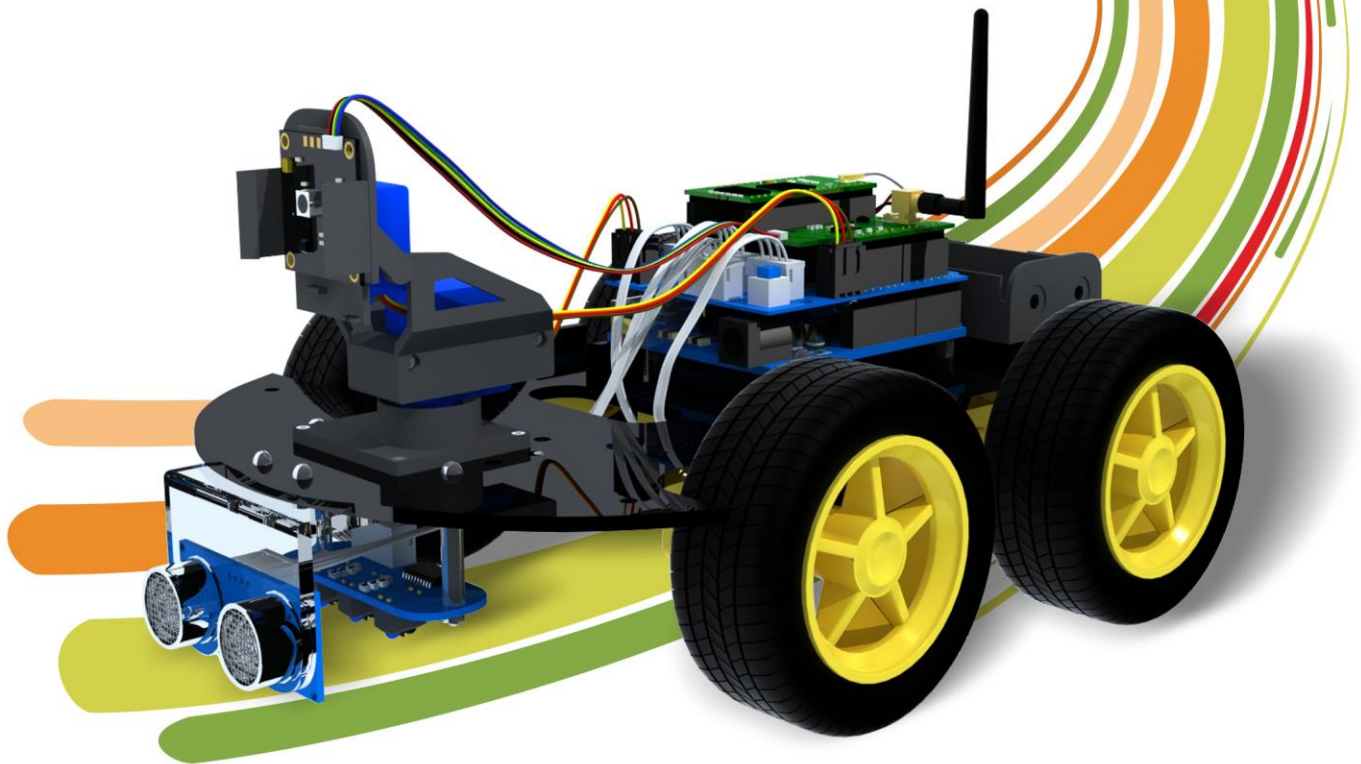


UCTRONICS[®]

Smart Wifi Robot Car Kit for Arduino

User Guide



UCTRONICS

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1. Introduction

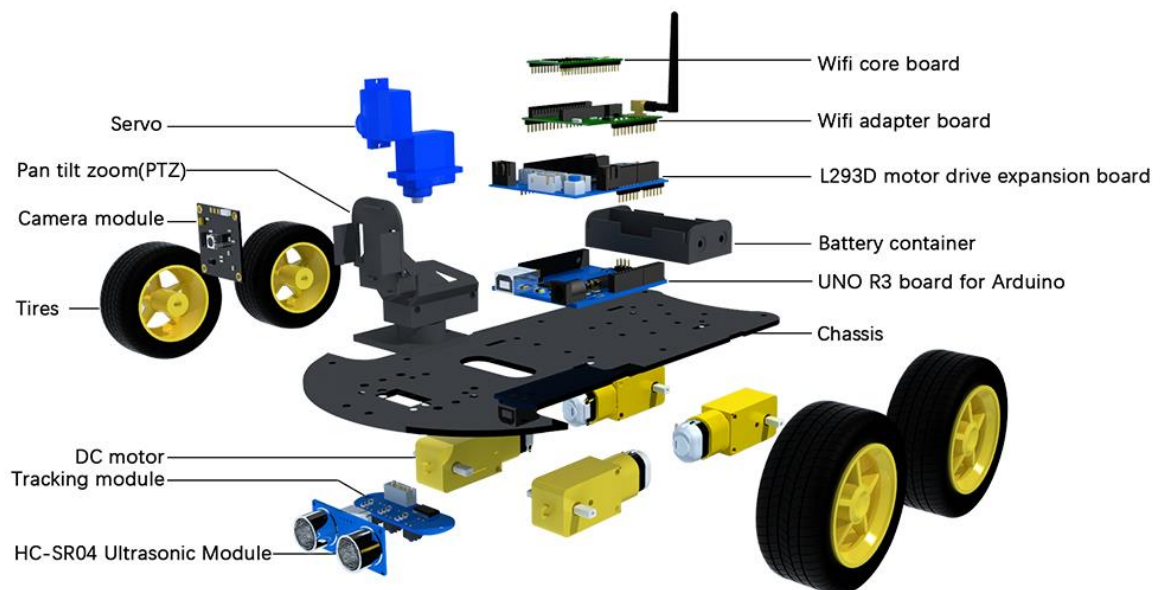


The UCTRONICS WIFI Smart Robot Car Kit is a flexible vehicular kit particularly designed for education, competition and entertainment. With it, you can implement diverse interesting ideas, such as WIFI remote control, automatic avoidance of obstacles, line inspection, take pictures and record videos, etc. What's more, in the manual mode, it has first person view (FPV).

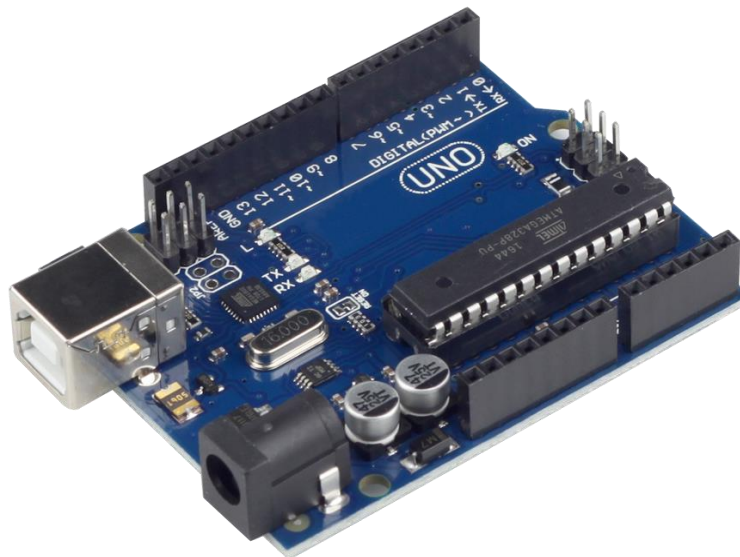
A robot is a machine that can perform some tasks automatically or with guidance. Robotics is generally a combination of computational intelligence and physical machines (motors). Due to their high level of performance and reliability, the robot gets the splendid popularity in our daily life.

Come on! let's go into a Robot World!

Each part of the car is as below:



1.1 The UNO R3 board for Arduino



The UNO is the best board to get started with electronics and coding. If this is your first experience tinkering with the platform, the UNO is the most robust board you can start playing with. The UNO is the most used and documented board of the whole Arduino family.

1.1.1 Specification

Microcontroller: ATmega328P	Input voltage (recommended): 7V-12V
Operating voltage: 5V	Digital I/O Pins: 14 (of which 6 provide PWM output)
Analog input Pins: 6	DC current per I/O Pin: 40 mA
SRAM: 2 KB (ATmega328)	DC current for 3.3V Pin: 50 mA
Clock speed: 16 MHz	Flash memory: 32 KB (ATmega328P) of which 0.5 KB used by bootloader

1.1.2 Functions of UNO Board

- Connect with L293D motor drive board, control the movement of the car
- Connect with ultrasonic module, achieve obstacle avoidance function
- Connect with camera and PTZ, control the movement of PTZ
- Connect with wifi module, remote control the car
- Connect with the tracking module, realize the function of line tracking

Click the following link, you can find in the Getting Started section all the information you need to configure your board, use the Arduino Software (IDE), and start tinker with coding and electronics.

<https://www.arduino.cc/en/Guide/HomePage>

1.2 Function of Each Module

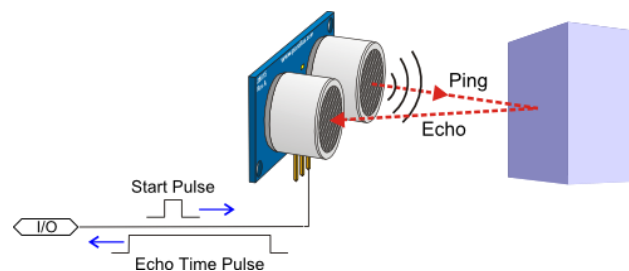
- L293D expansion board with a switch: drive the motor to rotate
- Ultrasonic sensor module: distance measurement and obstacle avoidance
- Line tracking module: black and white sensor for recognition of the white and black lanes
- Wifi module: provide the Wifi remote control function
- Chassis kit: the frame of the car and drive the car to move
- Servo and Pan/Tilt/Zoom: enable the camera to rotate
- 5MP camera module: take a picture or record a video

2. Function Module Introduction

2.1 HC-SR04 Ultrasonic Sensor Module



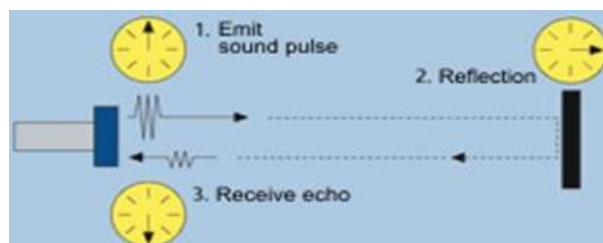
The HC-SR04 ultrasonic sensor module for Arduino is used for obstacle detection. Ultrasonic sensor transmits the ultrasonic waves from its sensor head and again receives the ultrasonic waves reflected from an object.



Ultrasonic sensor general diagram

2.1.1 Working Principle

The ultrasonic sensor emits the short and high frequency signal. These propagate in the air at the velocity of sound. If they hit any object, then they reflect back echo signal to the sensor. The ultrasonic sensor consists of a multi vibrator, fixed to the base. The multi vibrator is combination of a resonator and vibrator. The resonator delivers ultrasonic wave generated by the vibration. The ultrasonic sensor actually consists of two parts; the emitter which produces a 40 kHz sound wave and the detector detects 40 kHz sound wave and sends electrical signal back to the microcontroller.



Ultrasonic working principle

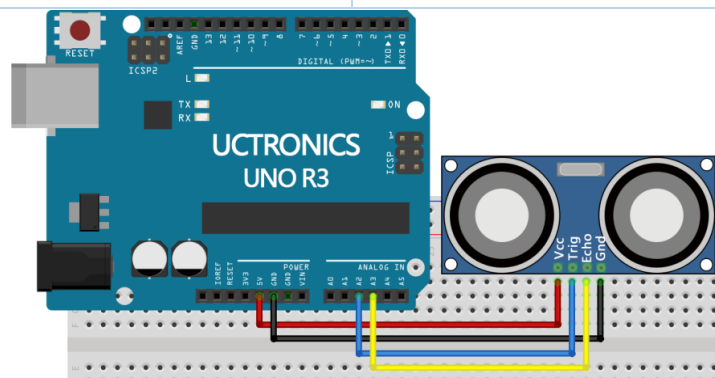
The ultrasonic sensor enables the robot to virtually see and recognize object, measure distance and avoid obstacles. The operating range of ultrasonic sensor is 2 cm to 450 cm.

