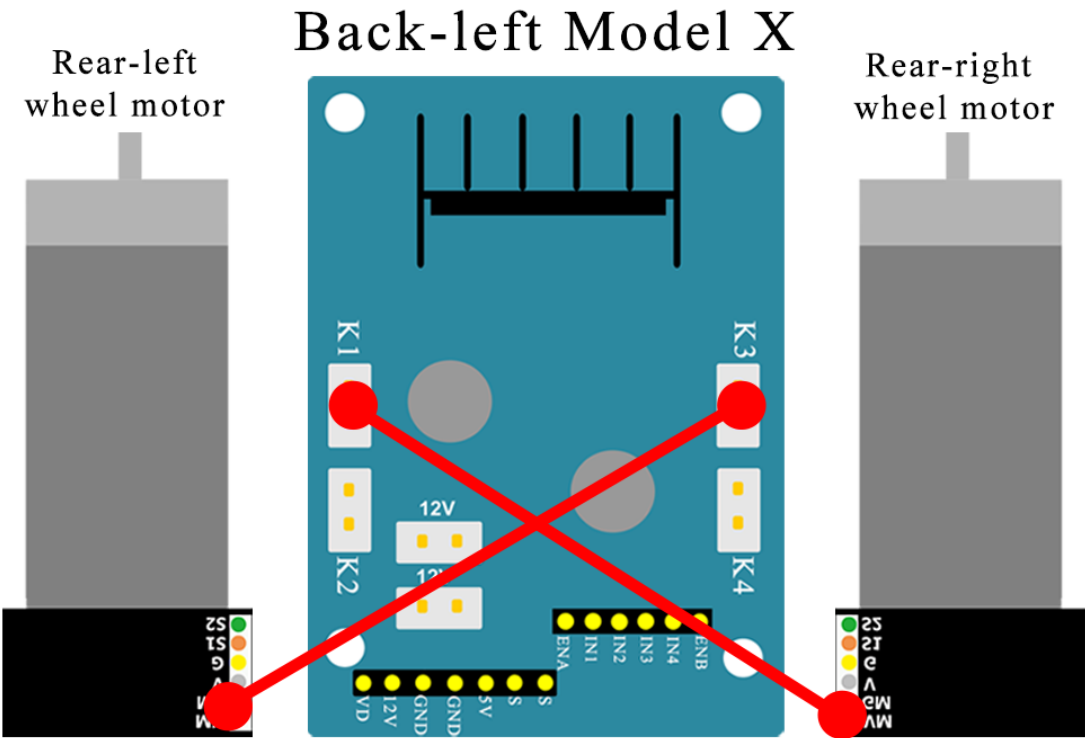
Before connect wires, make sure you have inserted OSOY00 Wifi Shield onto MEGA2560 board already.

STEP10. Connect 4 motors to 2 model X driver as per the following pictures.

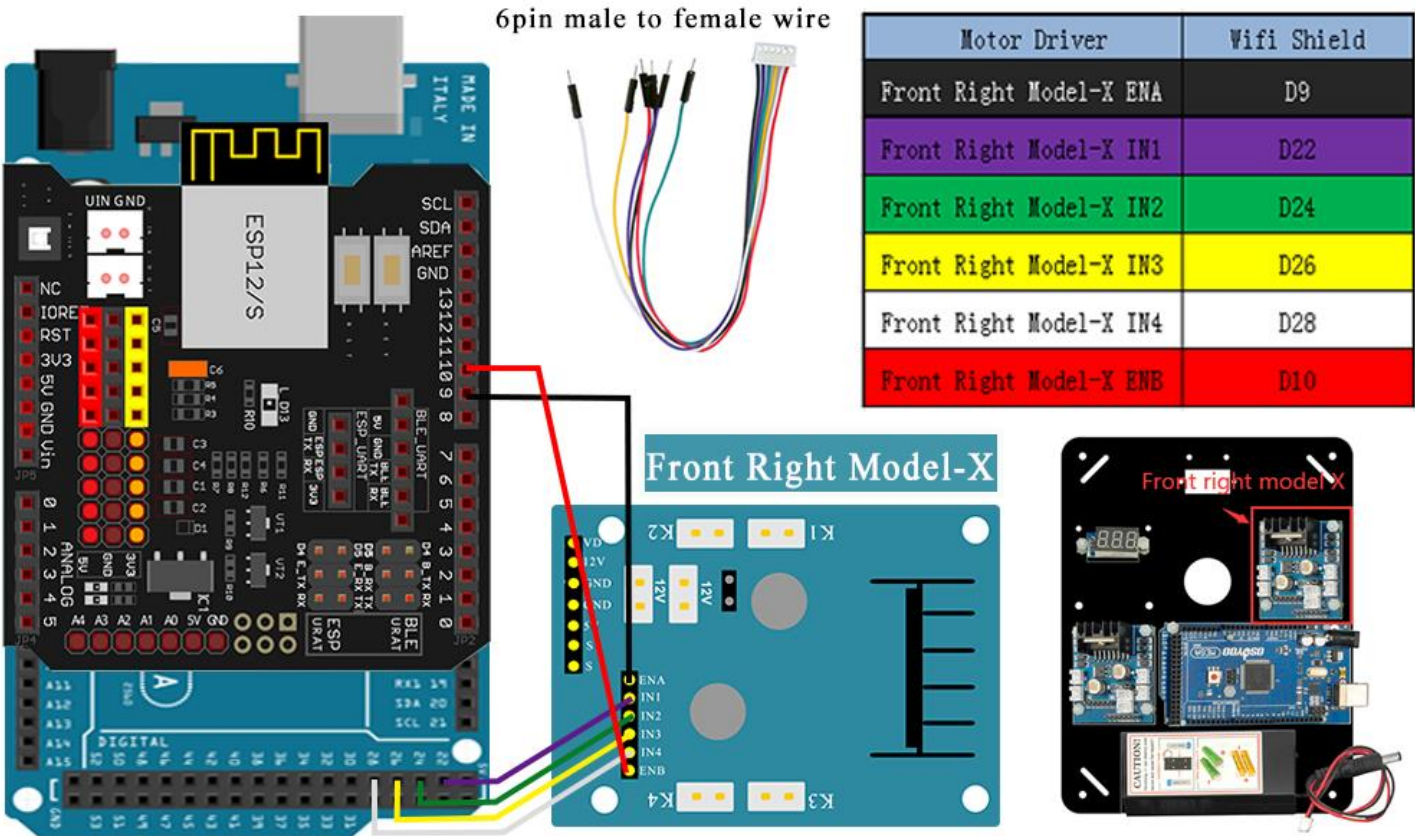
Wheel Motor	Front-right Model X
Front-right motor	K1
Front-left motor	K3

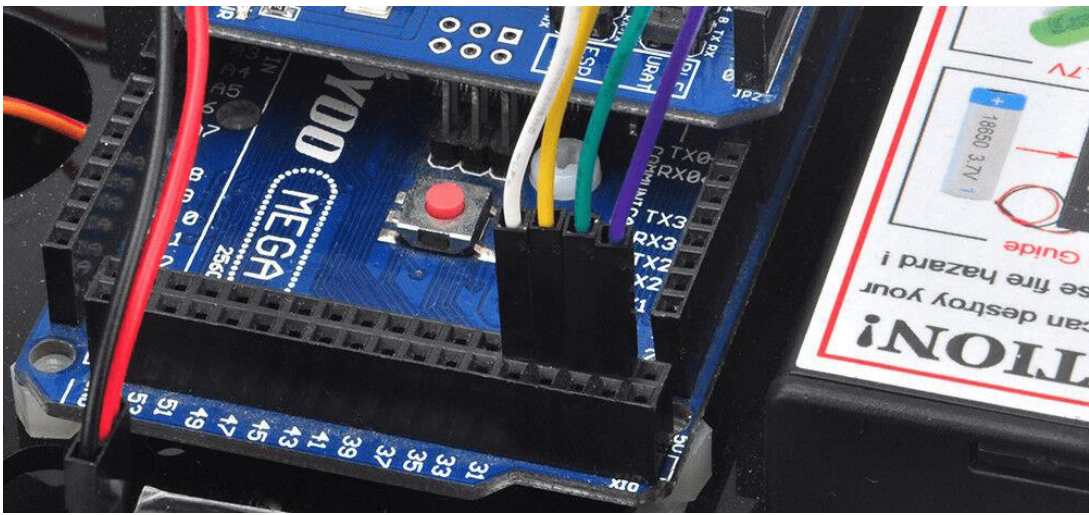


Wheel Motor	Back-left Model X
Rear-right motor	K1
Rear-left motor	K3



STEP11. Front Right Model-X board IN1,IN2,IN3,IN4 pin connect to D22,D24,D26,D28





Note: wire(purple wire) is connected to D22 which is located on the SECOND female hole from right in following picture 10. Many people treat the first hole as D22. THIS IS WRONG.

STEP12. Back Left Model-X board IN1,IN2,IN3,IN4 pin connect to D5,D6,D7,D8

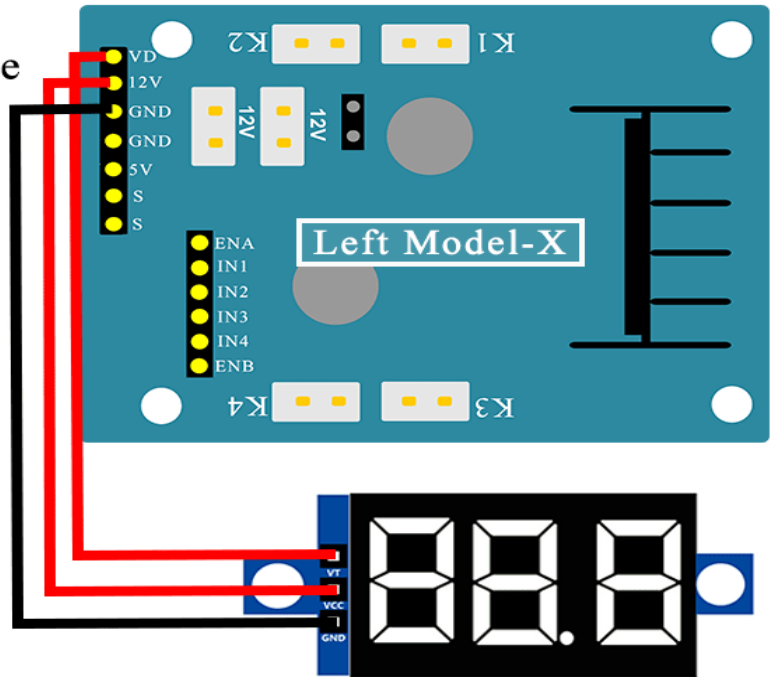
Motor Driver	Wifi Shield
Back Left Model-X ENA	D11
Back Left Model-X IN1	D5
Back Left Model-X IN2	D6
Back Left Model-X IN3	D7
Back Left Model-X IN4	D8
Back Left Model-X ENB	D12

STEP13. connect the voltage meter to back left model-x motor driver board with 3pin female to female cable.

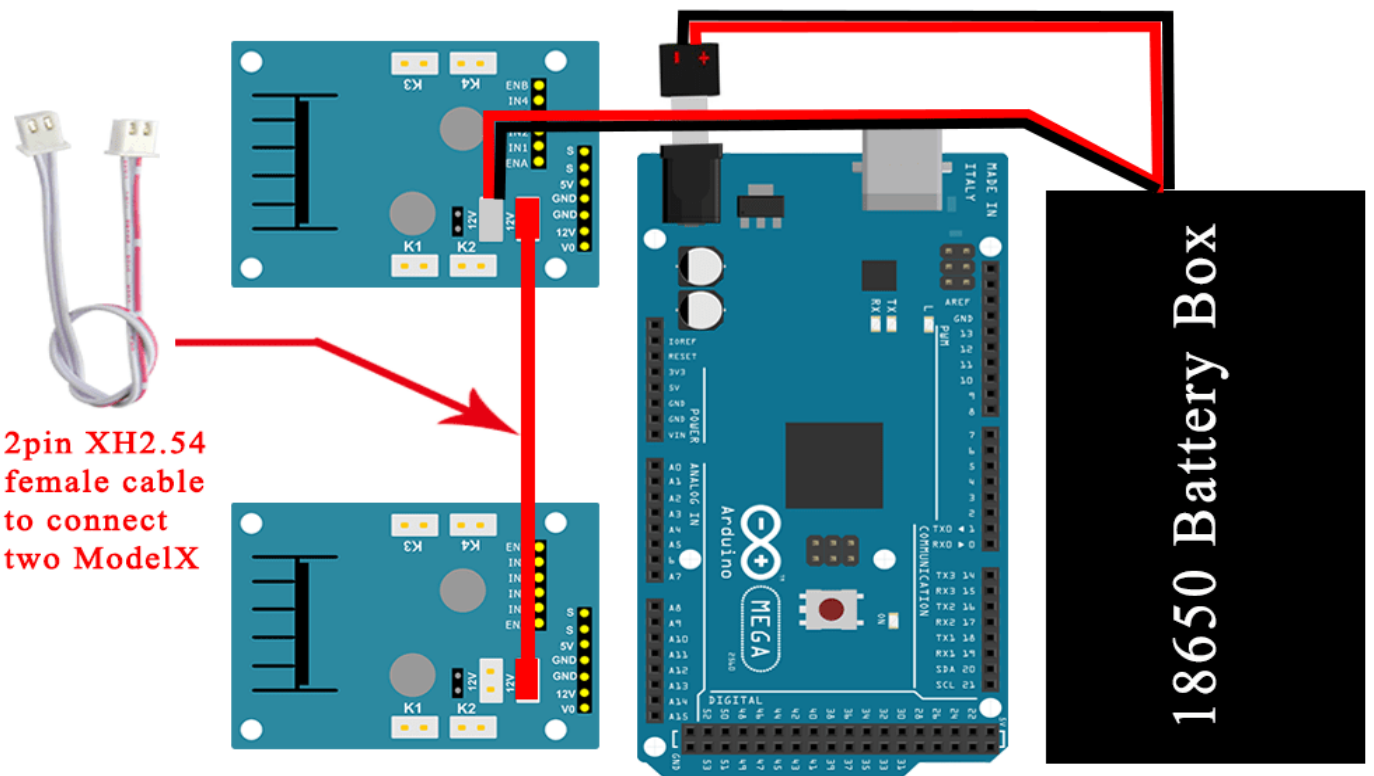
3pin female to female cable



Motor Driver	Voltage Meter
GND	GND
5V	VCC
S	VT



STEP14. Connect two model x motor driver board with 2pin XH2.54 female cable, connect XH2.54 female cable and the DC cable from 18650 battery box to right model x motor driver board.



SOFTWARE INSTALLATION

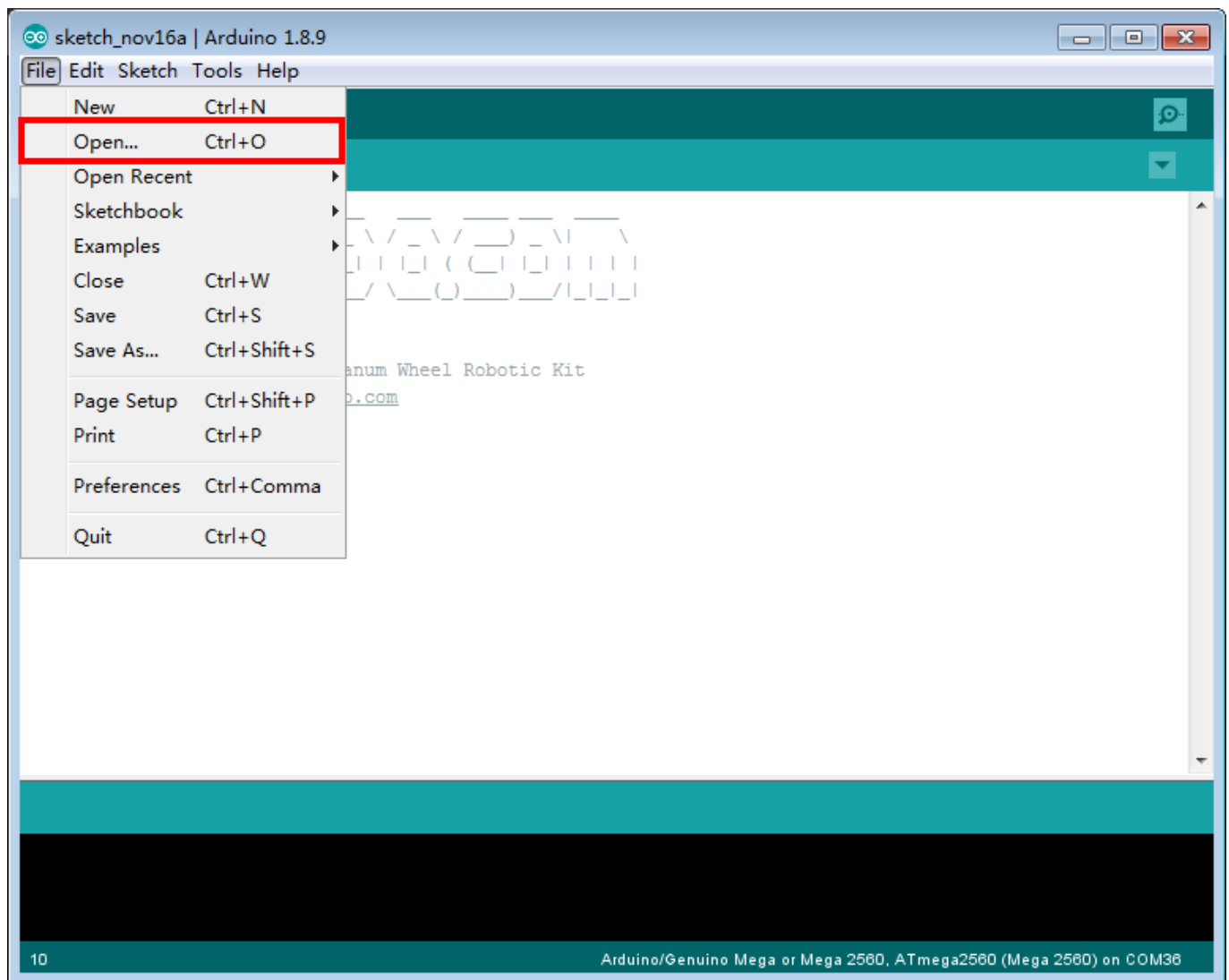
Open-source Arduino Software(IDE)		Download Arduino IDE here: https://www.arduino.cc/en/Main/Software?setlang=en
7 zip is a free zip utility that un-zips zip files		Download 7zip here for free https://www.7-zip.org/

Step 1: Install latest Arduino IDE (If you have Arduino IDE version after 1.1.16, please skip this step). Download Arduino IDE from

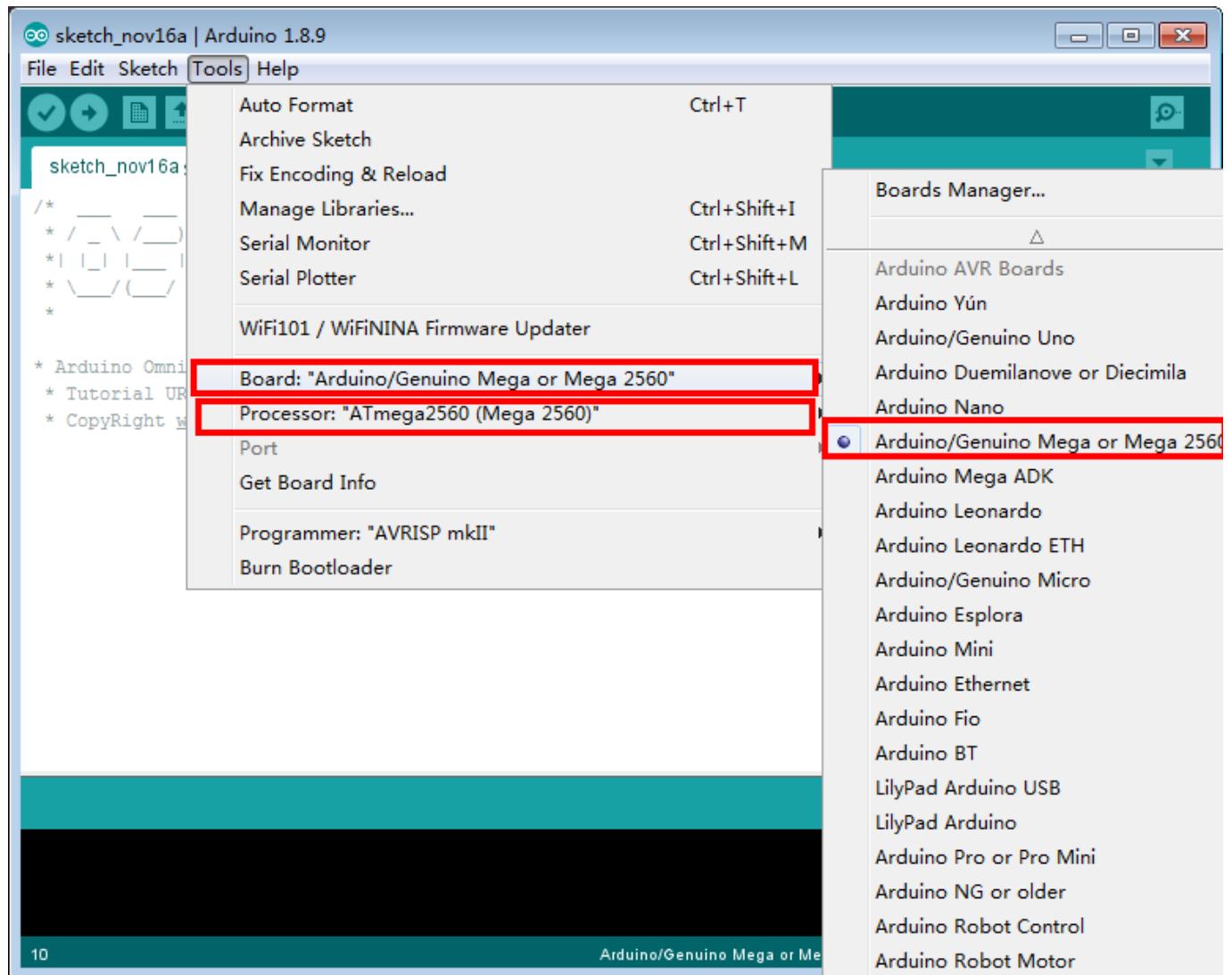
<https://www.arduino.cc/en/Main/Software?setlang=en> , then install the software.

Step 2: Download http://osoyoo.com/driver/mecanum_metal_chassis/for_mega2560/metal-2560-lesson1-reverse.zip, unzip the download zip file lesson1-reverse.zip, you will see a folder called lesson1-reverse .

Step 3: Connect mega2560 board to PC with USB cable, Open Arduino IDE -> click file -> click Open -> choose code “lesson1-reverse.ino” in lesson1 folder, load the code into arduino.



Step 4: Choose corresponding board/port for your project, upload the sketch to the board.



HOW TO PLAY

Disconnect Arduino from PC, put battery into battery box. When you put the car on the ground and turn on the switch on OSOYOO Uart WIFI shield V1.3 and the switch on battery box if you install battery box for 18650, the car should move

Forward/Backward; Left turn,Right turn;

Right Parallel Shift/Left Parallel Shift;

Down Left Diagonal / Up Right Diagonal;

Up Left Diagonal / Down Right Diagonal;

If the car does not move as per this sequence , you need check the wire connection.

NOTICE

We have two type of motors. Most of our cars are made of **Type A** motors and a few of them are **Type B**. **Type B** motor rotates at reverse direction of **Type A** motor.

After running Lesson 1 code, the **Type A** car will move

Forward → Backward → Left turn → Right turn →

Right Parallel Shift → Left Parallel Shift →

Down Left Diagonal → Up Right Diagonal →

Up Left Diagonal → Down Right Diagonal

If your Mecanum car doesn't move as per the above sequence, then your motor might be **Type B**. When type B car is running lesson 1 default sketch, its moving sequence is:

Backward → Forward → Right tur → Left turn →

Left Parallel Shift → Right Parallel Shift →

Up Right Diagonal → Down Left Diagonal →

Down Right Diagonal → Up Left Diagonal

It is important to test whether your car is Type A or Type B. Our default code in all the 5 lessons are designed for Type A motor.

If your car is Type B, then you need use reversed sketch code as following, otherwise the project might not work properly:

Lesson 1 reverse sketch:

https://osoyoo.com/driver/mecanum_metal_chassis/for_mega2560/metal-2560-lesson1-reverse.zip

Lesson 2 reverse sketch:

https://osoyoo.com/driver/mecanum_metal_chassis/for_mega2560/metal-2560-lesson2-reverse.zip

Lesson 3 reverse sketch:

https://osoyoo.com/driver/mecanum_metal_chassis/for_mega2560/metal-2560-lesson3-reverse.zip

Lesson 4 reverse sketch:

https://osoyoo.com/driver/mecanum_metal_chassis/for_mega2560/metal-2560-lesson4-reverse.zip

Lesson 5 reverse sketch:

https://osoyoo.com/driver/mecanum_metal_chassis/for_mega2560/metal-2560-lesson5-reverse.zip

Lesson 2 Obstacle Avoidance Robot Car

OBJECTIVE

In this lesson, you must complete [lesson 1](#) before you continue on with this lesson. we use the ultrasonic module to “see” obstacle and measure the distance. If the distance is less than predefined threshold value, the buzzer will beep and the car will turn around from the obstacle automatically.

PARTS & DEVICES

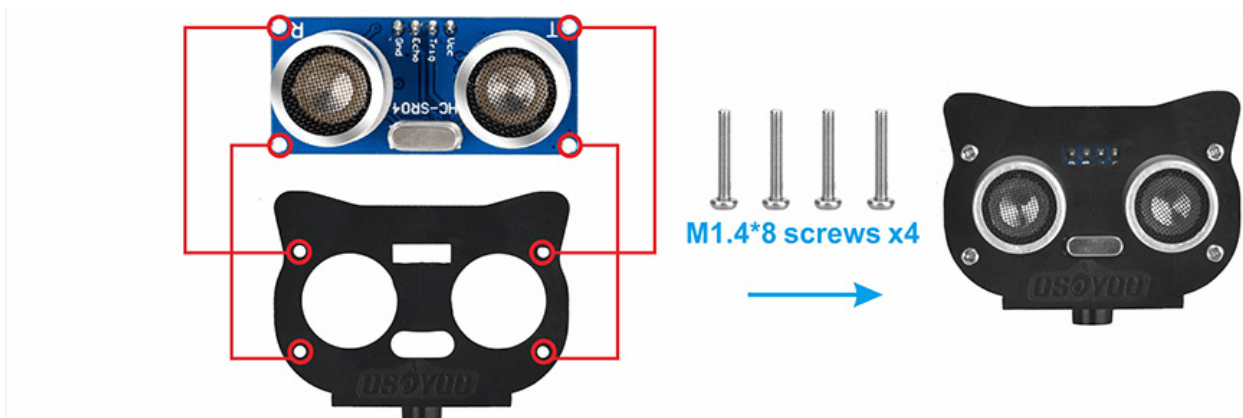
OSOYOO Mecanum Wheels Robotic Car Chassis x 1 (2xleft-wheels/2xright-wheels and Motor x 4)
OSOYOO Mega2560 board fully compatible with Arduino x 1
OSOYOO V1.3 Wifi shield x 1
OSOYOO Model X motor driver x 2
OSOYOO MG90 servo motor x 1
OSOYOO Ultrasonic sensor module x1
OSOYOO Mount holder
OSOYOO Battery box x 1
18650 Batteries(3.7V) x 2

HARDWARE INSTALLATION

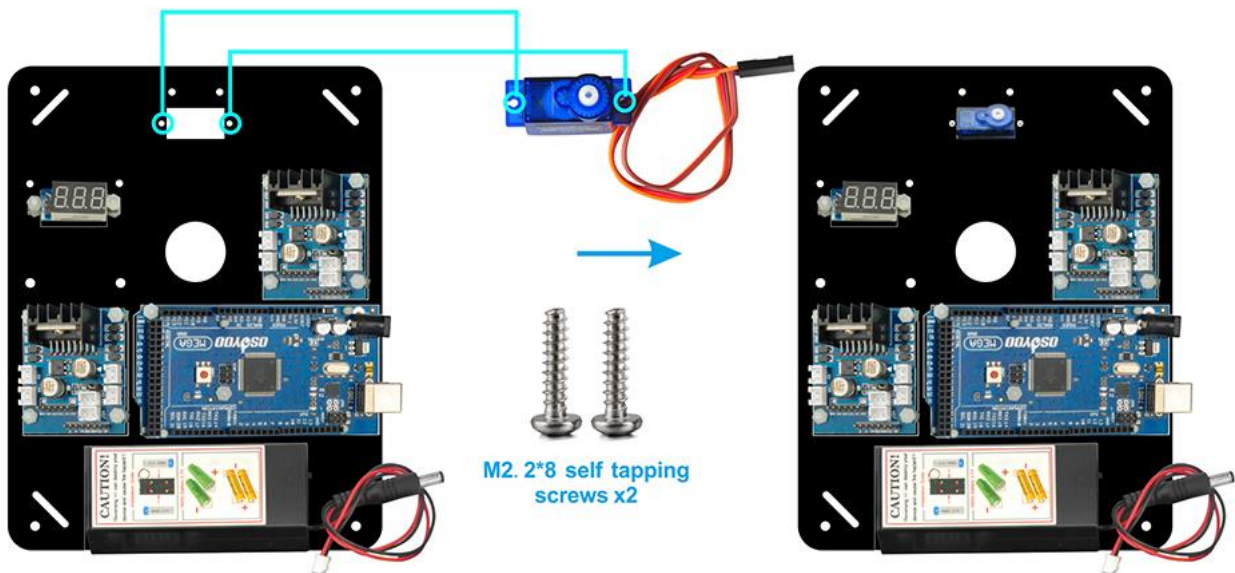
You must complete [lesson 1 \(assembling the car\)](#) before you continue on with this lesson.

In this lesson3, we will add a servo motor and to the robotic car built in Lesson 1.

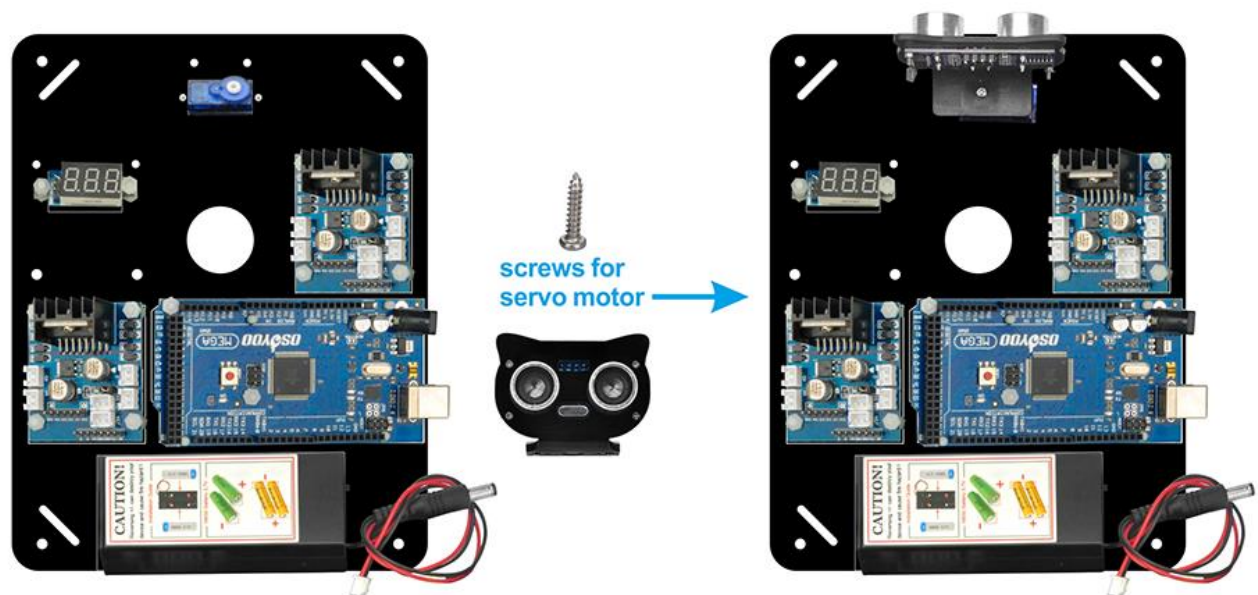
STEP1: Install Ultrasonic Module to mount holder with 4pcs M1.4*8 screw and M1.4 nuts.



STEP 2: Installed servo motor at the front of upper car chassis with 2pcs M2.2*8 Self Tapping Screws.



STEP 3: Install mount holder for ultrasonic module on servo motor with M2*4 Self Tapping screw (Please note: please upload code to adjust servo motor direction before fixing this screw).