2.1.2 Specification

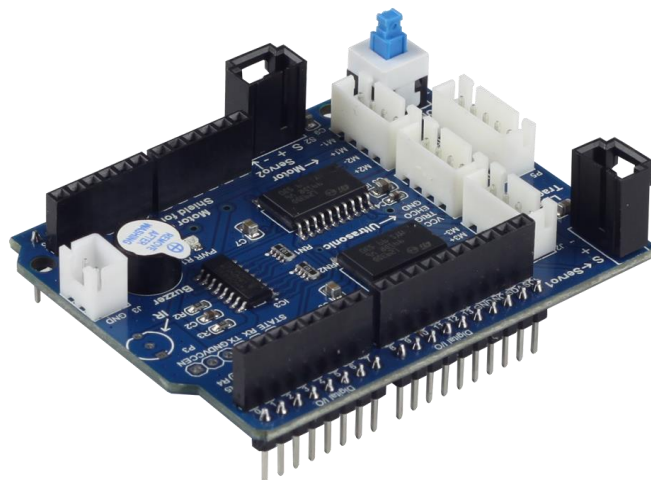
Working voltage: 5V DC	Output signal: Electric frequency signal
Static current: < 2mA	Output voltage: 0V (no obstacle) ,5V(obstacle in range)
Sensor angle: <= 15°	Echo signal: output TTL PWL signal
High precision: Up to 0.3cm	Input trigger signal: 10us TTL impulse
Detection distance: 2-450cm	Mode of connection: VCC, trig (T), echo, GND

2.1.3 Wiring diagram:

HC-SR04 Ultrasonic Sensor Module	UNO
VCC	5V
Trig	A2
Echo	A3
GND	GND



2.2 L293D Motor Drive Expansion Board

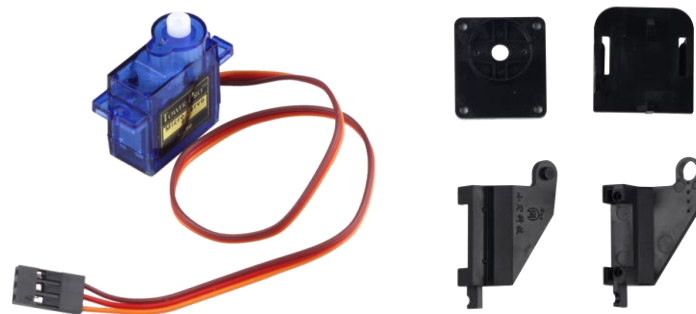


This is a commonly used DC motor drive module, using L293D chip with small current DC motor driver. The pins are made compatible with Arduino which is easy to use.

2.2.1 Specification

- 2 connections for 5V servos connected to the Arduino's high-resolution dedicated timer
- Up to 4 bi-directional DC motors with 4 PWM speed regulation
- Up to 2 stepper motor control, single / double step control, staggered or microstepping and rotation angle control
- Ultrasonic interface, tracking module interface
- The buzzer is already soldered in the L293D motor drive board
- 4 H-Bridges: L293D chipset provides 0.6A per bridge (1.2A peak) with thermal shutdown protection, 4.5V to 36V
- Pull down resistors to keep motors in the state of rest during power-up
- All module interfaces have been modified with XH2.54 ports as to make it much easier and convenient to assemble the car
- With power button

2.3 SG90 9g micro servo motor and Pan/Tilt/Zoom

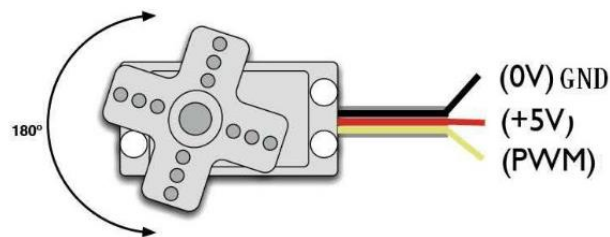


SG90 9g micro small servo motor is the main source of controlling action of the remote-control model. The module is widely applied in the field of fixed wing, helicopter, gliding, small robot, manipulator model.

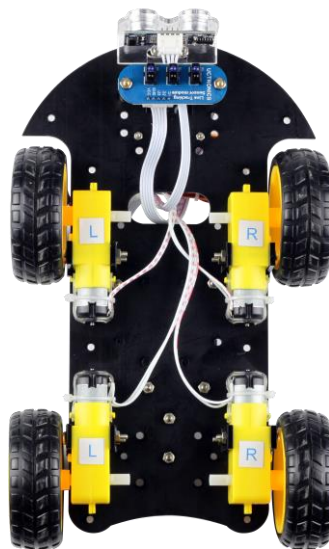
PTZ (Pan/Tilt/Zoom) is a set of equipment used to install and fix the camera module. One set of PTZ contains a PTZ base, 3 pieces PTZ brackets and several accessory screws. Support full rotation.

2.3.1 Specification

- Size: 23x12.2x29 mm
- Torsional moment: 1.5kg/cm
- Working voltage: 4.2V-6V
- Temperature range: 0C°-55C°
- Operating speed: 0.1 seconds /60°
- Dead band width: 10 microseconds
- The maximum rotation angles of left and right are around the same.



2.4 4WD Driver Motor Robot Smart Car Chassis Kits



With the car platform, adding micro-controller (such as Arduino) and sensor modules, then program it, a robot car comes up.

All the module interfaces have been modified with XH2.54 ports as to make it much easier and convenient to assemble the car.

2.4.1 Contents

- 4pcs Wheels
- 4pcs Geared Motors (1:48)
- 8pcs T-type Fastener
- 1pcs 18650 Battery Container
- 1pcs Acrylic Car Chassis
- Screws+ Nuts

2.5 Line Tracking Module



The line tracking module detects lines in the surrounding environment, and transfers the data to the processor. The processor analyzes the data, and sends a command to control the movement of the wheels.

2.5.1 Working Principle

The TCRT5000 IR sensor on the line follower has a TX and RX inside. If a bright color surface is detected in front of the sensor, such as a white paper (about 1cm away), most of the IR rays will be reflected; if a dark color like black surface is detected, most of the rays will be absorbed, while only a small amount will be reflected. The RX will output different analog signals according to the intensity of the reflected IR light.

2.5.2 Specification

Working voltage: DC 5V	Detecting range: 1~20mm
Working temperature: 0°C ~ + 50°C	Detector type: phototransistor
Emitter wavelength: 950 nm	PCB dimension: 20mm×54mm
3 output channel	Output level: TTL level (black line of low effective, high efficient white line)

2.6 WIFI Module Kit



The wifi module kit includes two parts, one is the core board, and the other is the wifi adapter board. It is used to send control command to the car and transmits the real-time camera image to the smart phone.

2.6.1 Specification:

The wifi core board:

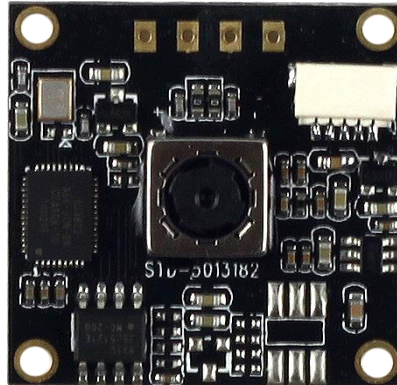
- Support OS: Openwrt (linux)
- Working voltage: $3.3V \pm 10\%$
- Average power consumption: 0.45W
- Working temperature: $-10 \sim 70^{\circ}C$
- Wireless speed: maximum is 150Mbps
- RF power: maximum is 18dbm
- System frequency: 400MHz
- RAM: 64MByte DDR2 RAM
- Wireless transmission distance: 80-100m
- Wireless working mode: Routing, AP, Relay, Bridging
- Item dimension: 39mm X 23mm

The wifi adapter board:

- Support USB camera interface
- With system startup light

- With wifi antenna
- Item dimension: 46mm X 44mm

2.7 Camera

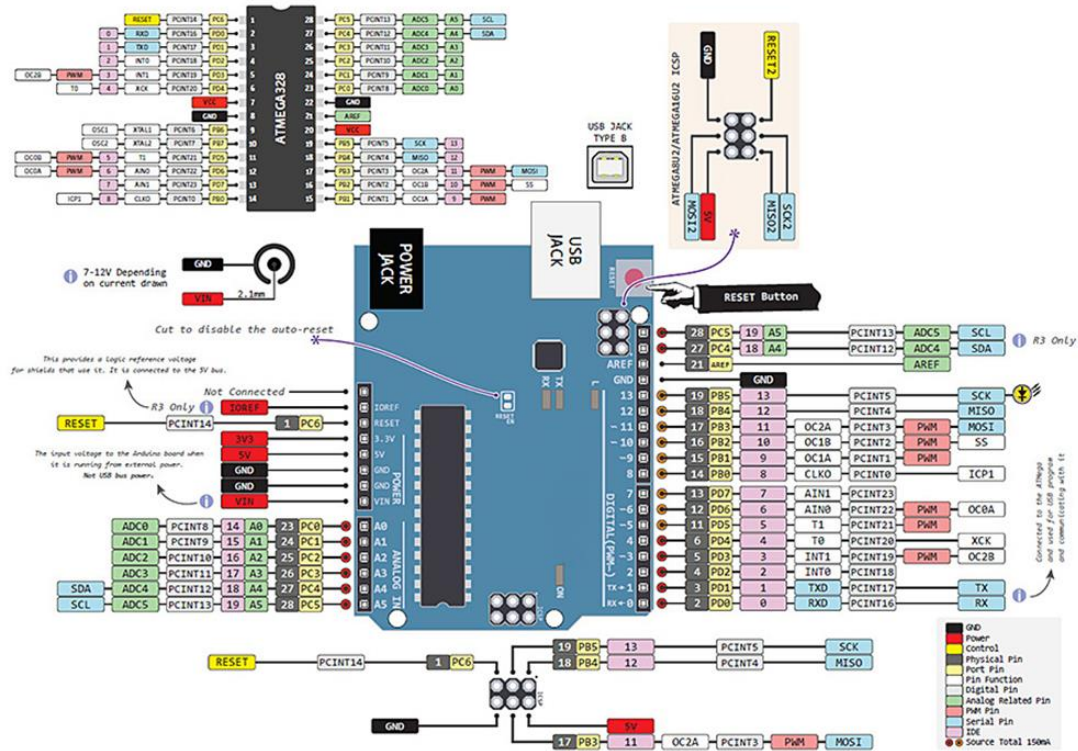


You can take a picture or record a video through the camera stuck in the Pan/Tilt/Zoom and connected with two 9g micro servo motor, thus giving better shooting experience when you're using it on the smart car kit.

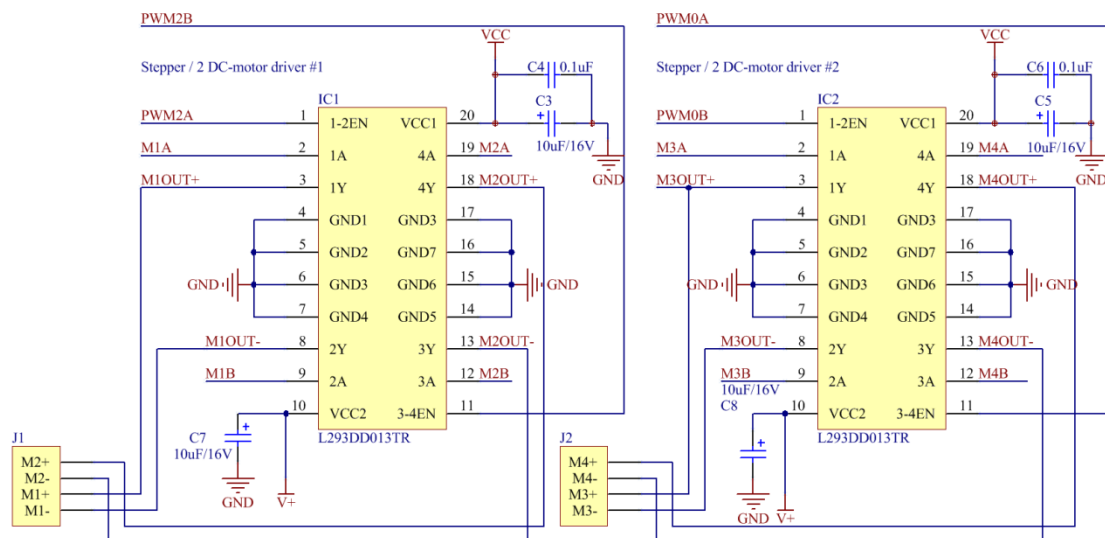
2.7.1 Specification:

- 5 megapixels image sensor OV5640
- Support for JPEG output format
- Interface: usb2.0
- Item size: 28mm X 28mm