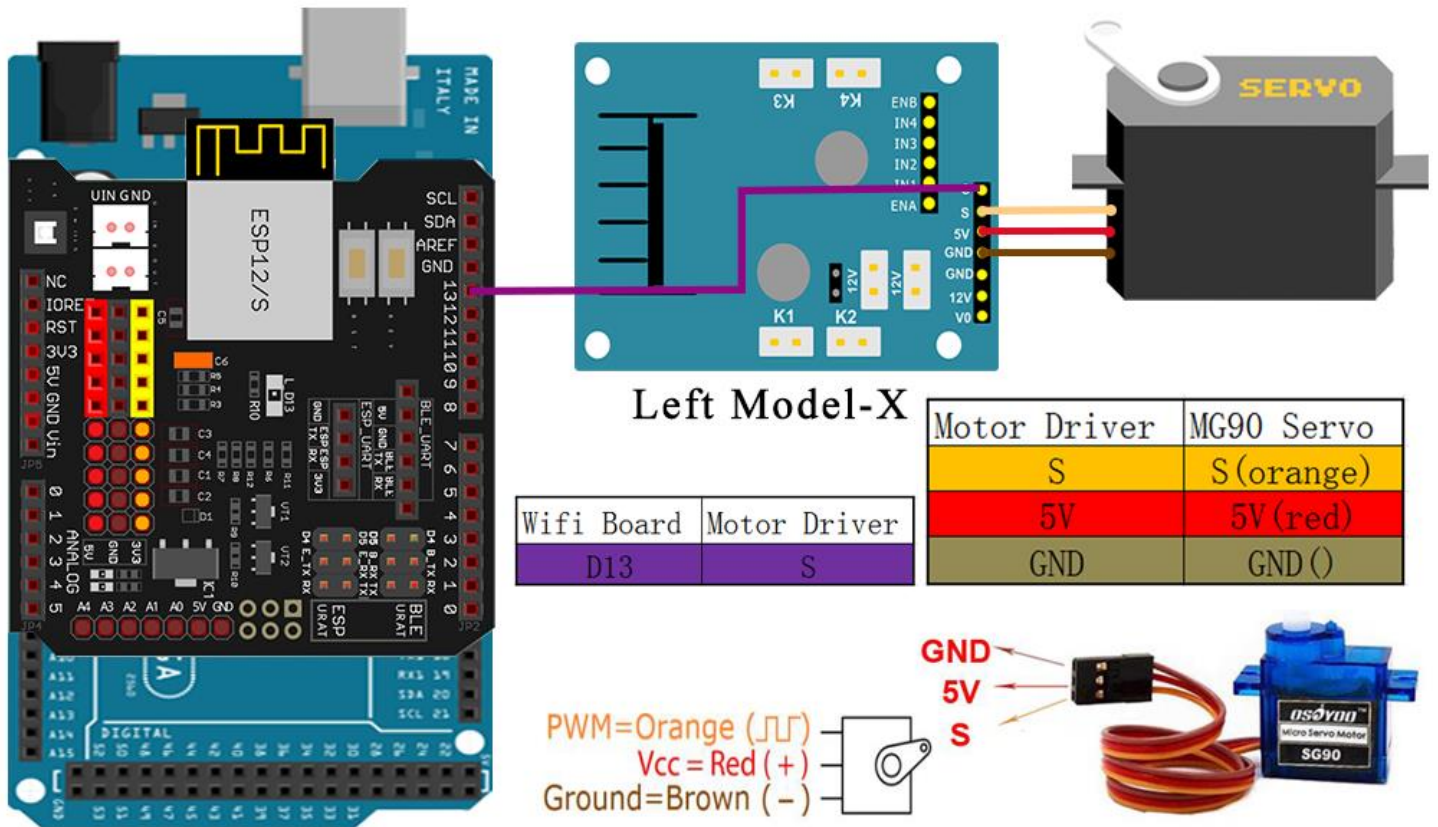


CIRCUIT CONNECTION

If you just finishes [Lesson 1](#), please keep all lesson 1 connections same as it is.

STEP 4: Connect Servo 3-pin head to any Model X board servo slot(yellow to S pin, red to 5v,brown to G pin), then connect another S pin to Wifi board D13.

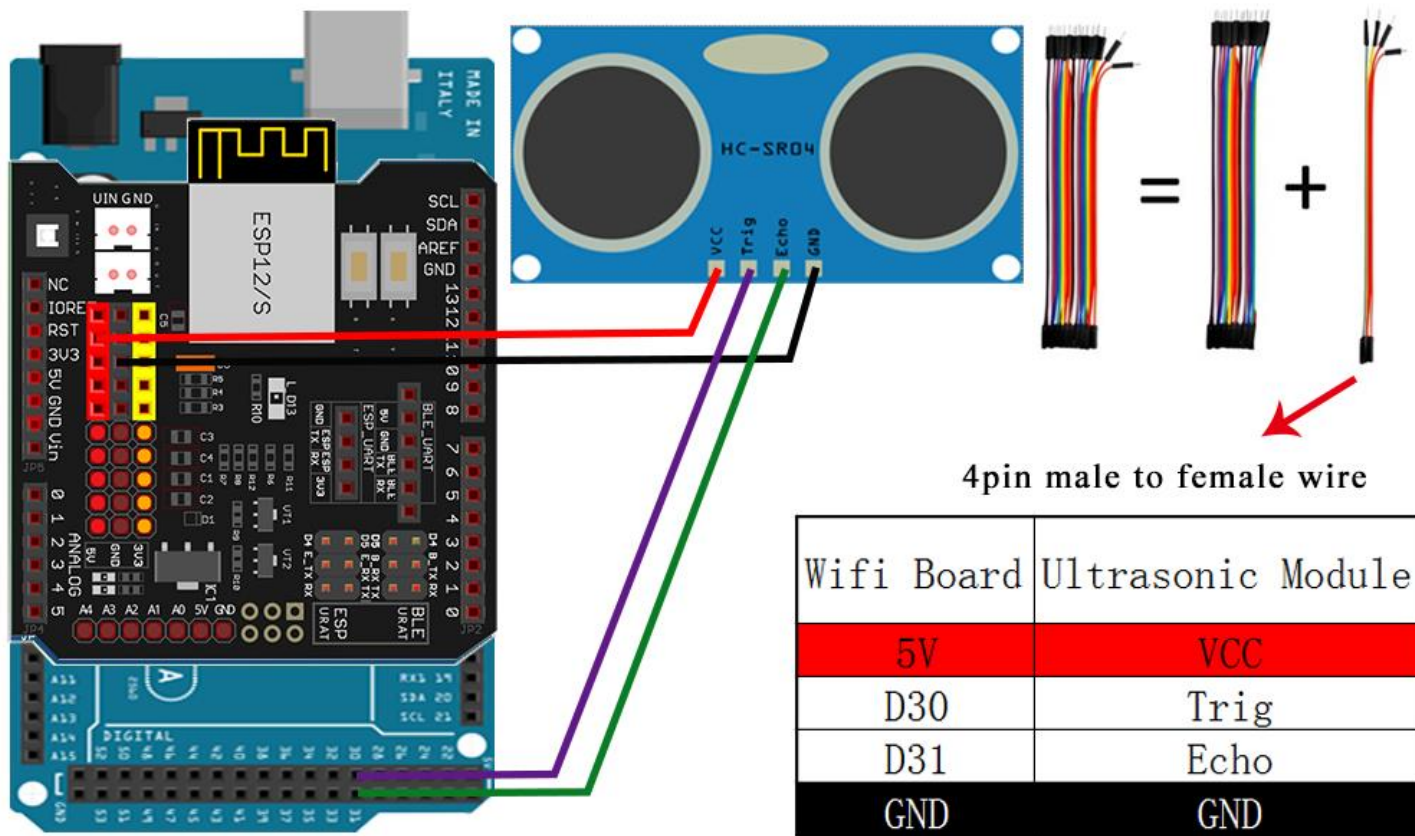
(Note: You need split 1 pcs of male-to-female jumper wires from our 10-pc jumper wire bundle. Any color from the bundle will be ok. The rest of wires are as spare parts for potential broken or damaged wires.)



STEP 5: Connect ultrasonic module to wifi board and mega2560 board .

VCC and GND of ultrasonic module to 5V and GND of wifi board, Trig and Echo to D30 and D31 of mega2560.

(Note: You need split 4 pcs of male-to-female jumper wires from our 10-pc jumper wire bundle. Any color from the bundle will be ok. The rest of wires are as spare parts for potential broken or damaged wires.)



SOFTWARE INSTALLATION

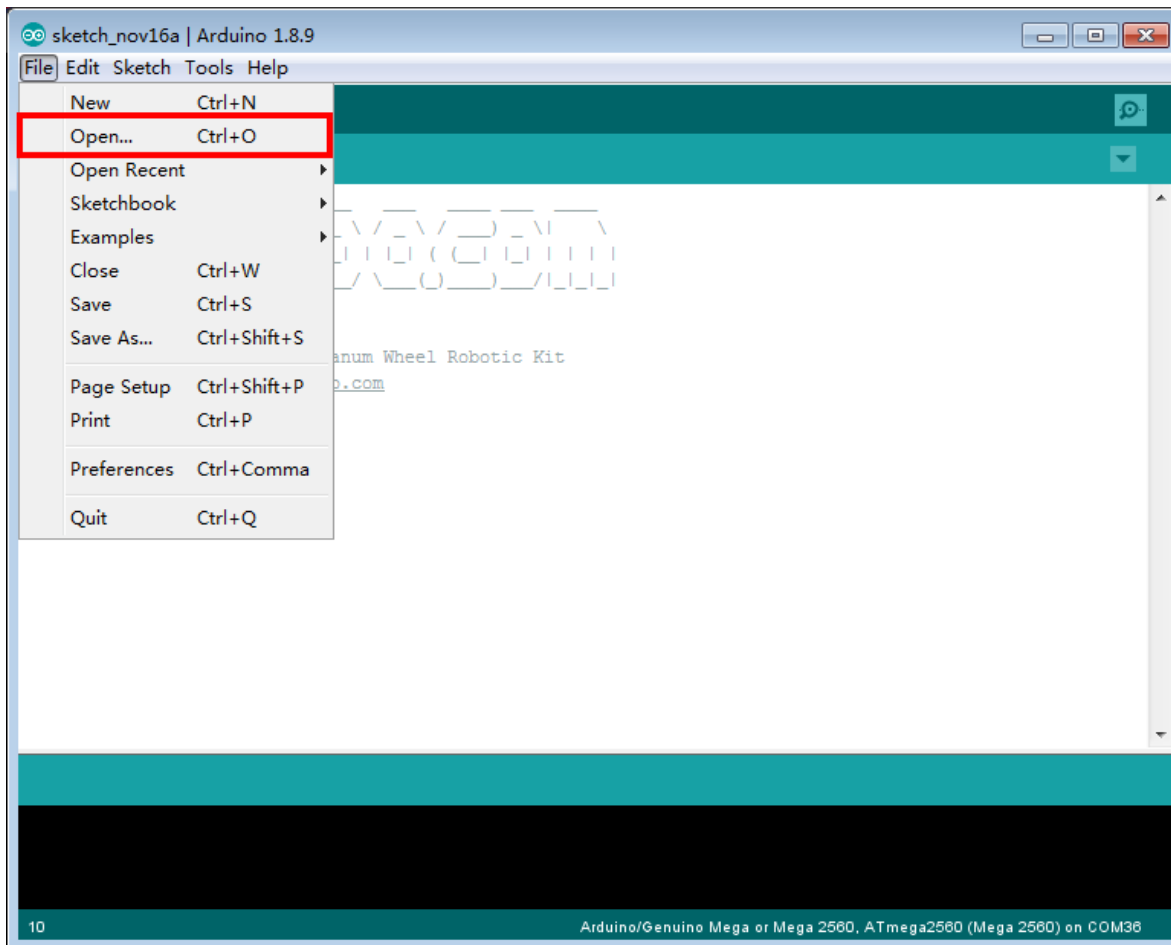
Open-source Arduino Software(IDE)		Download Arduino IDE here: https://www.arduino.cc/en/Main/Software?setlang=en
7 zip is a free zip utility that unzips zip files		Download 7zip here for free https://www.7-zip.org/

Step 1: Install latest Arduino IDE (If you have Arduino IDE version after 1.1.16, please skip this step). Download Arduino IDE from <https://www.arduino.cc/en/Main/Software?setlang=en> , then install the software.

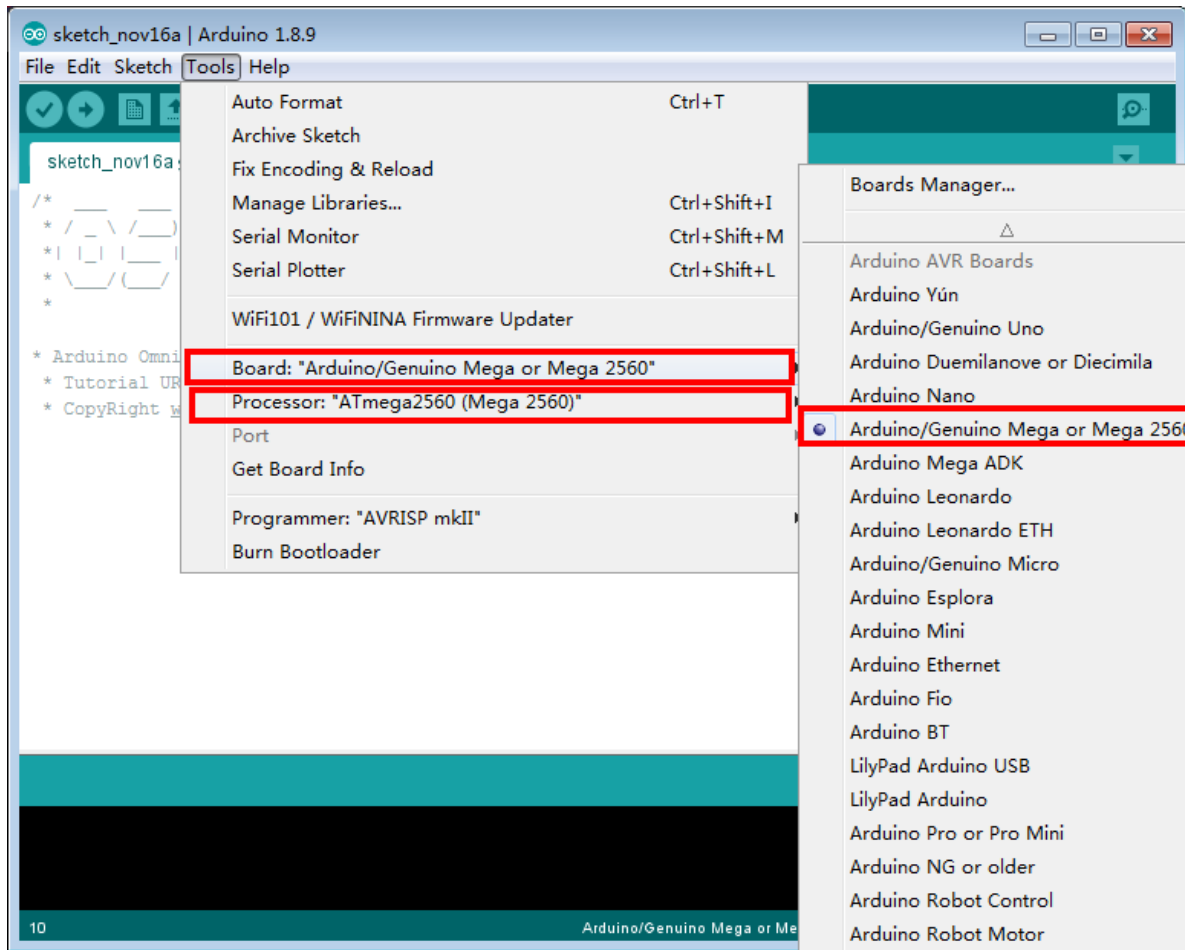
Step 2: Download http://osoyoo.com/driver/mecanum_metal_chassis/for_mega2560/metal-2560-lesson2-reverse.zip , unzip the download zip file lesson2-reverse.zip, you will see a folder called lesson2-reverse .

Step 3: Connect mega2560 board to PC with USB cable, Open Arduino IDE -> click file ->

click Open -> choose code “lesson2-reverse.ino” in lesson folder, load the code into arduino as following.



Step 4: Choose corresponding board/port for your project, upload the sketch to the board.



Step 5: Ultrasonic sensor servo initial direction alignment.

After turning on the battery, the servo will make some movement and finally stops at a direction for 5 seconds.

During this first 5 seconds, you must make sure the ultrasonic sensor (two eyes) is facing straight forward.

If it is not straight forward, you should turn off battery immediately and remove the sensor from servo, reinstall it and make it facing straight forward direction as following picture. Otherwise the obstacle avoidance program will not work properly.

After adjusting sensor direction, turn on battery again. If its direction is not straight forward, turn off battery and do direction alignment again.

If the ultrasonic module turn to front view position, that means you no need adjust sensor position anymore. Just wait 5 seconds. If no obstacle is detected, the car will go forward. If any obstacles is detected, the car will stop, the ultrasonic module will turn from right to left to detect surrounding obstacle. The robot car will decide to make left turn, right turn or backward according to obstacle sensor data and our obstacle avoidance algorithm.

Sometimes your car might have collision and make your Ultrasonic sensor position change, you must remember to do sensor direction alignment again.

The robot car will decide to make left turn, right turn or backward according to obstacle sensor data and our obstacle avoidance algorithm. Sometimes your car might have collision and make your Ultrasonic sensor position change, you must remember to do sensor direction alignment again.

Important parameters in the sketch file

Following parameters in Line 32 to 39 of mecanum-2560-lesson2.ino are very important to make performance tuning. See the comments in the #define statements:

```
#define FAST_SPEED 110    //The difference between FAST_SPEED and SPEED determines the slight
turning sharpness
#define SPEED 80          //forward moving speed
#define TURN_SPEED 110    //Turning Speed
#define FORWARD_TIME 200  //FORWARD_TIME determines Forward distance
#define BACK_TIME 300     // determines BACK MOVEMENT distance
#define TURN_TIME 250     //Determines turning sharpness
#define OBSTACLE_LIMIT 30 //minimum distance in cm to obstacles at both sides
```

Lesson 3 Line Following Robot Car

OBJECTIVE

In this lesson3, we will add a 3-Point tracking sensor module to the robotic car built in Lesson

1.The software in this lesson will read data from the 3-Point Tracking sensor module and automatically guide the smart car to move along the black track line in the white ground.

PARTS & DEVICES

OSOYOO Mecanum wheels robotic car chassis x 1 (2xleft-wheels/2xright-wheels and Motor x 4)

OSOYOO Mega2560 board fully compatible with Arduino UNO/Mega2560 x 1

OSOYOO V1.3 Wifi shield x 1

OSOYOO Model X motor driver x 2

OSOYOO 5-Point Tracking sensor module

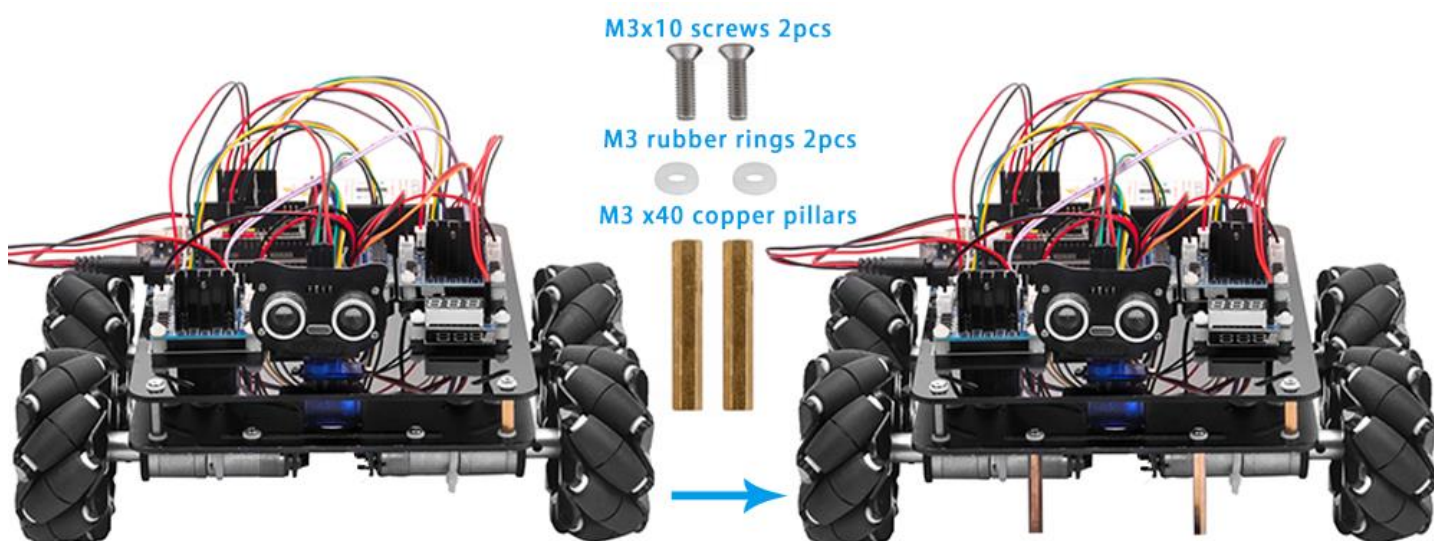
OSOYOO Battery box x 1

18650 Batteries(3.7V) x 2

HARDWARE INSTALLATION

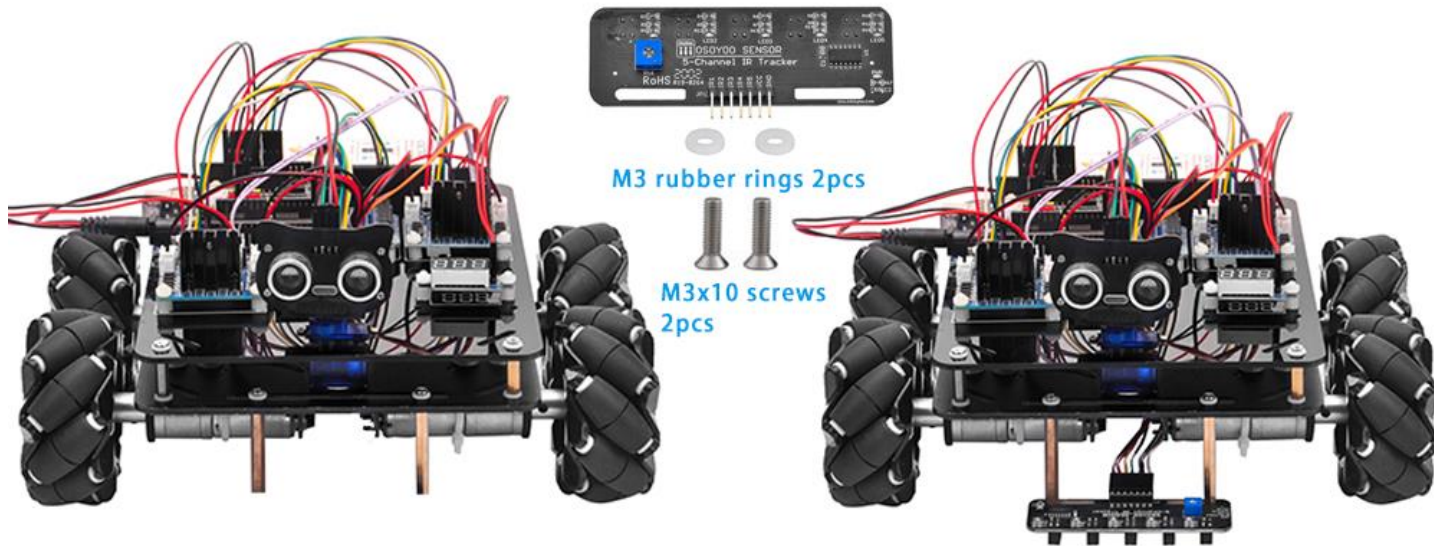
You must complete lesson 1 (assembling the car), before you continue on with this lesson.

STEP1: Install 2pcs M3x40 copper pillars with 2pcs M3 screws and 2pcs M3 rubber rings as the following pictures.



STEP2: We will add a 5-Point tracking sensor module to the robotic car with 2pcs

M3x10 screws and 2pcs M3 rubber rings as the following pictures.



CIRCUIT CONNECTION

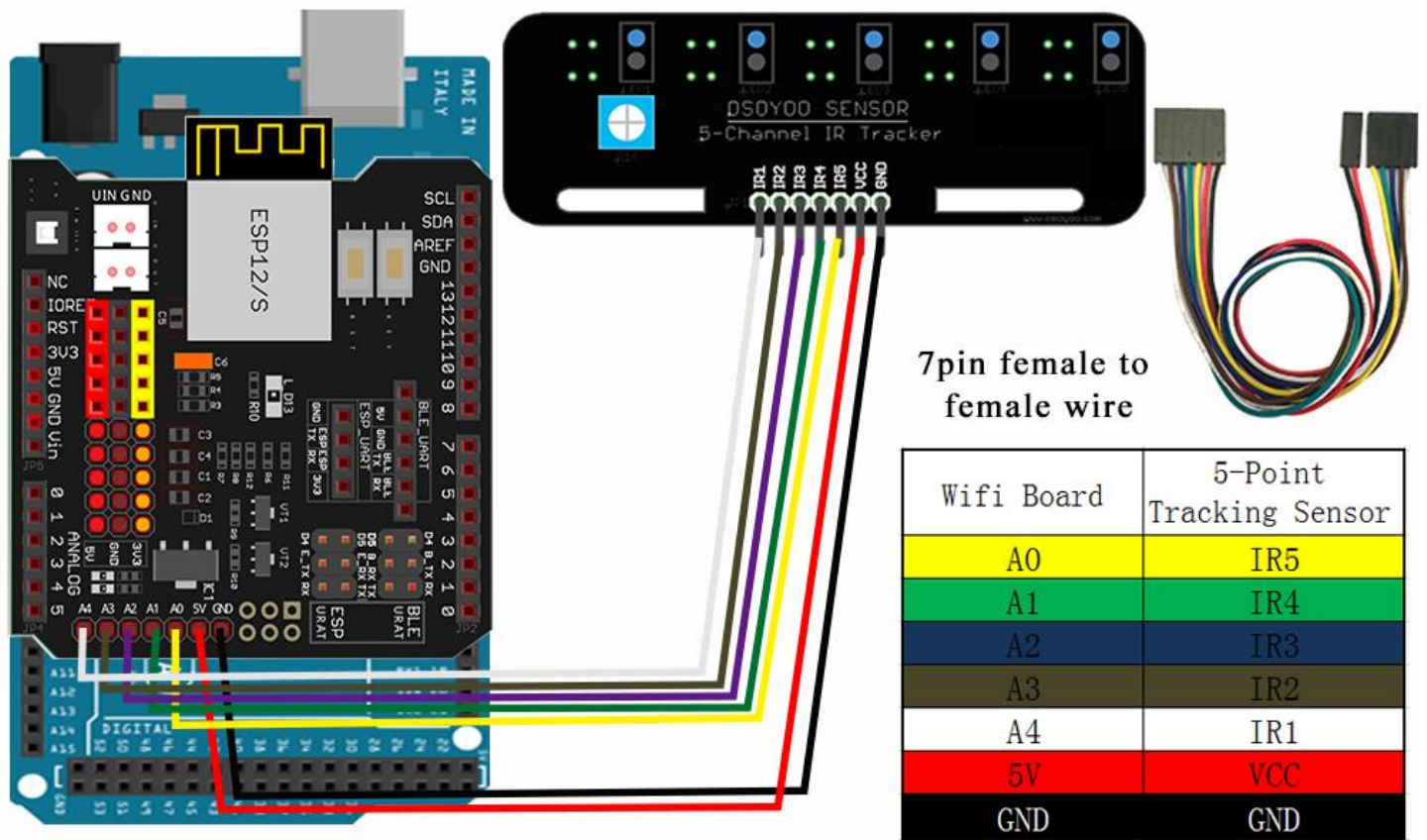
Start the installation from previous status of [Lesson 1](#) .

If you have installed Lesson 1, no need change anything, just keep the hardware wire connection as it is.

Connect VCC pin of tracking sensor module to 5V of wifi shield;

Connect GND pin of tracking sensor module to GND of wifi shield

Connect IR1,IR2,IR3,IR4,IR5 pins to A4,A3,A2,A1,A0 with 7pin female to female cable as the following photo shows (Remember: DO NOT remove any existing wires installed in Lesson1).



SOFTWARE INSTALLATION

Open-source Arduino Software(IDE)		Download Arduino IDE here: https://www.arduino.cc/en/Main/Software?setlang=en
7 zip is a free zip utility that unzips zip files		Download 7zip here for free https://www.7-zip.org/

Step 1: Install latest Arduino IDE (If you have Arduino IDE version after 1.1.16, please skip this step). Download Arduino IDE from

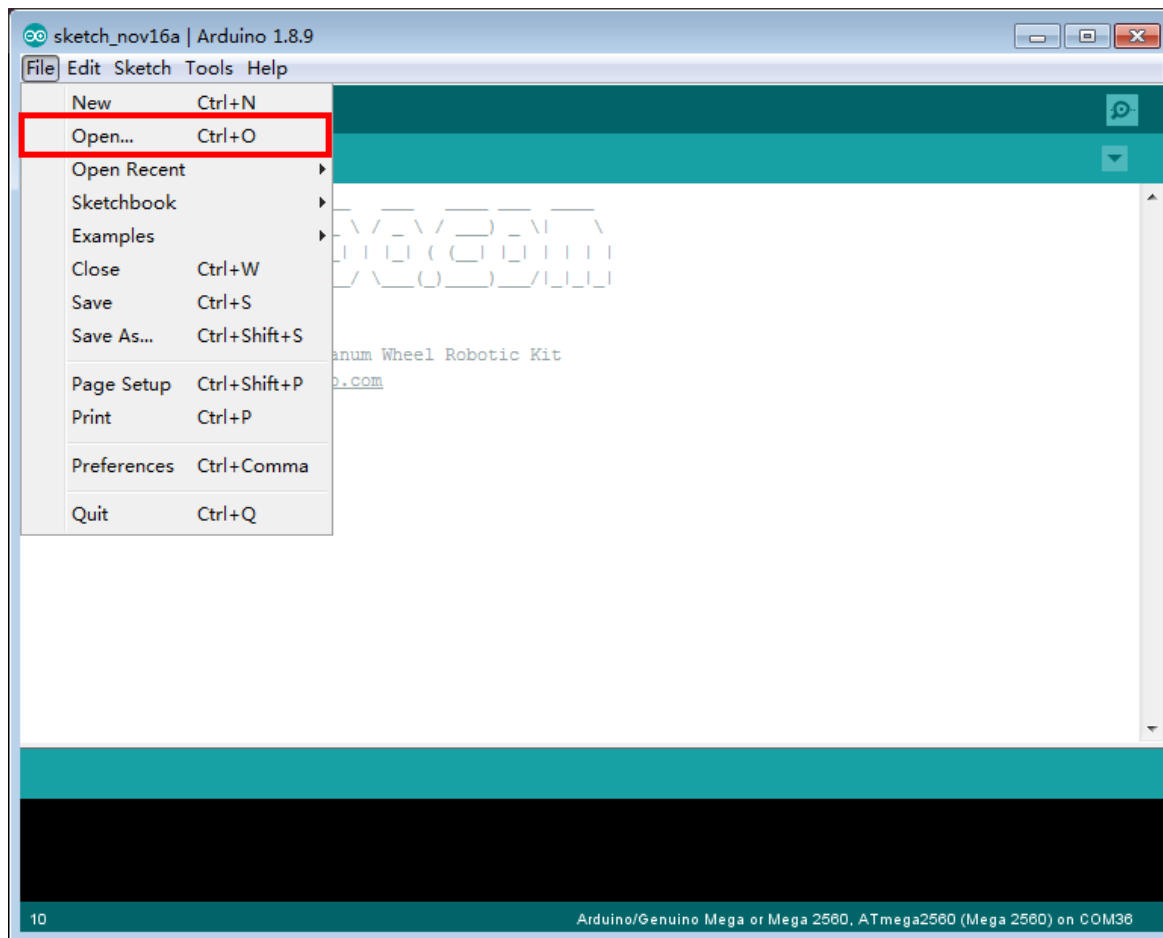
<https://www.arduino.cc/en/Main/Software?setlang=en> , then install the software.

Step 2: Download

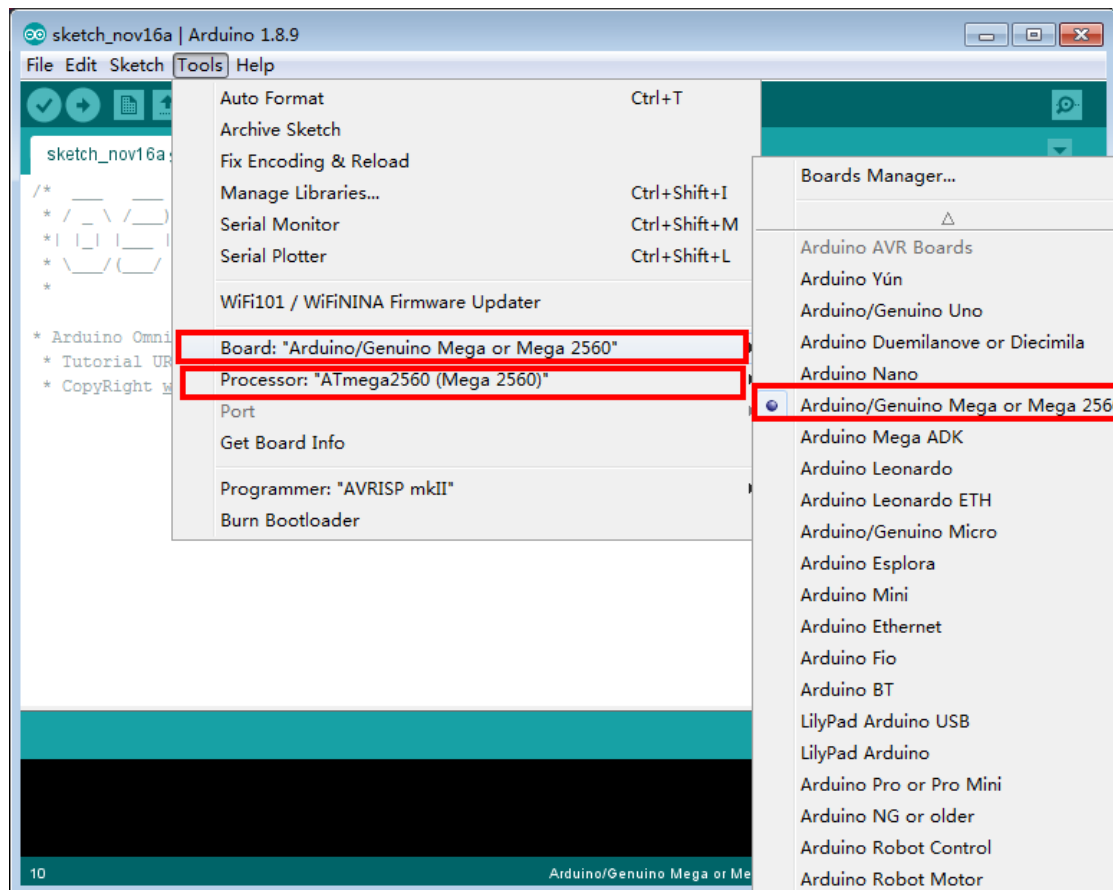
https://osoyoo.com/driver/mecanum_metal_chassis/for_mega2560/metal-2560-lesson3-5point-reverse.zip ,

unzip the download zip file lesson3-reverse.zip, you will see a folder called lesson3-reverse .