3. Pin Definition

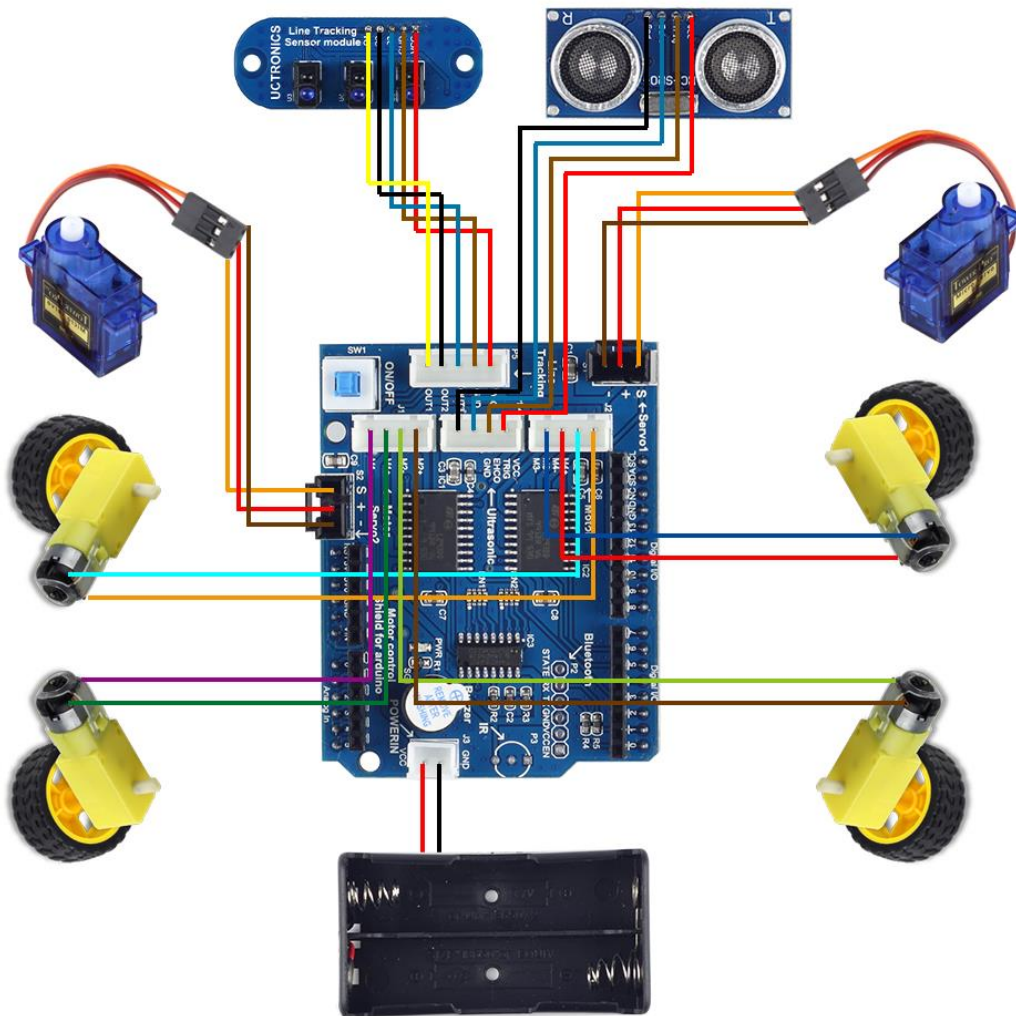


Arduino UNO R3 Board



L293D Motor Drive Expansion Board

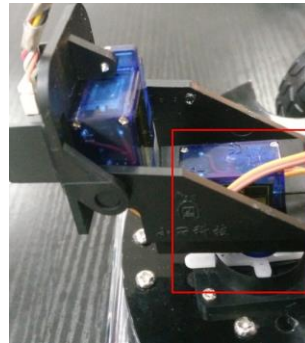
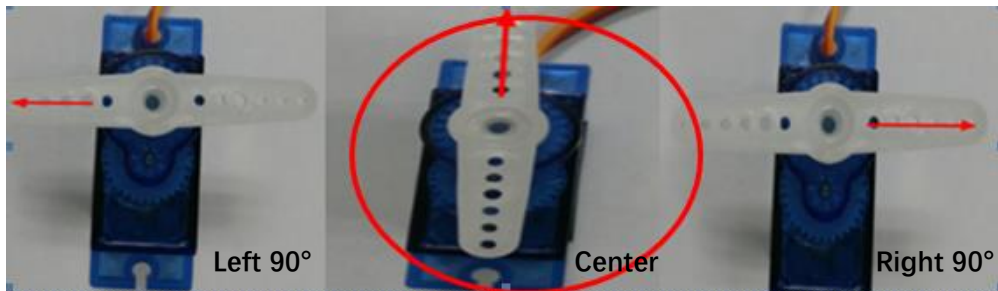
4. Wiring



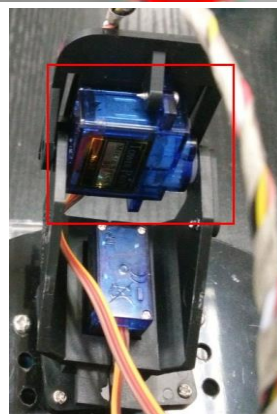
5. Installation

A pre-introduction of the servo installation: 90°

- For the bottom servo, you should calibrate to the center position manually. The servo can turn 180 degrees, you should set it to center position so that you can turn left 90 degrees and turn right 90 degrees. Below middle picture shows the center position.

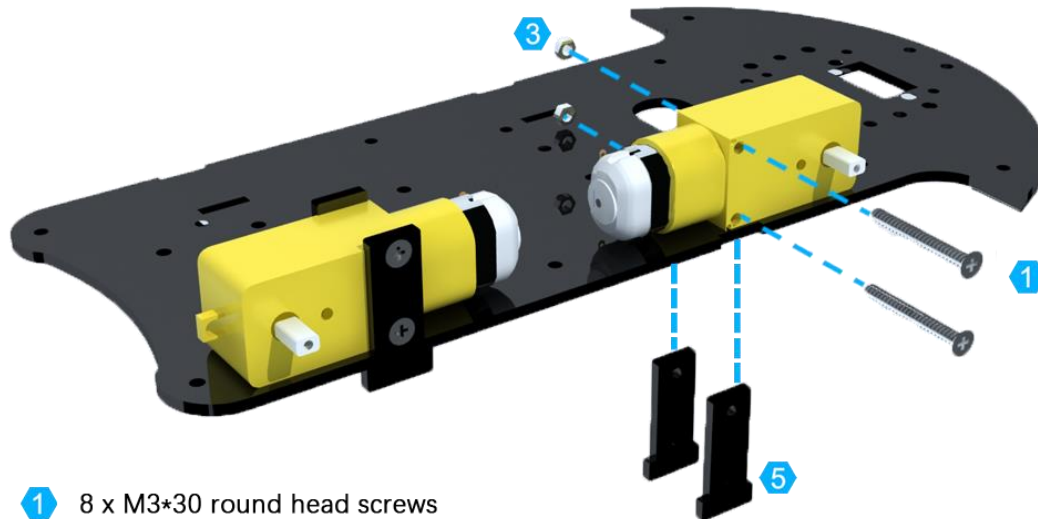


- For the above servo, you should set the center position in order that you can turn up 90 degrees and turn down 90 degrees. Below middle picture shows the center position.



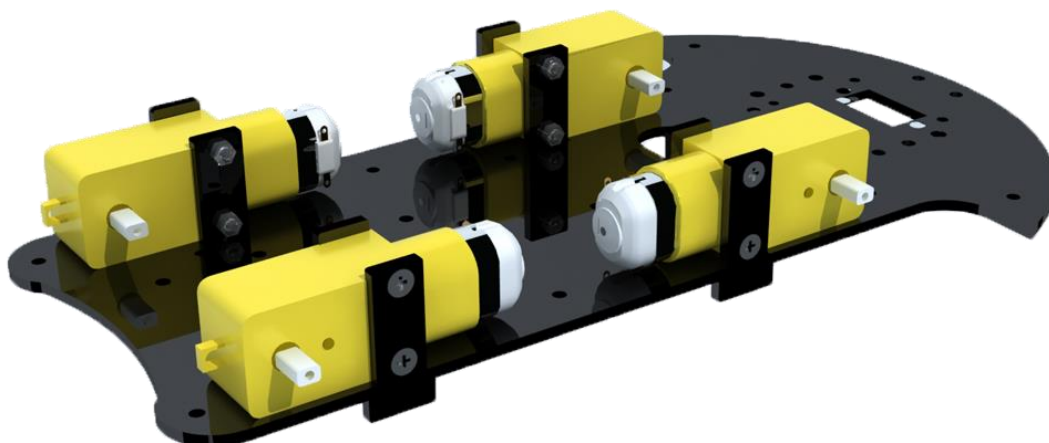
5.1 Installation of the Car

Step 1: Install the deceleration DC motor

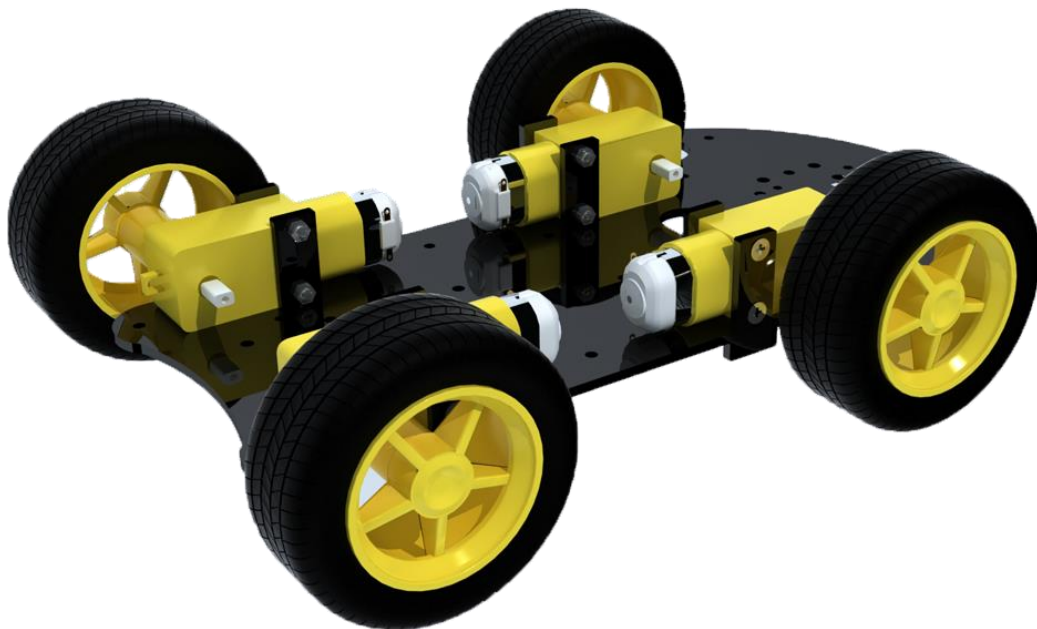
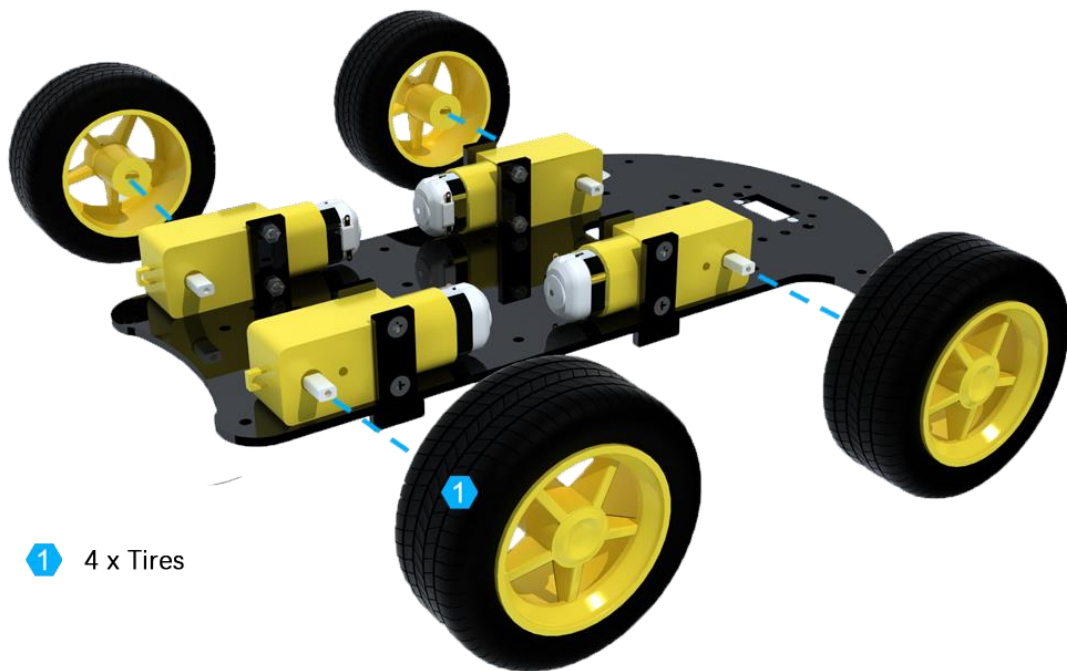


- 1 8 x M3*30 round head screws
- 2 4 x DC motor
- 3 8 x M3 nuts
- 4 1 x Chassis
- 5 8 x T-type fastener