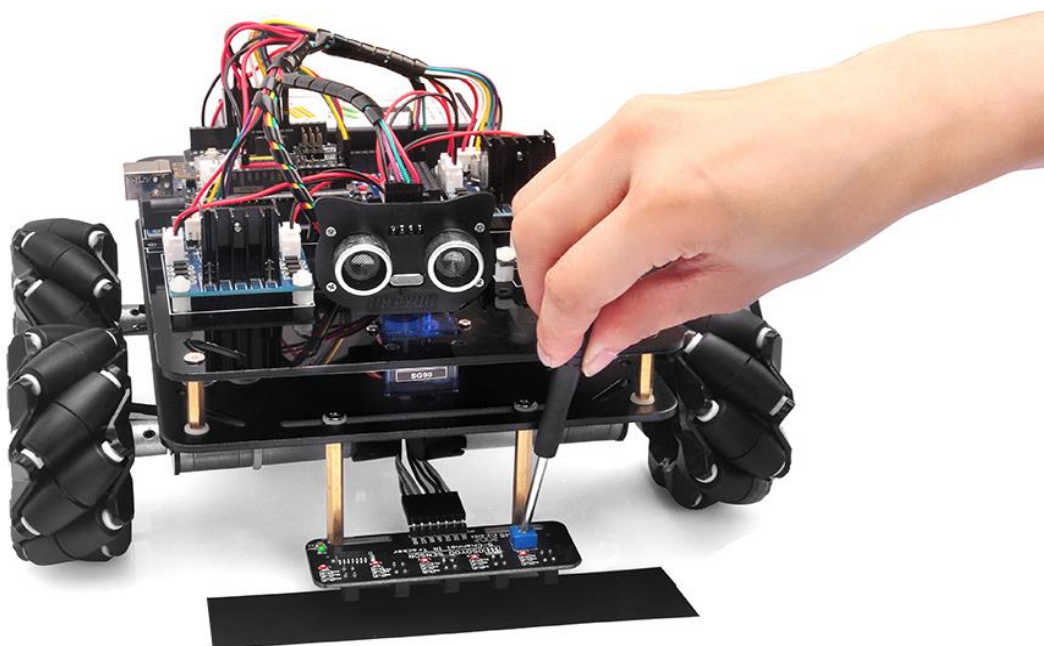
Step 3: Connect mega2560 board to PC with USB cable, Open Arduino IDE -> click file -> click Open -> choose code “lesson3-reverse.ino” in lesson folder, load the code into arduino as following:.



Step 4: Choose corresponding board/port for your project, upload the sketch to the board.



Step 5: Adjust the sensitivity of tracking sensor modules. Turn on and hold the car and adjust the potentiometer on the tracking sensor with cross screwdriver until you get the best sensitivity status: the signal indicate LED light will turn on when sensor is above white ground, and the signal LED will turn off when the sensor is above black track.



HOW TO PLAY

Prepare a black track (the width of the black track must be between 20mm and 30mm) in white ground. Please be noted that the bend angle of track can't be too sharp otherwise the car will move out of the track.

Turn on the car and put the middle of tracking sensor module facing over black track, and then the car will move along the black track automatically.

Motor Speed Tuning for better tracking performance

To get better tracking performance result, motor power(speed) value should be adjusted properly as per battery level. If motor power(speed) value is too high, your car might run too fast and easy to get out of track. If motor power(speed) is too low, the car might not even move.

To adjust the motor power value, you need change the 3 constants : MID_SPEED, HIGH_SPEED, LOW_SPEED in line 13,14,15 in mecanum-2560-lesson3.ino sketch file. Their default values are 70,80,60 which are good when batteries are fully charged.

After batteries are running low, you might need to increase the value of these 3 constants. You can gradually add or reduce 10 each time on these values and compare which values have best tracking performance.

Lesson 4 Bluetooth Controlled Imitation Driving

OBJECTIVE

Mecanum Omni wheel is a very powerful wheel technology which allows robot car make omni-directional movement (parallel shift to left and right).In this project, we will show how to use Arduino to control an Osoyoo Brand mecanum wheel robot car.

PARTS & DEVICES

OSOYOO Mecanum Wheels Robotic Car Chassis x 1 (2x left-wheels/2x right-wheels and 4x motor)
OSOYOO Mega2560 board fully compatible with Arduino
OSOYOO V1.3 Wifi Shield x 1
OSOYOO Model X motor driver x 2
OSOYOO HC02 bluetooth module
OSOYOO Battery box x 1
18650 Batteries(3.7V) x 2

HARDWARE INSTALLATION

You must complete [lesson 1 \(assembling the car\)](#) before you continue on with this lesson.

No need change anything, just keep the hardware wire connection as it is.

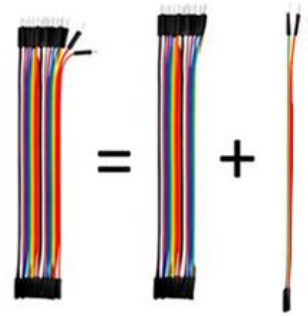
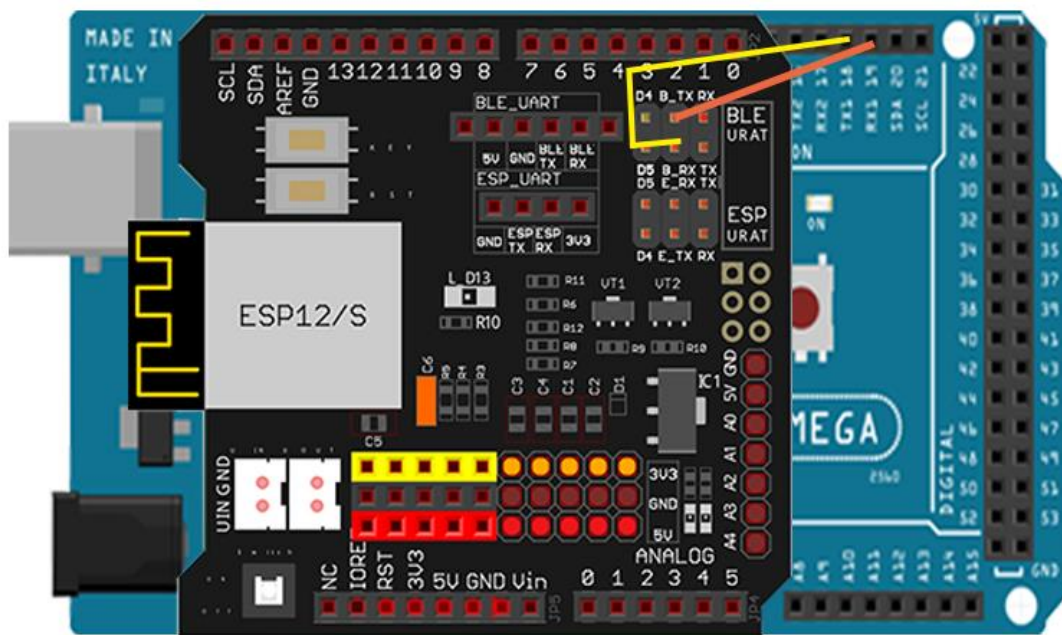
CIRCUIT CONNECTION

STEP1: Connect B_TX and B_RX to D19 and D18.

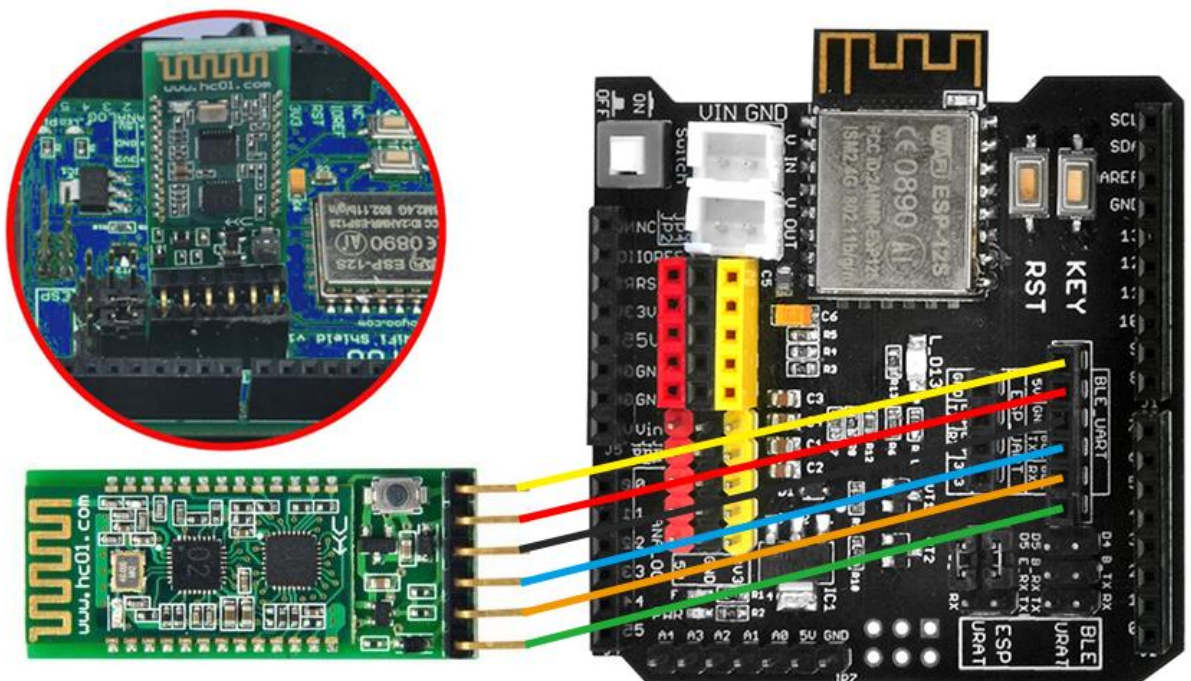
(Note: You need split 2 pcs of male-to-female jumper wires from our 10-pc jumper wire bundle. Any color from the bundle will be ok. The rest of wires are as spare parts for potential broken or damaged wires.)

Wifi Board	Arduino mega2560
B_TX	D19
B_RX	D18

2pin male to female wire



STEP2: Bluetooth Module should be inserted into bluetooth 6-pin slot in OSOY00 Wifi Board




SOFTWARE INSTALLATION

Open-source
Arduino
Software(IDE
)



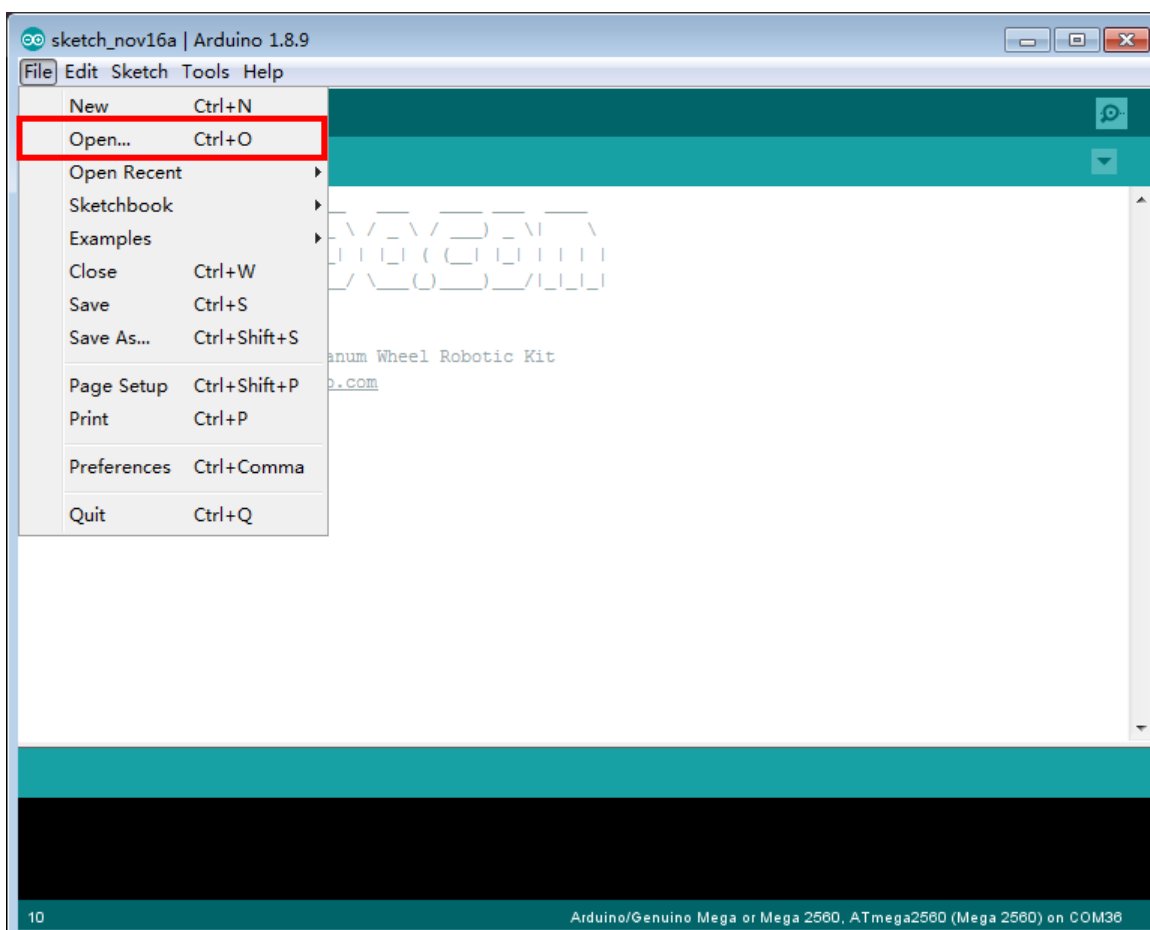
Download Arduino IDE here:
<https://www.arduino.cc/en/Main/Software?setlang=en>

7 zip is a free zip utility that unzips zip files		Download 7zip here for free https://www.7-zip.org/
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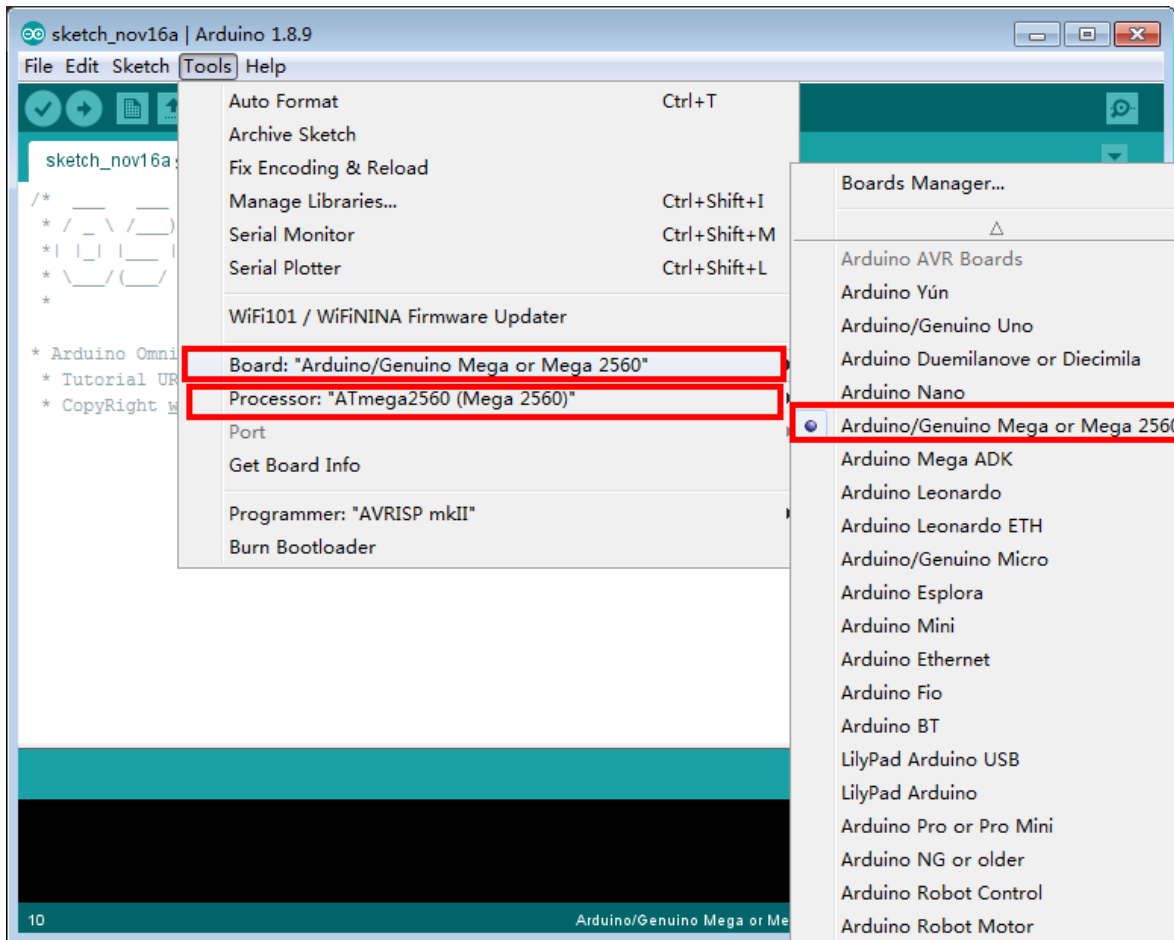
Step 1: Install latest Arduino IDE (If you have Arduino IDE version after 1.1.16, please skip this step). Download Arduino IDE from <https://www.arduino.cc/en/Main/Software?setlang=en> , then install the software.

Step 2: Download http://osoyoo.com/driver/mecanum_metal_chassis/for_mega2560/metal-2560-lesson4-reverse.zip , unzip the download zip file lesson4-reverse.zip, you will see a folder called lesson4-reverse .

Step 3: Connect mega2560 board to PC with USB cable, Open Arduino IDE -> click file -> click Open -> choose code “lesson4-reverse.ino” in lesson4-reverse folder,load the code into arduino.

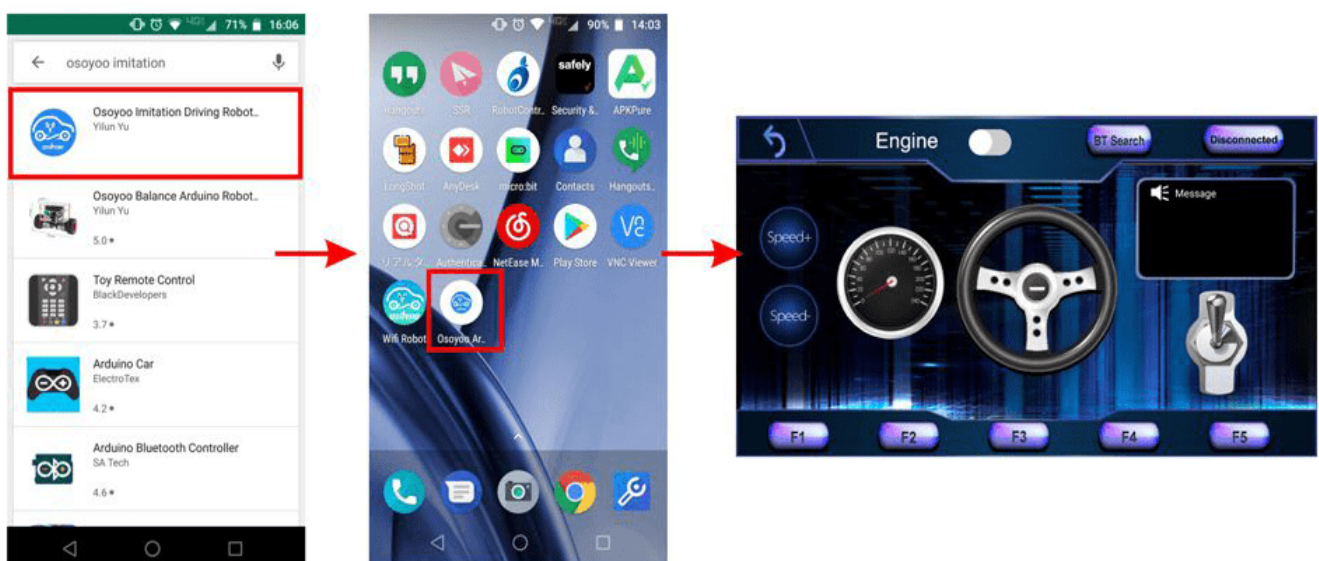


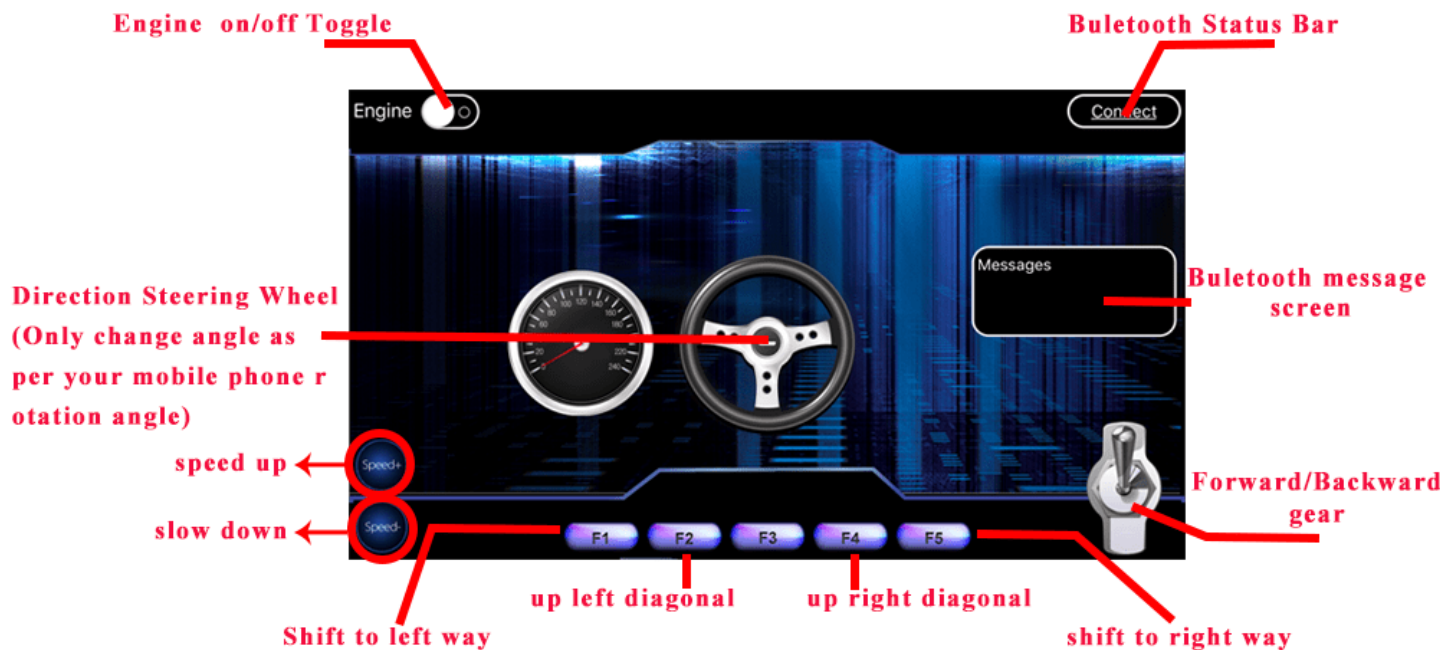
Step 4: Choose corresponding board/port for your project,upload the sketch to the board.



Mobile APP:

Go to your Google Play or Apple APP store and search APP name “OSOYOO imitation driving”,
Download the APP as following and install it in your smart phone.





HOW TO PLAY

Power on the robot, and open APP.

- 1) If you have not paired Bluetooth module with your cell phone, please pair the bluetooth module first before open the APP. In your cell phone Setting-> Bluetooth ,find a Bluetooth device called **HC02**, pair it with password 1234
- 2) After bluetooth HC02 device is paired, open the APP. If you are using Android APP, Click **BT Search** Button to connect APP to HC02 device, if it is iOS APP, just click **connect**
- 3) Click Engine Switch to start/stop the car
- 4) Click Speed +/- button to accelerate or reduce speed
- 5) Rotate the mobile phone to change direction (steering wheel will rotate while you are turning the phone).
- 6) Click Gear button to change gear to Forward or Backward direction.
- 7) Press F1 to Shift to left way, F5 to shift to right way, F3 to up left diagonal, F4 to up right diagonal.

NOTICE

Motor Speed Tuning for better performance

To get better running performance result, motor power(speed) value should be adjusted

properly as per battery level. If motor power(speed) value is too high, your car might run too fast and easy to out of control. If motor power(speed) is too low, the car might not even move.

To adjust the motor power value, you need change the 3 constants line 27,28,29 in mecanum-2560-lesson4.ino sketch file:

```
#define MIN_SPEED  50
#define TURN_SPEED  70
#define SLOW_TURN_SPEED  50
#define BACK_SPEED 60
```

MIN_SPEED is the minimum power required to start the car. If when APP engine toggle is switched to RED, but your car does not move, you need increase this value , if the car runs too fast at engine start moment, you need reduce this value.

TURN_SPEED AND, SLOW_TURN_SPEED value determines the turning speed of your car. If your car turning too fast, you need reduce these two values, if turning too slow or not turning, increase these two values. Always make

SLOW_TURN_SPEED about 20 to 30 lower than TURN_SPEED value.

BACK_SPEED value determines the reverse back running speed.

After batteries are running low, you might need to increase the value of these 3 constants. You can gradually add or reduce 10 each time on these values and compare which values have best tracking performance.

Lesson 5 Wifi Controlled Robot Car

OBJECTIVE

In this project we will connect Robot Car to Wifi and Use an APP to control the car through Internet. This is a typical Internet of Things (IoT) Application.

PARTS & DEVICES

OSOYOO Mecanum Wheels Robotic Car Chassis x 1 (2x left-wheels/2x right-wheels and 4x motor)
OSOYOO Mega2560 board fully compatible with Arduino
OSOYOO V1.3 Wifi Shield x 1
OSOYOO Model X motor driver x 2
OSOYOO Battery box x 1
18650 Batteries(3.7V) x 2

HARDWARE INSTALLATION

If you just finishes all [lesson 1](#) (assembling the car) and [lesson 4](#) (bluetooth imitation driver), please keep all lesson connections same as it is. Then plug out bluetooth from Wifi Shield.

CIRCUIT CONNECTION

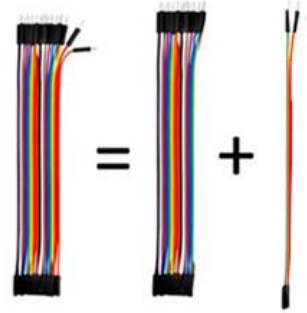
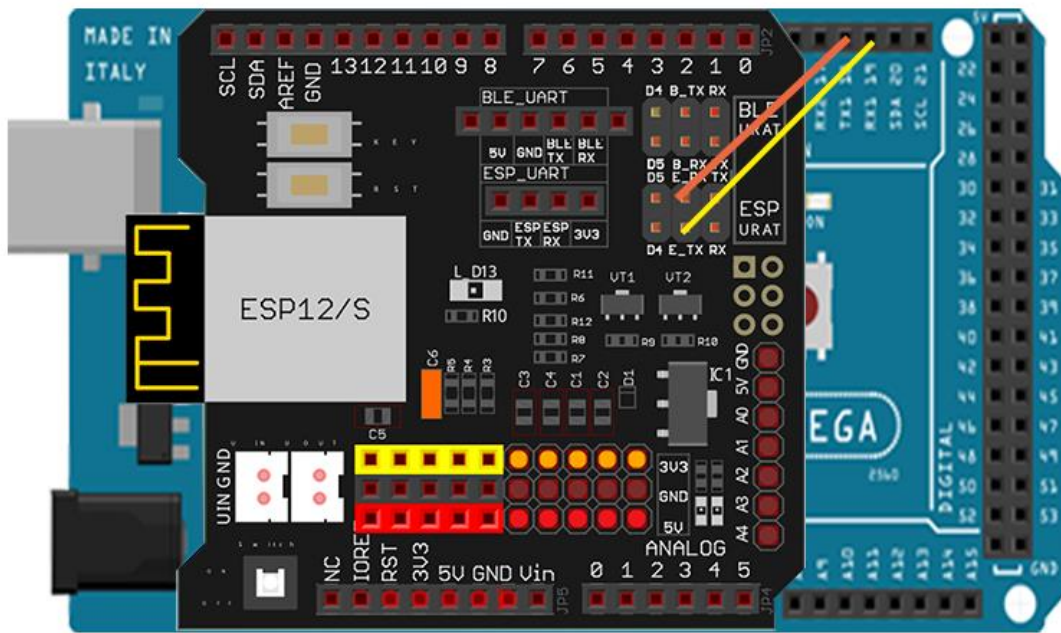
Remove the connection B_TX to D18 and B_RX to D19.

Connect E_RX to D18(TX1) and E_TX to D19(RX1).

(Note: You need split 2 pcs of male-to-female jumper wires from our 10-pc jumper wire bundle. Any color from the bundle will be ok. The rest of 8 pcs wires are as spare parts for potential broken or damaged wires.)

Wifi Board	Arduino mega2560
E_TX	D19
E_RX	D18

2pin male to female wire

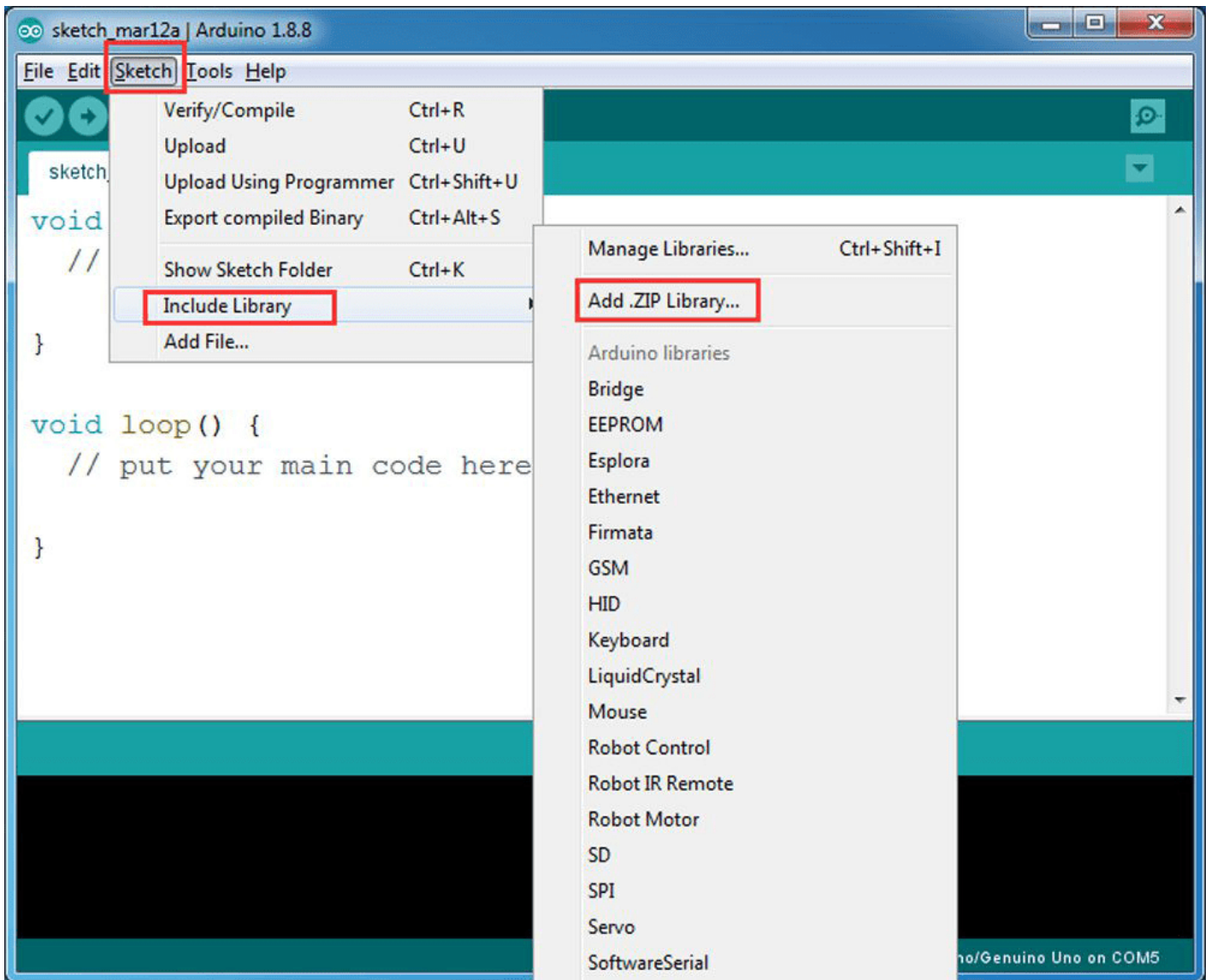


SOFTWARE INSTALLATION

Open-source Arduino Software(IDE)		Download Arduino IDE here: https://www.arduino.cc/en/Main/Software?setlang=en
7 zip is a free zip utility that un-zips zip files		Download 7zip here for free https://www.7-zip.org/

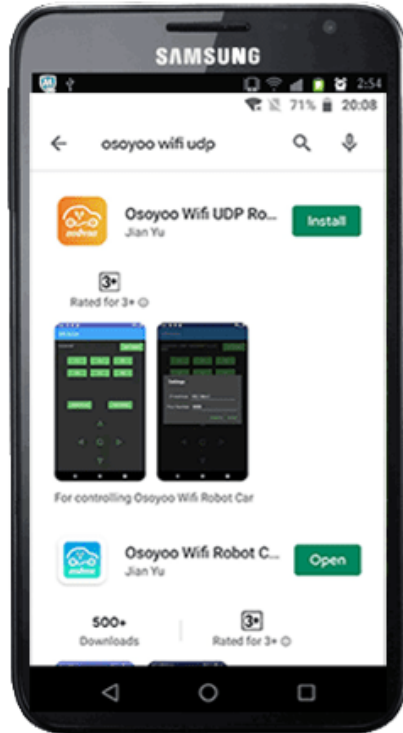
Step 1: Install latest Arduino IDE (If you have Arduino IDE version after 1.1.16, please skip this step). Download Arduino IDE from <https://www.arduino.cc/en/Main/Software?setlang=en> , then install the software.