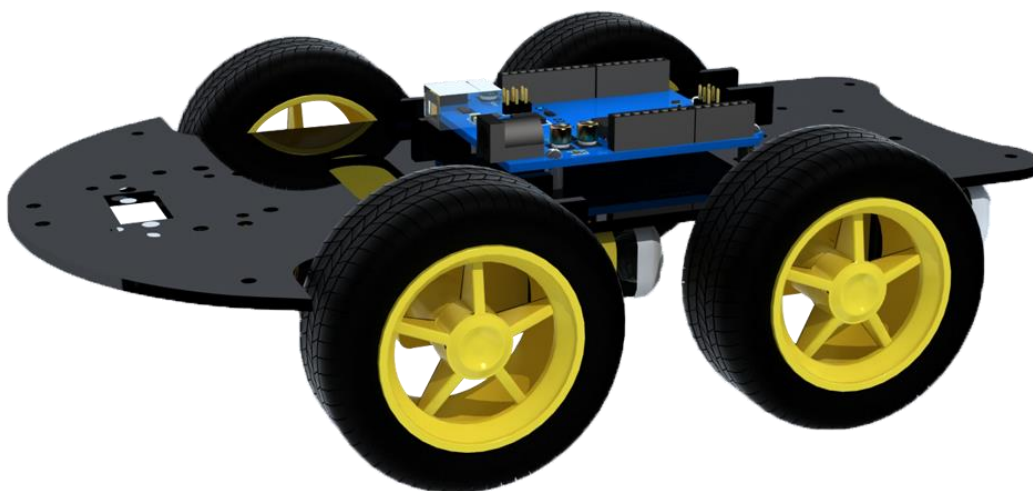
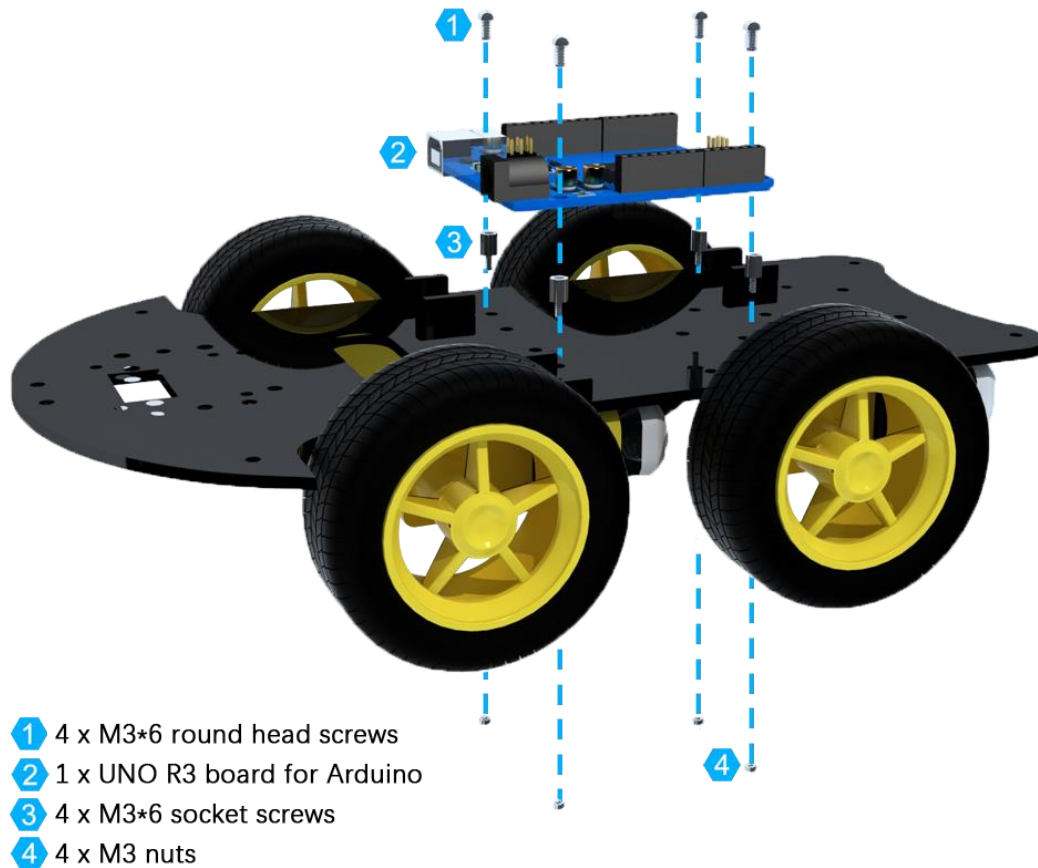
Note: Make sure each motor is installed in the correct direction



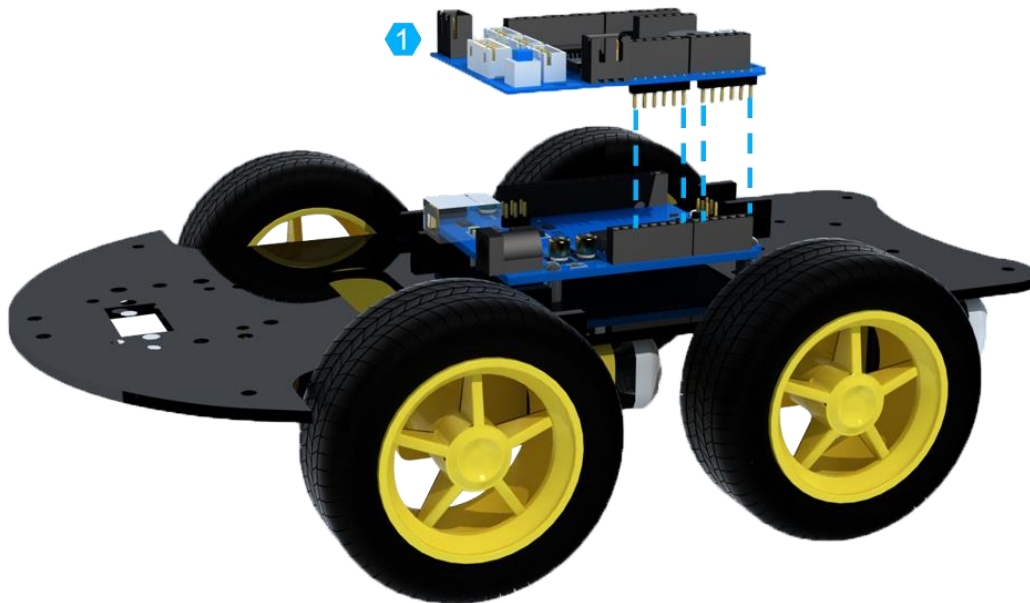
Step 2: Fix the wheel



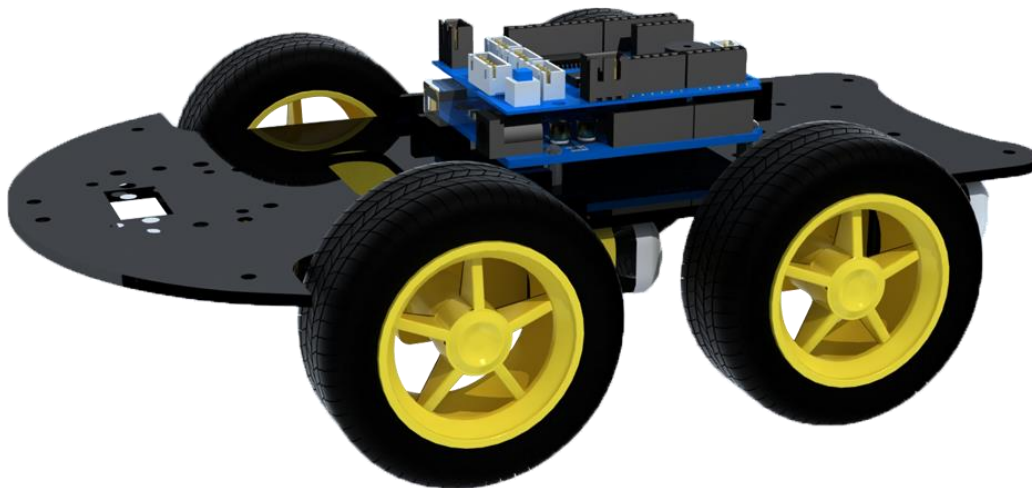
Step 3: Install the UNO board



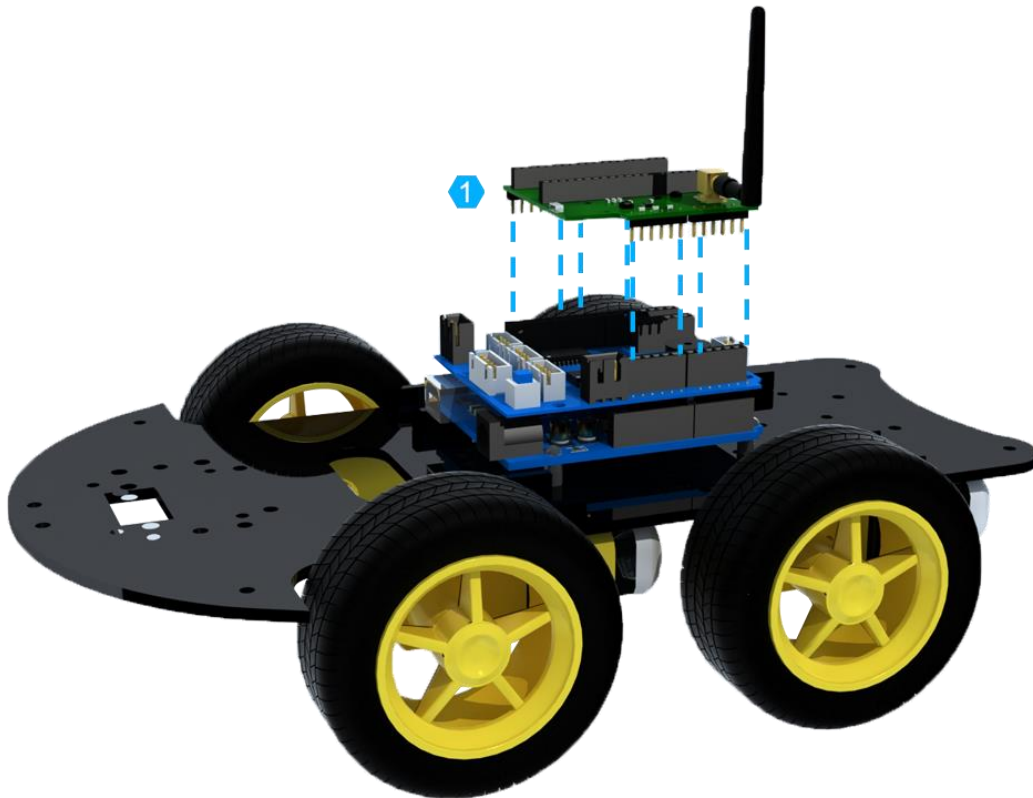
Step 4: Install the L293D motor drive board