Step 2: Please download the library zip file from [WiFiEsp-master.zip](#) .Open Arduino IDE ->click Sketch ->Include Library ->Add .ZIP library , then load above zip file into Arduino.



Step 3: APP installation-you need search “OSOYOO Wifi UDP Robot Car Controller ” in Google Play or Apple Store, and then install this APP.**DOWNLOAD APP** FROM <https://osoyoo.com/driver/arduino-udp/udp-robot.apk>

Android Phone



Apple iOS



YOU CAN ALSO DOWNLOAD APP DIRECTLY FROM <https://osoyoo.com/driver/arduino-udp/udp-robot.apk>

Step 4: Arduino Sketch code Installation:

Download https://osoyoo.com/driver/mecanum_metal_chassis/for_mega2560/metal-2560-lesson5-reverse.zip

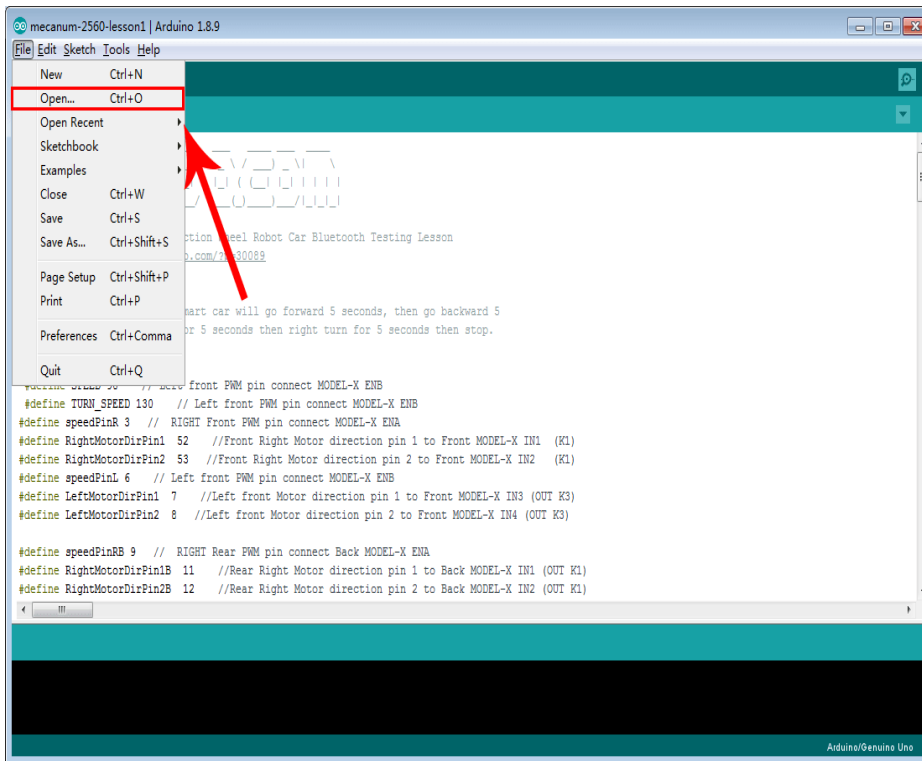
Unzip the downloaded file, enter the metal-2560-lesson5 folder, you will see two sub-folder : metal-2560-lesson5A-reverse and metal-2560-lesson5B-reverse. These two folders have program for two Wifi modes: AP mode and STA mode. The Arduino sketches for these two modes are different. Let' s explain these two modes one by one.



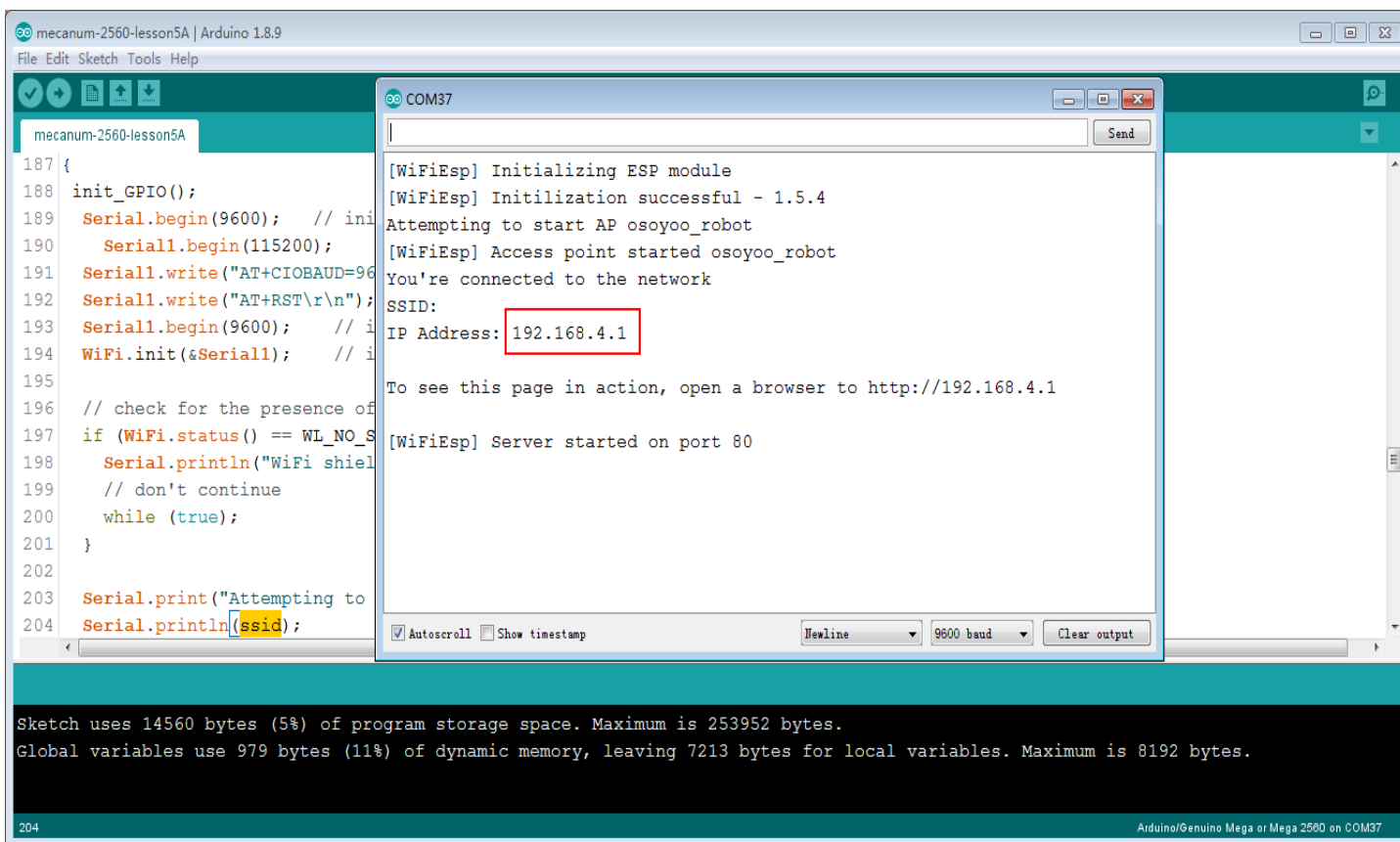
When working in AP mode, our robot car itself will become a Wifi Hot Spot. Our cell phone can connect to Robot Car as its wifi client. The IP address of Robot is fixed as

192.168.4.1 and It is not connected to WAN.

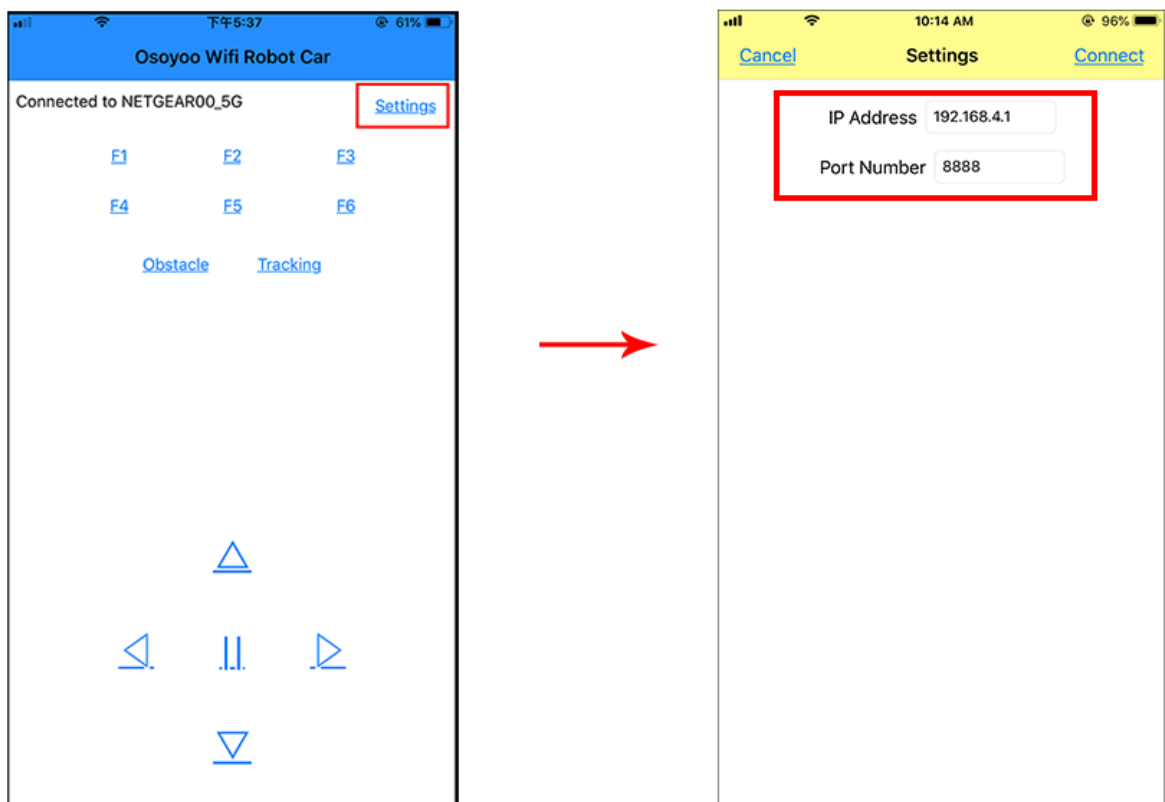
(1) Unzip the **metal-2560-lesson5-reverse** file and you will see a folder named metal-2560-lesson5A-reverse, upload the code into Arduino.



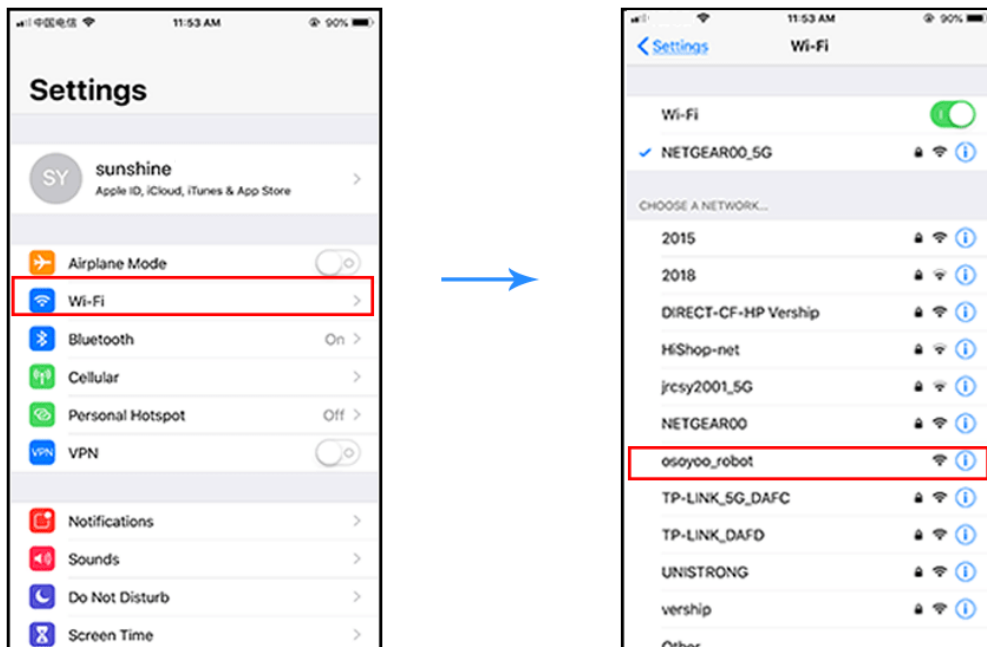
(2) Open your Arduino Serial monitor, and you will see a similar result as AP mode. A new Wifi SSID “osoyoo_robot” with IP address 192.168.4.1 will show up in the window. This means your Robot car has a Wifi Hot Spot name “osoyoo_robot” , its IP address is 192.168.4.1



(3) Now your Robot car become a Wifi Hot Spot and set IP address as “192.168.4.1” to your APP Setting section. Port number keep default value **8888**



(4) Connect your cell phone to “osooyoo_robot” Wifi hotspot, you can use Mobile phone control the robot car.



(5) You can click the ◀ ▶ ▲ ▼ direction keys to make the car move. Use “||” pause key to stop the car movement.

Click Obstacle to shift left side, Click Tracking to shift right side.

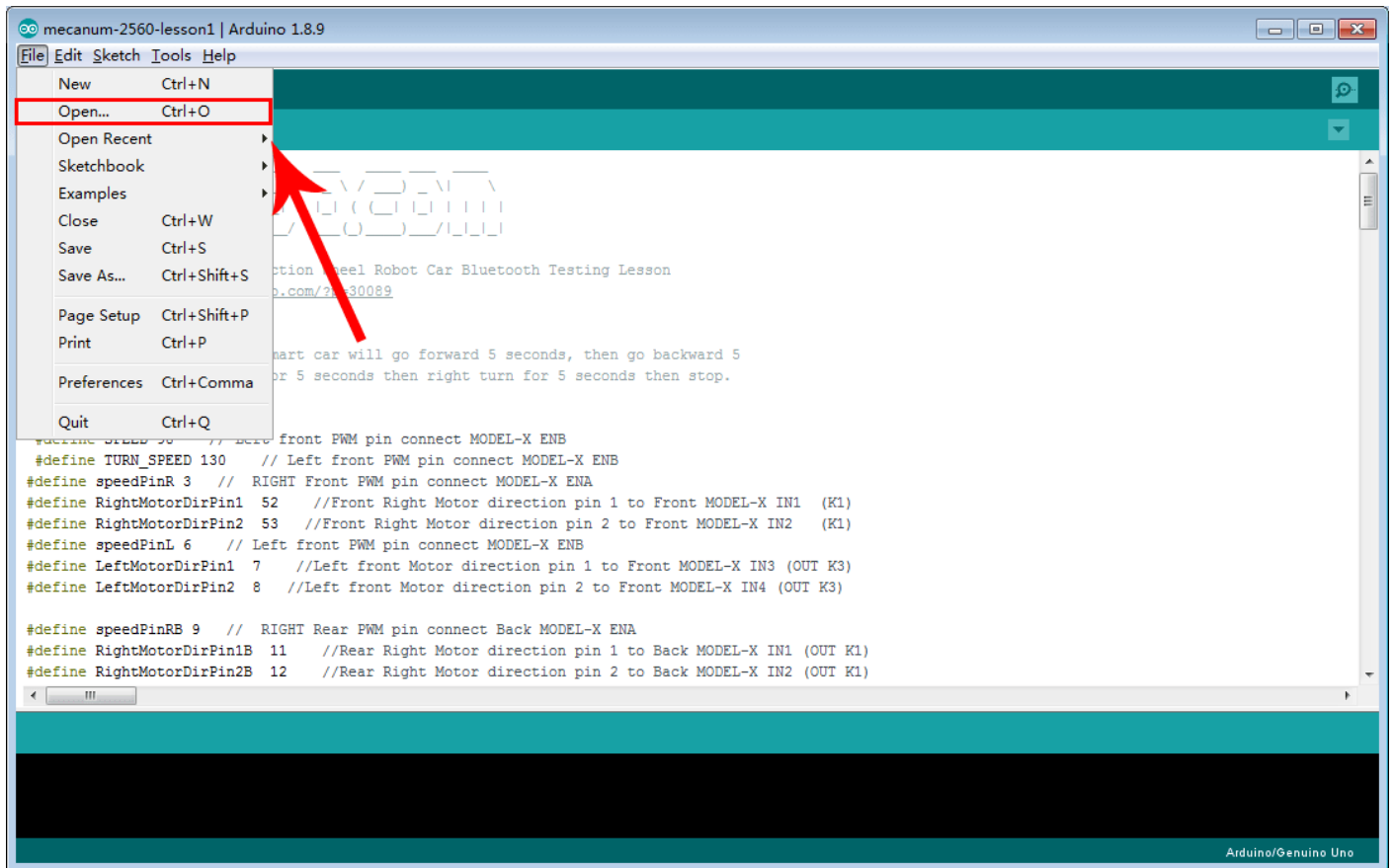
Click F1 to make upper-left diagonal movement, Click F3 to make upper-right diagonal movement

Click F4 to make back-left diagonal movement, Click F6 to make back-right diagonal movement.