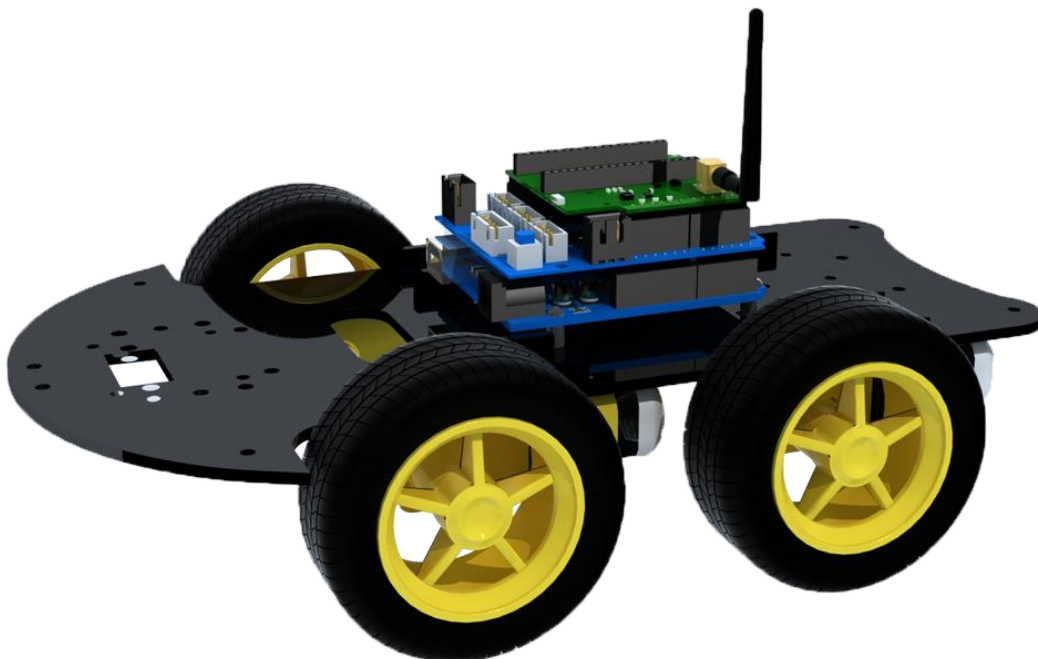
1 1 x L293D motor drive expansion board



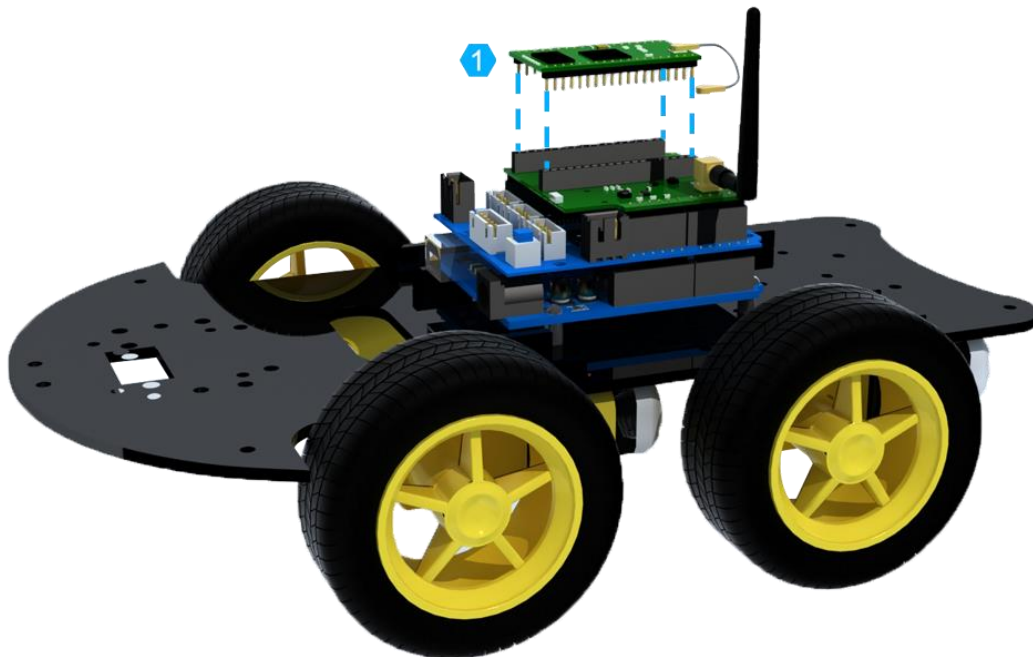
Step 5: Install the wifi adapter board



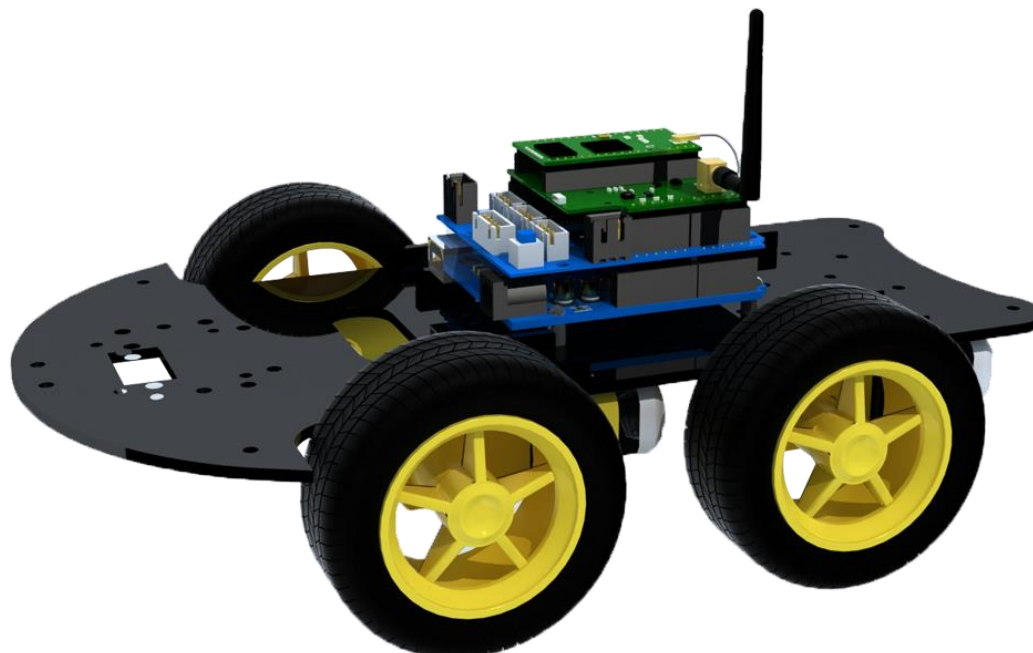
1 1 x Wifi adapter board



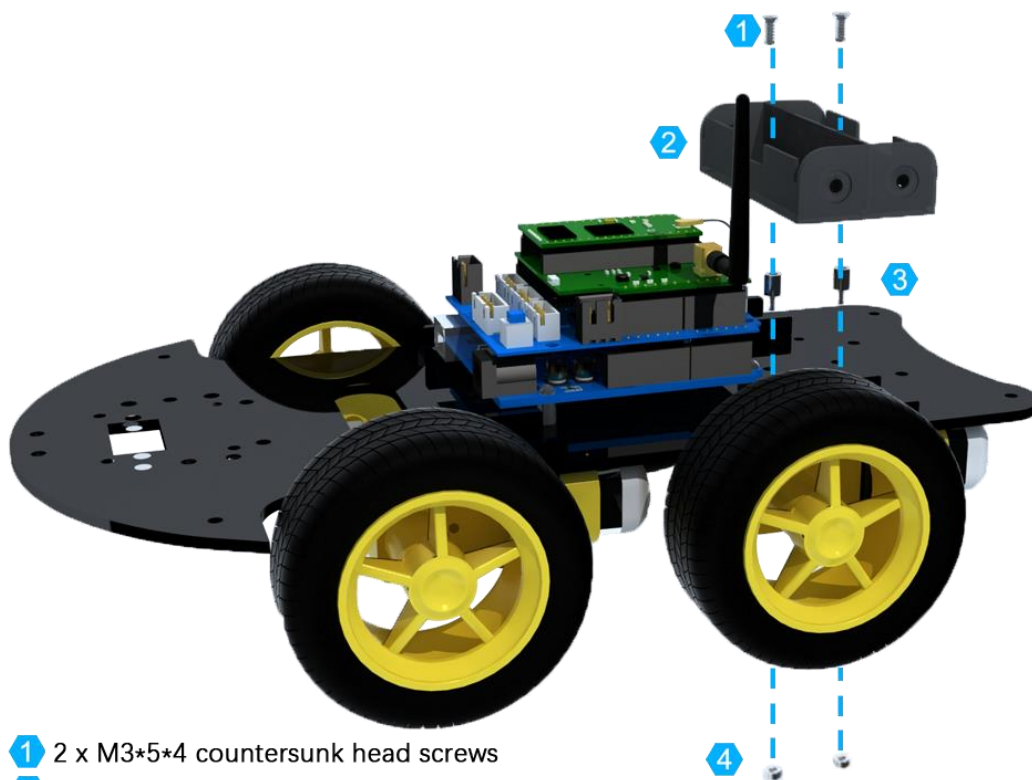
Step 6: Install the wifi core board



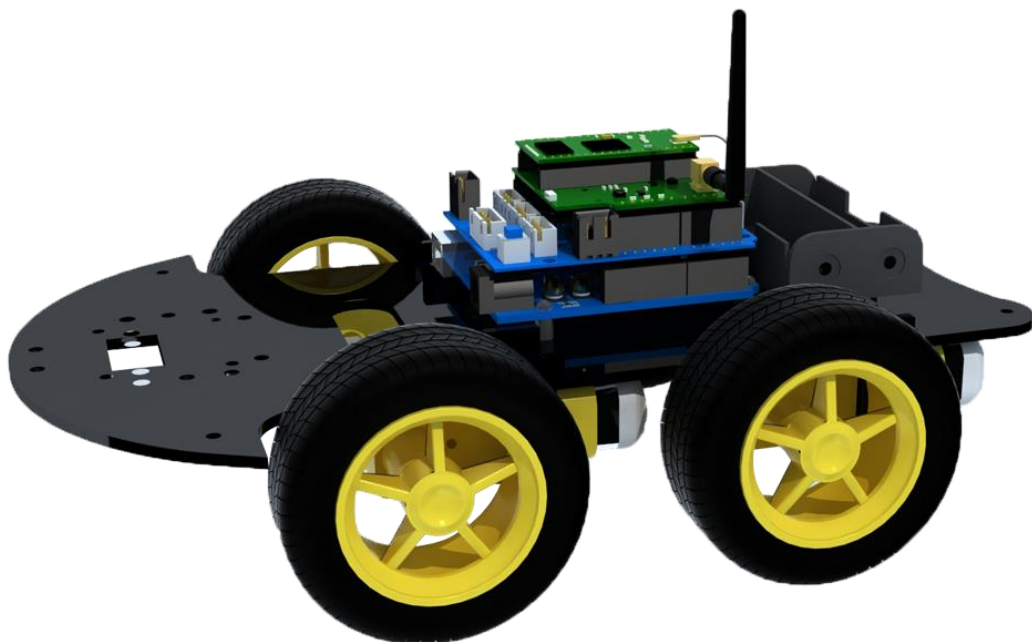
1 1 x Wifi core board



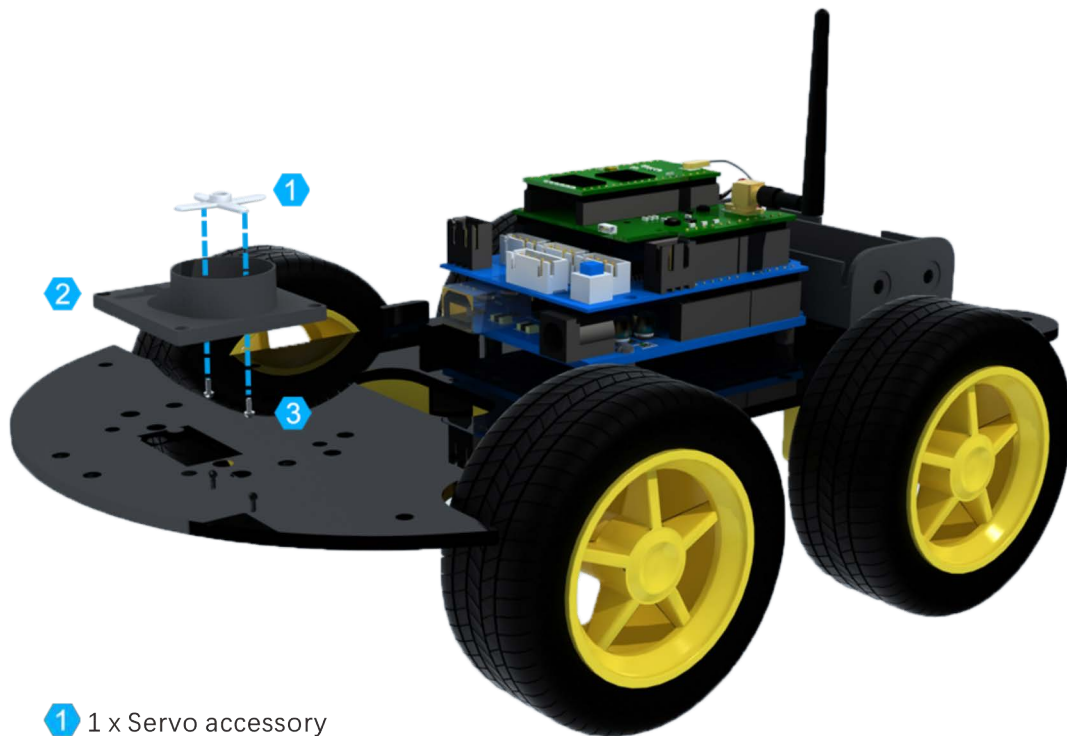
Step 7: Install the battery container



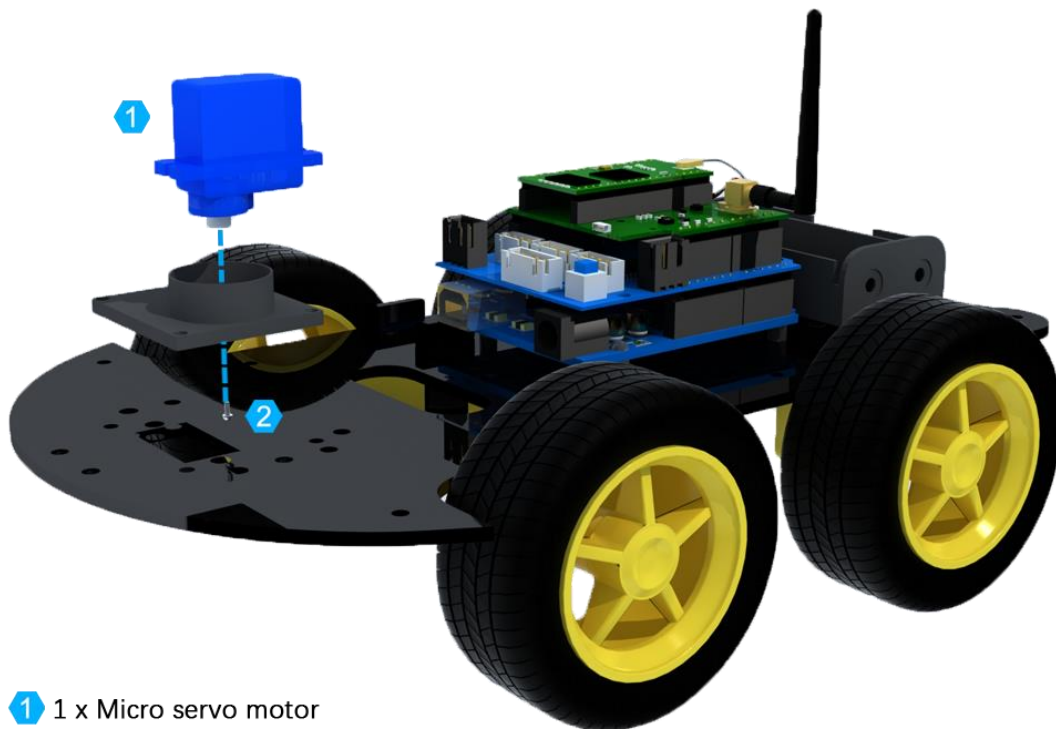
- 1 2 x M3*5*4 countersunk head screws
- 2 1 x Battery container
- 3 2 x M3*6 socket screws
- 4 2 x M3 nuts



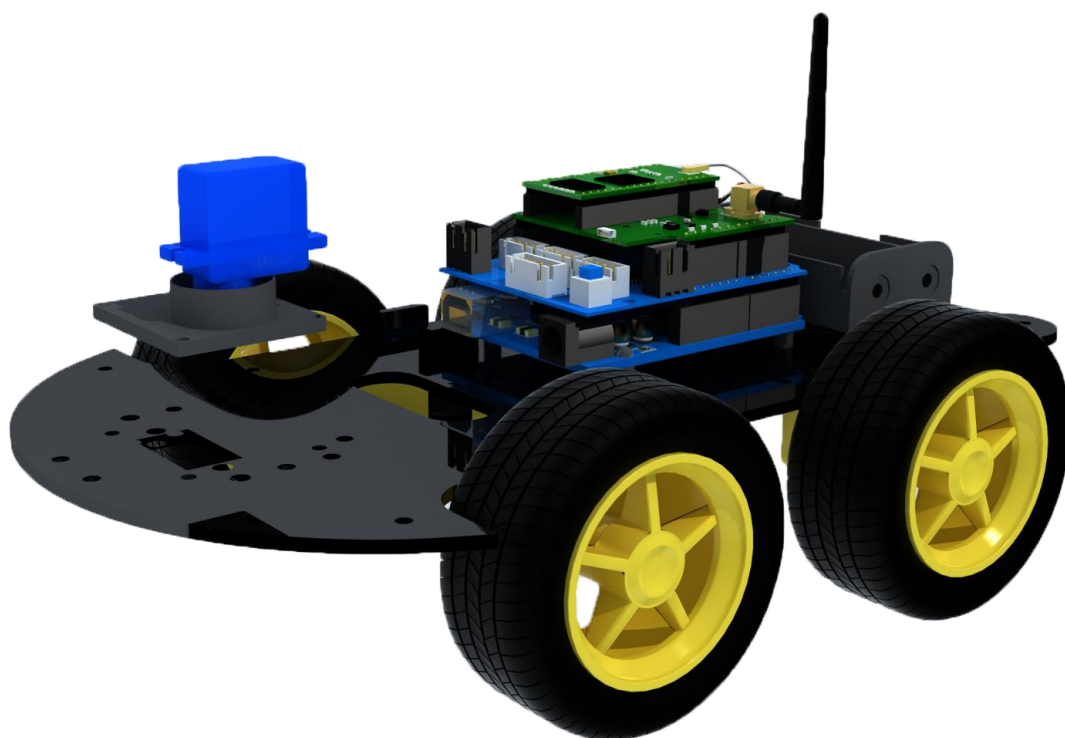
Step 8: Install the servo motor to the PTZ base



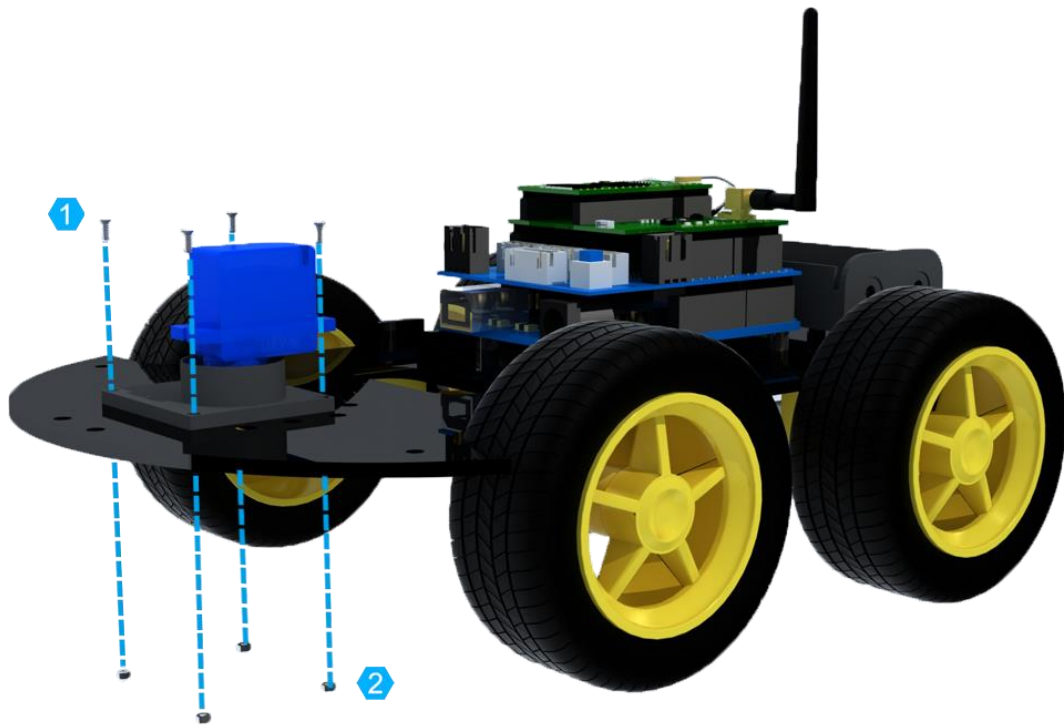
- 1 1 x Servo accessory
- 2 1 x Pan tilt zoom (PTZ)
- 3 2 x PTZ self-tapping screws



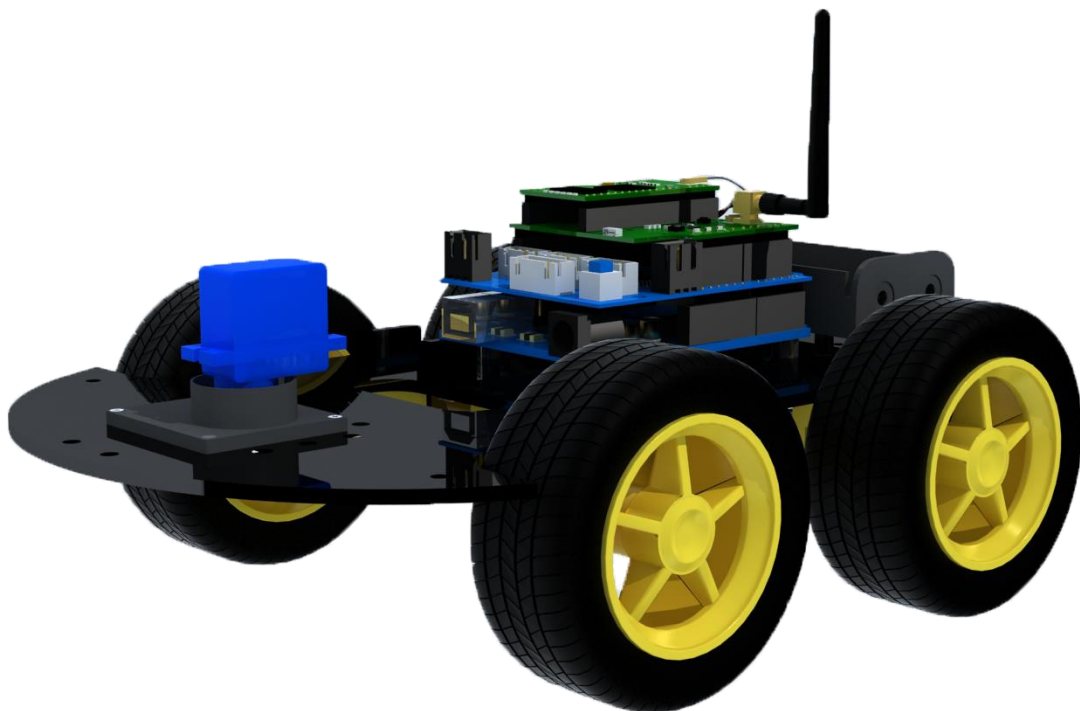
- 1 1 x Micro servo motor
- 2 1 x M2*4 round head screws



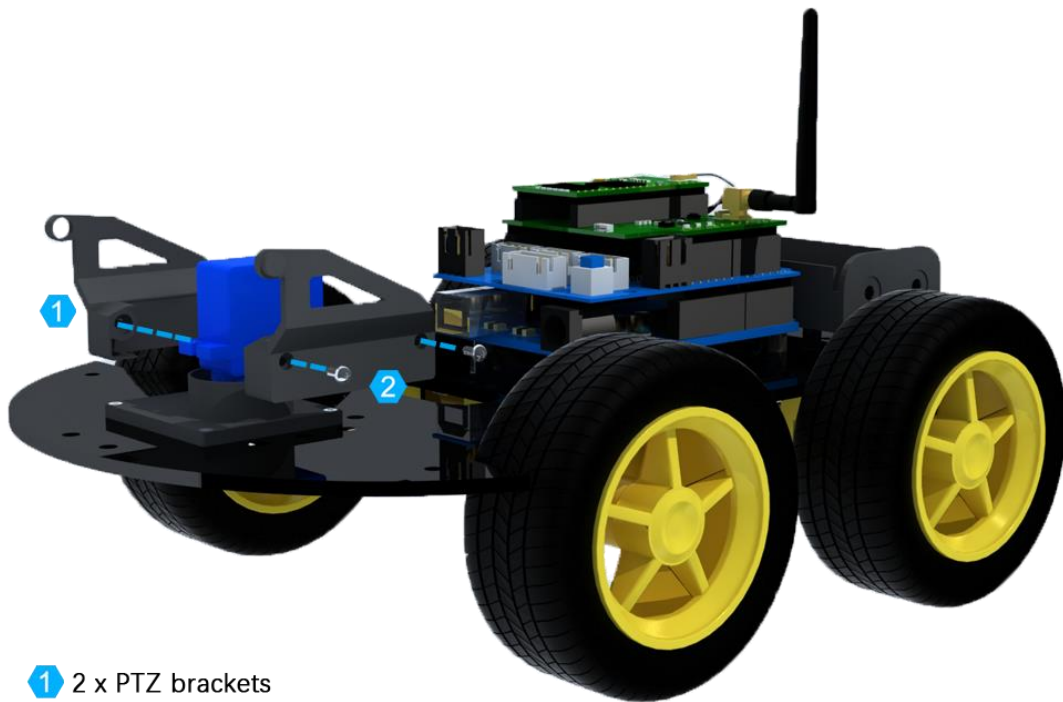
Step 9: Install the PTZ to the chassis



- 1 4 x M2*10 round head screws
- 2 4 x M2 nuts



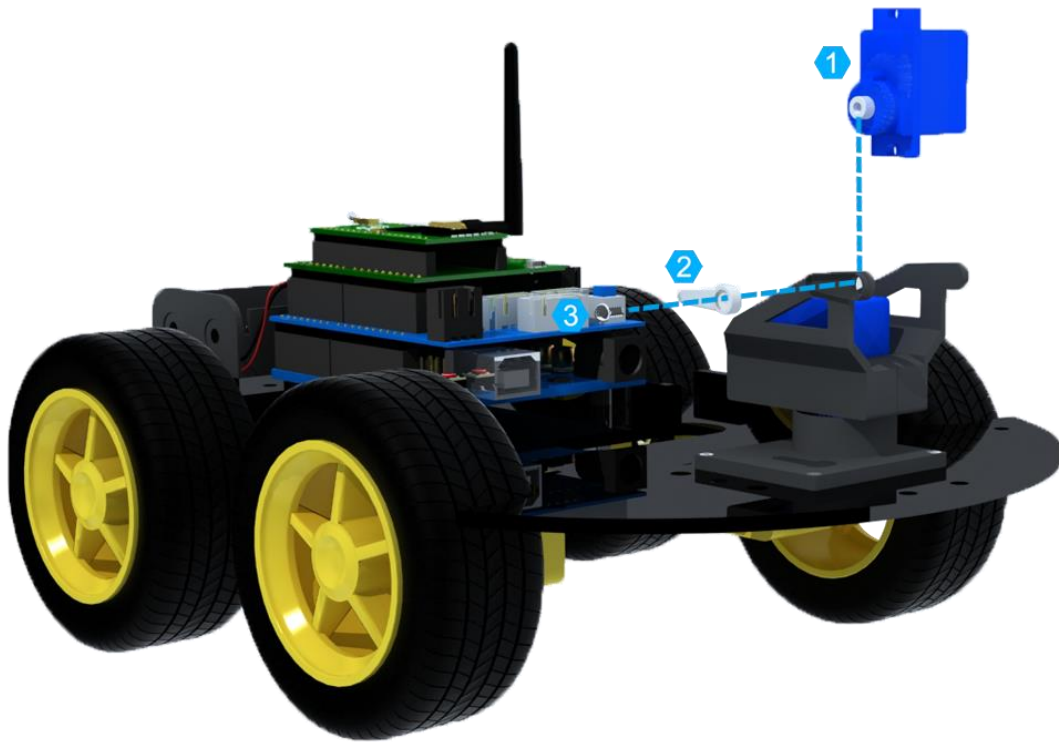
Step 10: Install the PTZ brackets to the servo motor