In STA mode, robot car does not work as a wifi hotspot. Instead, it will become an internet node in your LAN. You need tell Arduino sketch what is your local router's Wifi SSID and password, then Arduino talks to router and get its own LAN IP address from DHCP server. You can use Mobile APP to access the robot car's IP address and control its movement.

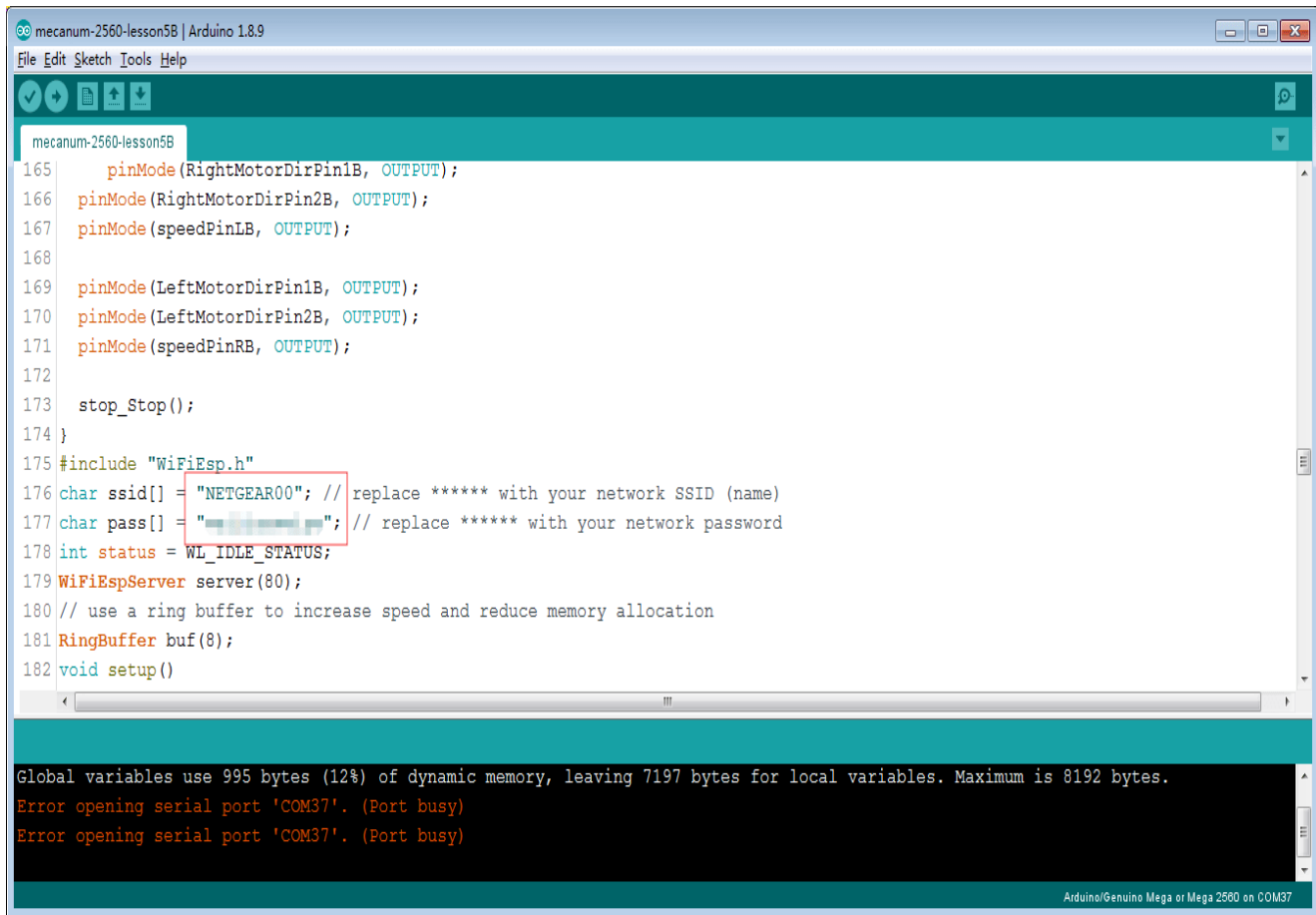
(1) Unzip the **metal-2560-lesson5-reverse** file and you will see a folder named metal-2560-lesson5B-reverse, then load the metal-2560-lesson5B-reverse.ino code into Arduino.



(2) You need change the code Line 176 and Line 177 :

char ssid[] = "YOUR_ROUTER_SSID"; // replace this with your router wifi SSID

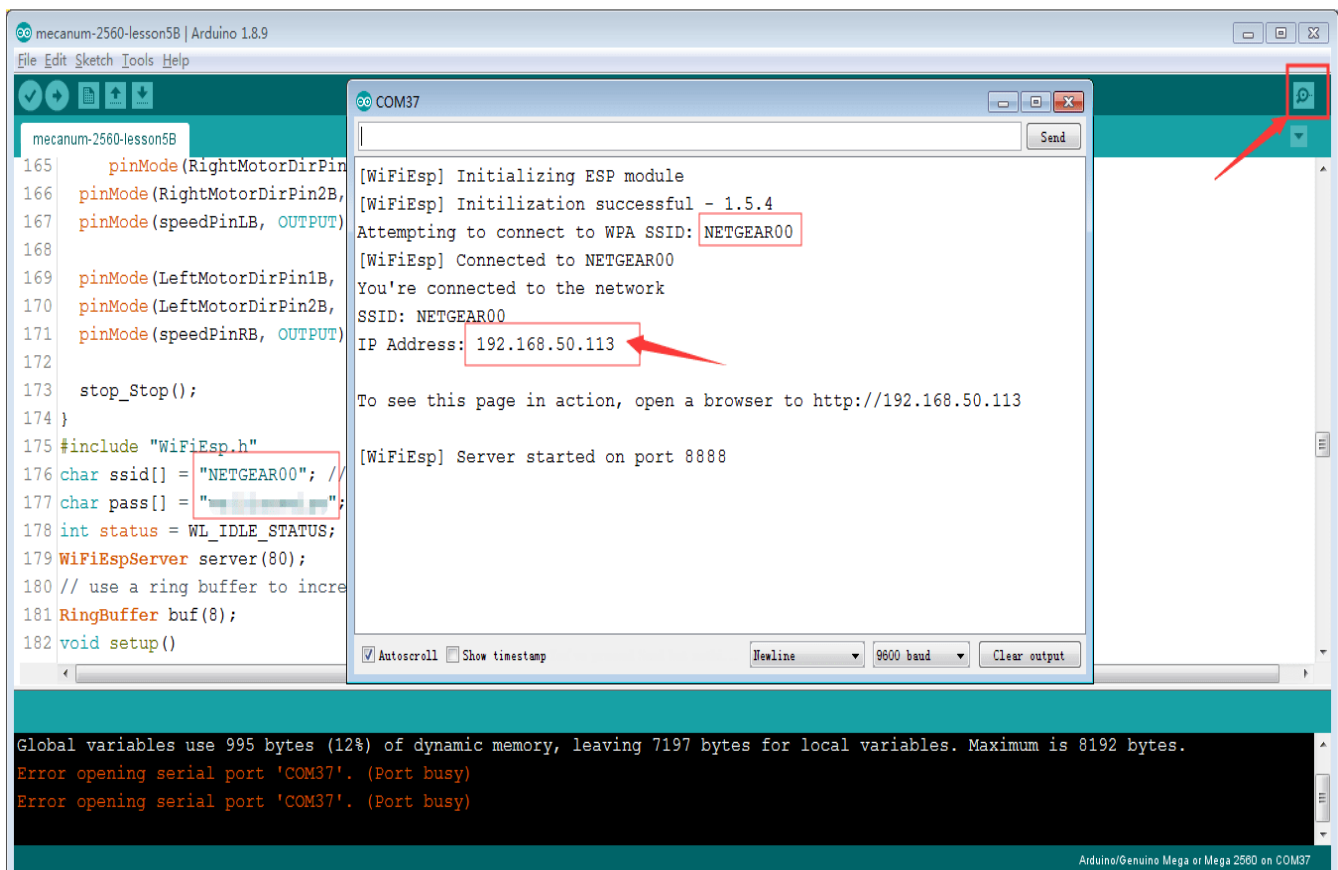
char pass[] = "YOUR_ROUTER_WIFI_PASSWORD"; // replace with your wifi password



```
165 pinMode(RightMotorDirPin1B, OUTPUT);
166 pinMode(RightMotorDirPin2B, OUTPUT);
167 pinMode(speedPinLB, OUTPUT);
168
169 pinMode(LeftMotorDirPin1B, OUTPUT);
170 pinMode(LeftMotorDirPin2B, OUTPUT);
171 pinMode(speedPinRB, OUTPUT);
172
173 stop_Stop();
174 }
175 #include "WiFiEsp.h"
176 char ssid[] = "NETGEAR00"; // replace ***** with your network SSID (name)
177 char pass[] = "*****"; // replace ***** with your network password
178 int status = WL_IDLE_STATUS;
179 WiFiEspServer server(80);
180 // use a ring buffer to increase speed and reduce memory allocation
181 RingBuffer buf(8);
182 void setup()

Global variables use 995 bytes (12%) of dynamic memory, leaving 7197 bytes for local variables. Maximum is 8192 bytes.
Error opening serial port 'COM37'. (Port busy)
Error opening serial port 'COM37'. (Port busy)
Arduino/Genuino Mega or Mega 2560 on COM37
```

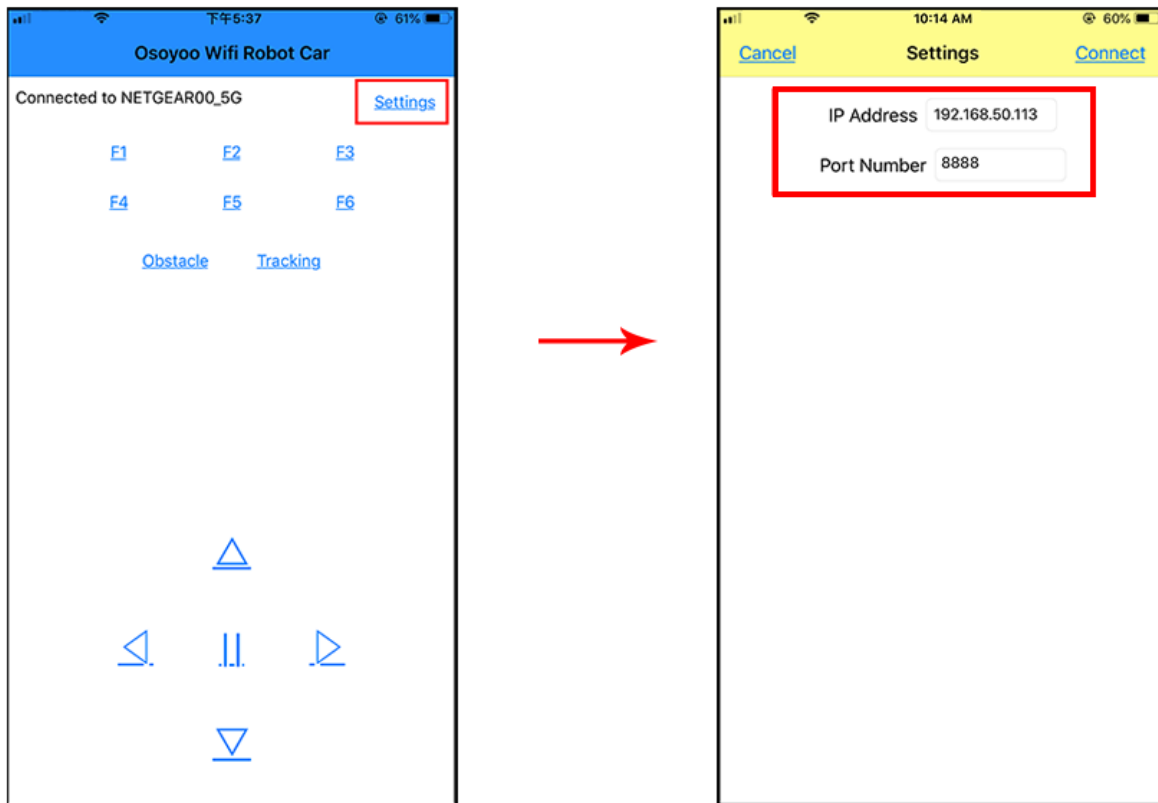
(3) Upload the sketch to Arduino. click the Serial monitor window in upper right corner of Arduino IDE, you will see following result:



```
COM37
[WiFiEsp] Initializing ESP module
[WiFiEsp] Initilization successful - 1.5.4
Attempting to connect to WPA SSID: NETGEAR00
[WiFiEsp] Connected to NETGEAR00
You're connected to the network
SSID: NETGEAR00
IP Address: 192.168.50.113
To see this page in action, open a browser to http://192.168.50.113
[WiFiEsp] Server started on port 8888

Global variables use 995 bytes (12%) of dynamic memory, leaving 7197 bytes for local variables. Maximum is 8192 bytes.
Error opening serial port 'COM37'. (Port busy)
Error opening serial port 'COM37'. (Port busy)
Arduino/Genuino Mega or Mega 2560 on COM37
```

(4) In this mode, you will see an IP address which is our LAN IP address assigned by my router. Please write down this IP address and click Setting to set up robot IP address and set this IP address to your APP Setting section (no need change default port 80 in APP).



(5) Now your Robot car is connected to your LAN, you can use Mobile phone under same LAN to control the robot car. If your APP is in WAN, you need to go to your Router Control Panel, forward Port 80 to Robot car LAN IP address, then you can use Router IP to control the car. This feature makes our robot car A REAL INTERNET OF THING device

(6) You can click the ◀ ▶ ▲ ▼ direction keys to make the car move. Use “||” pause key to stop the car movement.

Click Obstacle to shift left side, Click Tracking to shift right side.

Click F1 to make upper-left diagonal movement, Click F3 to make upper-right diagonal movement.

Click F4 to make back-left diagonal movement, Click F6 to make back-right diagonal movement.

NOTICE

FAQ about the Wifi UDP APP and sketch Code:

Q1)How to tune the robot car speed?

A: If you want change the speed performance of the robot car, please following parameters in line 11 to 13:

```
#define SPEED 85
```

```
#define TURN_SPEED 90
```

```
#define SHIFT_SPEED 130
```

SPEED value determines forward moving speed

TURN_SPEED value determines turning speed

SHIFT_SPEED value determines parallel shifting speed

Q2)What happened when you press buttons in OSOY00 WiFi UDP Robot Car APP ?

A: When you press a button of the APP, APP will send a single-letter message through UDP protocol to target device (in this example, our Arduino Wifi Shield)

Button	UDP message
F1	F
F2	G
F3	H
F4	I
F5	J
F6	K
▲	A
▼	B
▶	R
◀	L
square	E
obstacle	O
tracking	T

Q3)How does Arduino handle the UDP command?

Line 230 to line 245 in mecanum-2560-lesson5A.ino file are the codes which react to Cell phone command. For example, when ▲ is pressed, according to Q1 table, a letter “A” command was sent from Cell phone to Arduino. Line 233 case ‘A’ ... statement will make the car make car moving forward.

```
    char c=packetBuffer[0];
    switch (c)    //serial control instructions
    {
        case 'A':go_advance(SPEED);;break;
        case 'L':left_turn(TURN_SPEED);break;
        case 'R':right_turn(TURN_SPEED);break;
        case 'B':go_back(SPEED);break;
        case 'E':stop_Stop();break;
        case 'F':left_shift(0,150,0,150);break; //left ahead
        case 'H':right_shift(180,0,150,0);break; //right ahead
        case 'I':left_shift(150,0,150,0); break;//left back
        case 'K':right_shift(0,130,0,130); break;//right back
        case 'O':left_shift(200,150,150,200); break;//left shift
        case 'T':right_shift(200,200,200,200); break;//left shift
        default:break;
    }
```