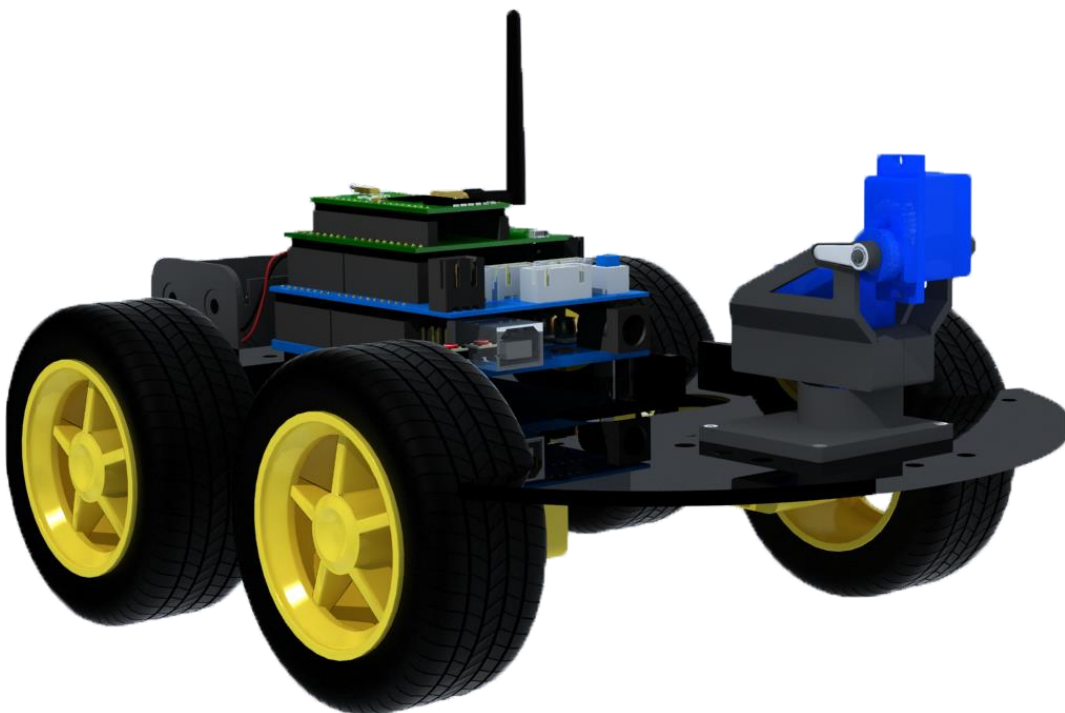
- 1 2 x PTZ brackets
- 2 2 x PTZ accessory screws



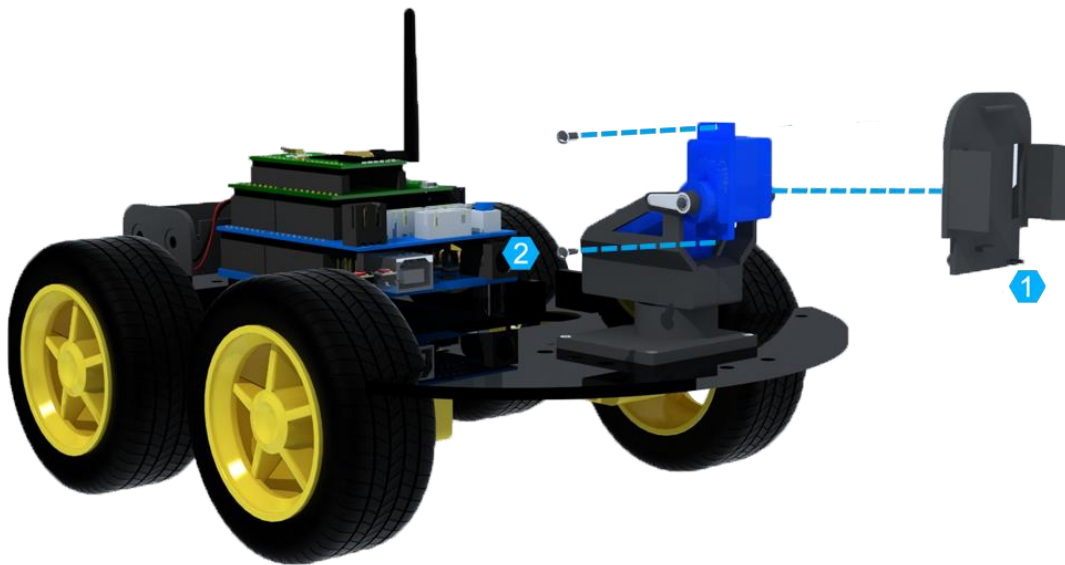
Step 11: Install the servo motor to the PTZ brackets



- 1 1 x Micro servo motor
- 2 1 x Servo accessory
- 3 1 x M2*4 round head screws



Step 12: Install the PTZ bracket to the servo motor



- 1 1 x PTZ brackets
- 2 2 x PTZ accessory screws



Step 13: Install the camera module to the PTZ brackets



1 x Camera module

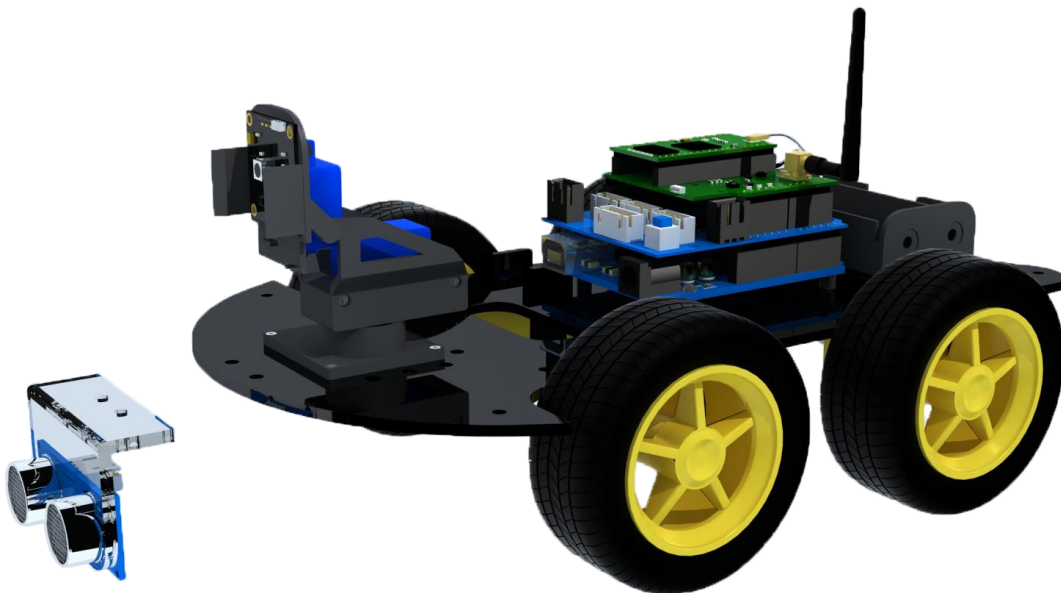
Note: Tear off the tape on the PTZ bracket and stick the camera module to it.



Step 14: Install the ultrasonic sensor to the ultrasonic holder



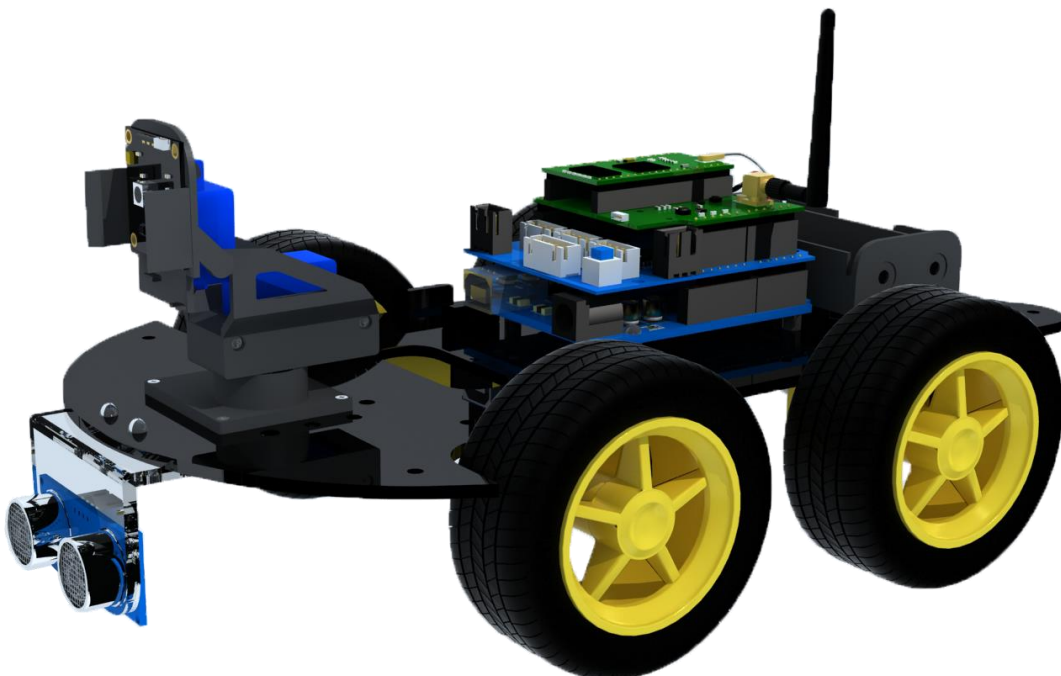
- 1 x Holder for HC-SR04
- 1 x HC-SR04 Ultrasonic Module



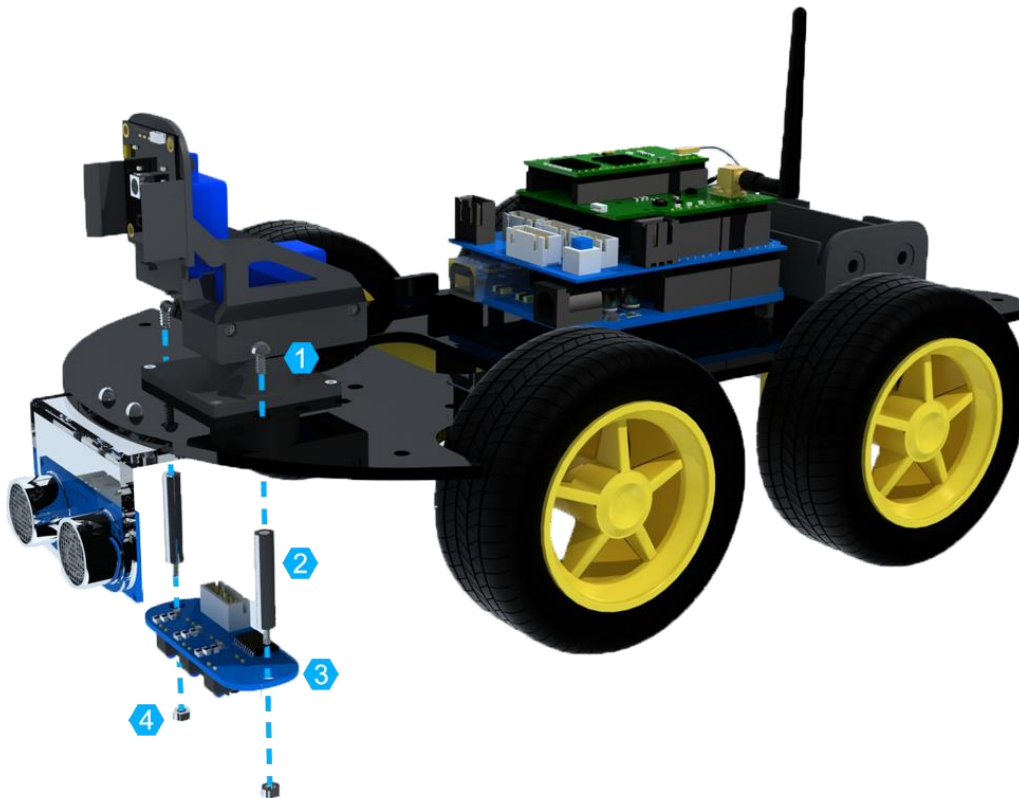
Step 15: Install the ultrasonic module to the chassis



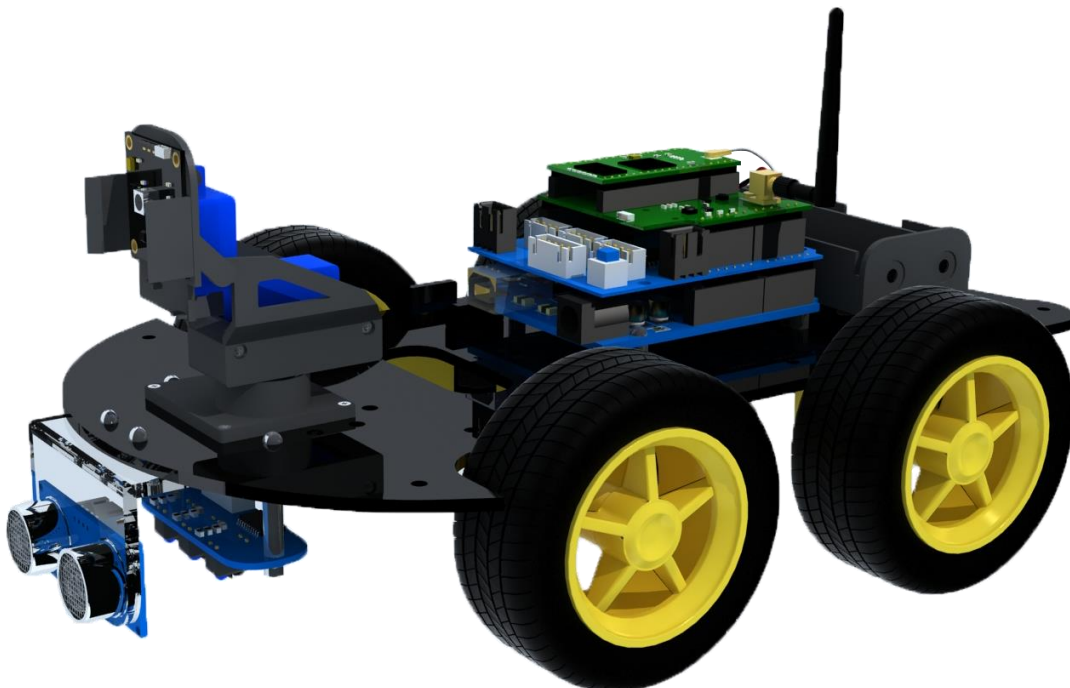
- 1 2 x M3*12 round head screws
- 2 2 x M3 nuts



Step 16: Install the line tracking module

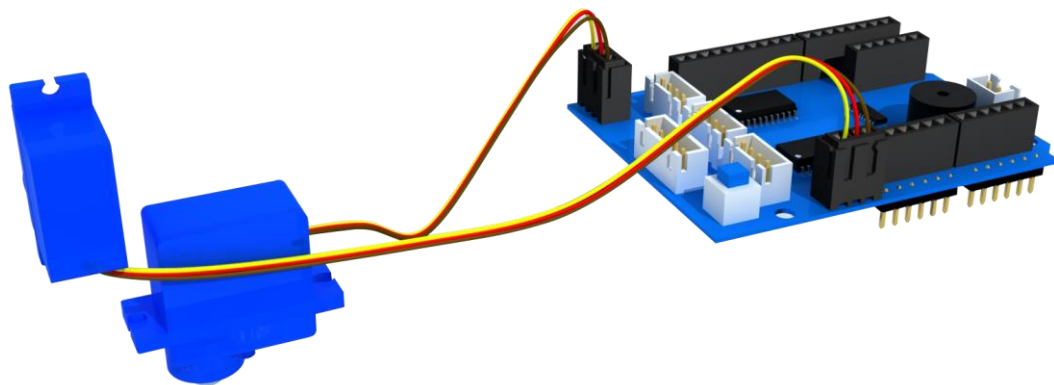
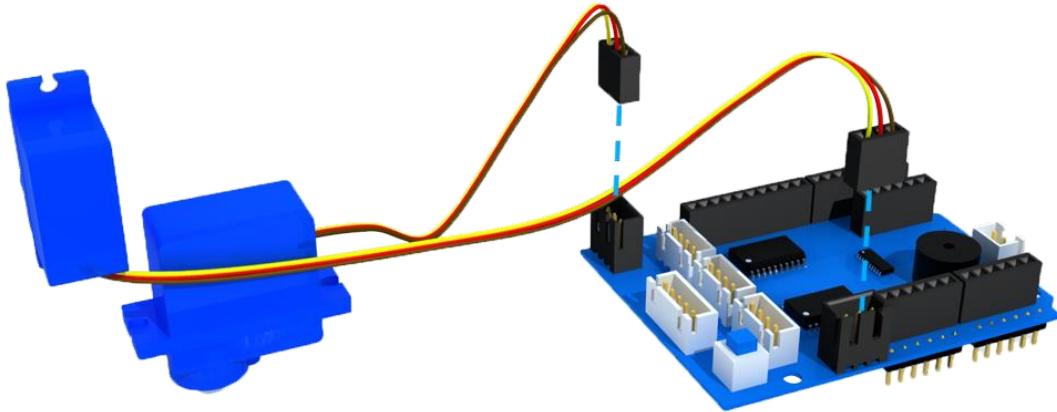


- 1 2 x M3*6 round head screws
- 2 2 x M3*30 socket screws
- 3 1 x Tracking module
- 4 2 x M3 nuts

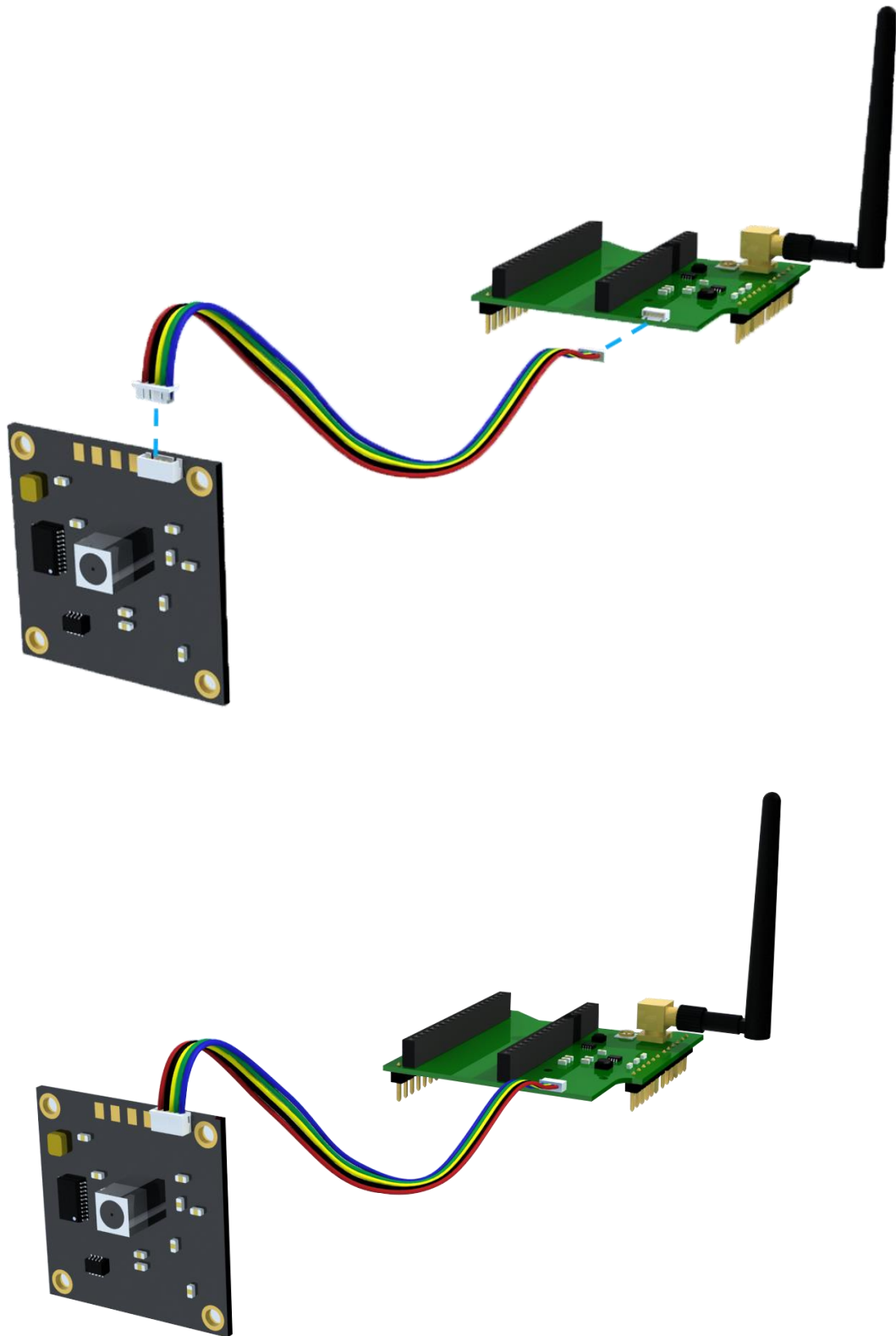


5.2 Wire Connection

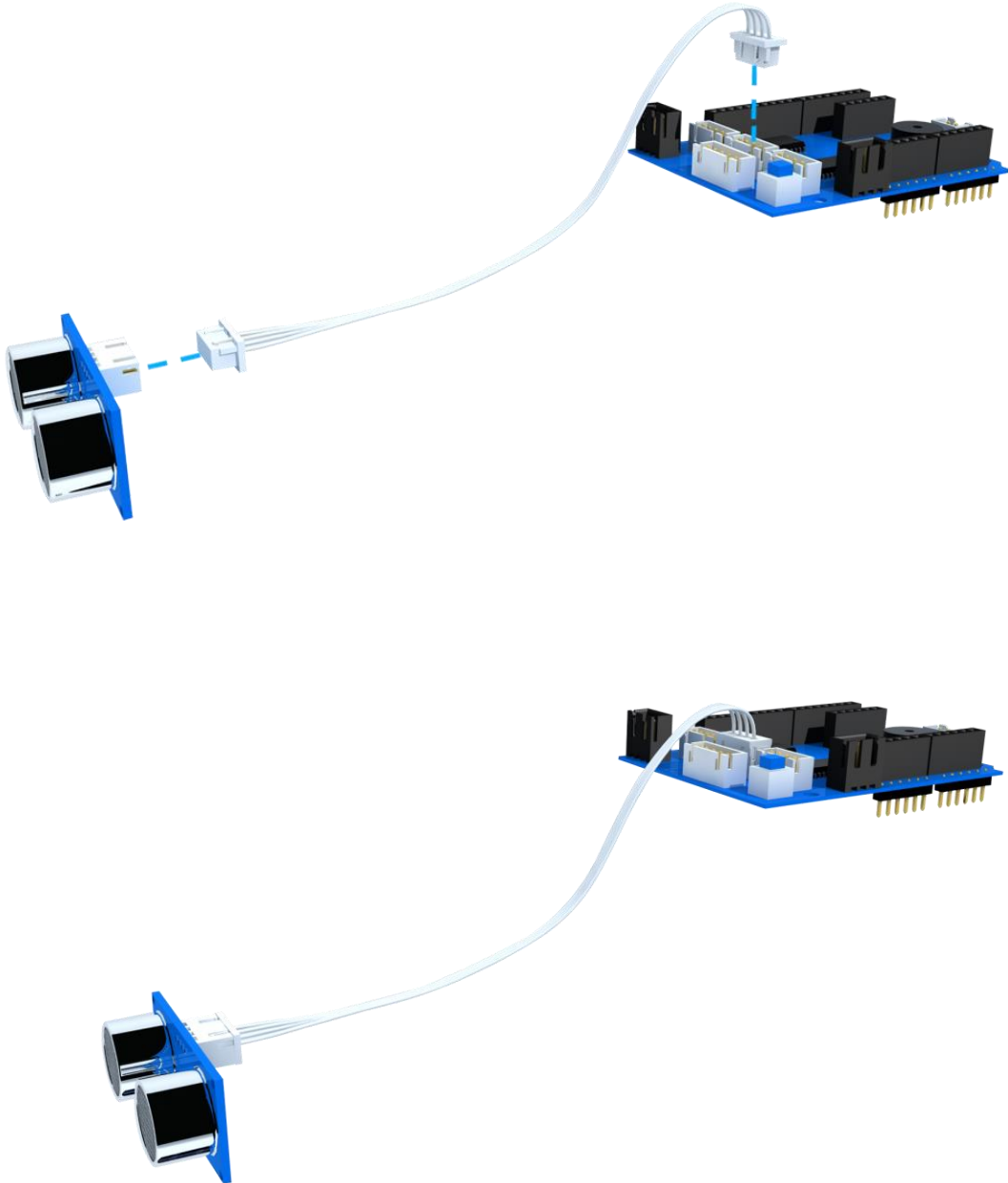
- Connect the micro servo motor to the L293D motor drive expansion board



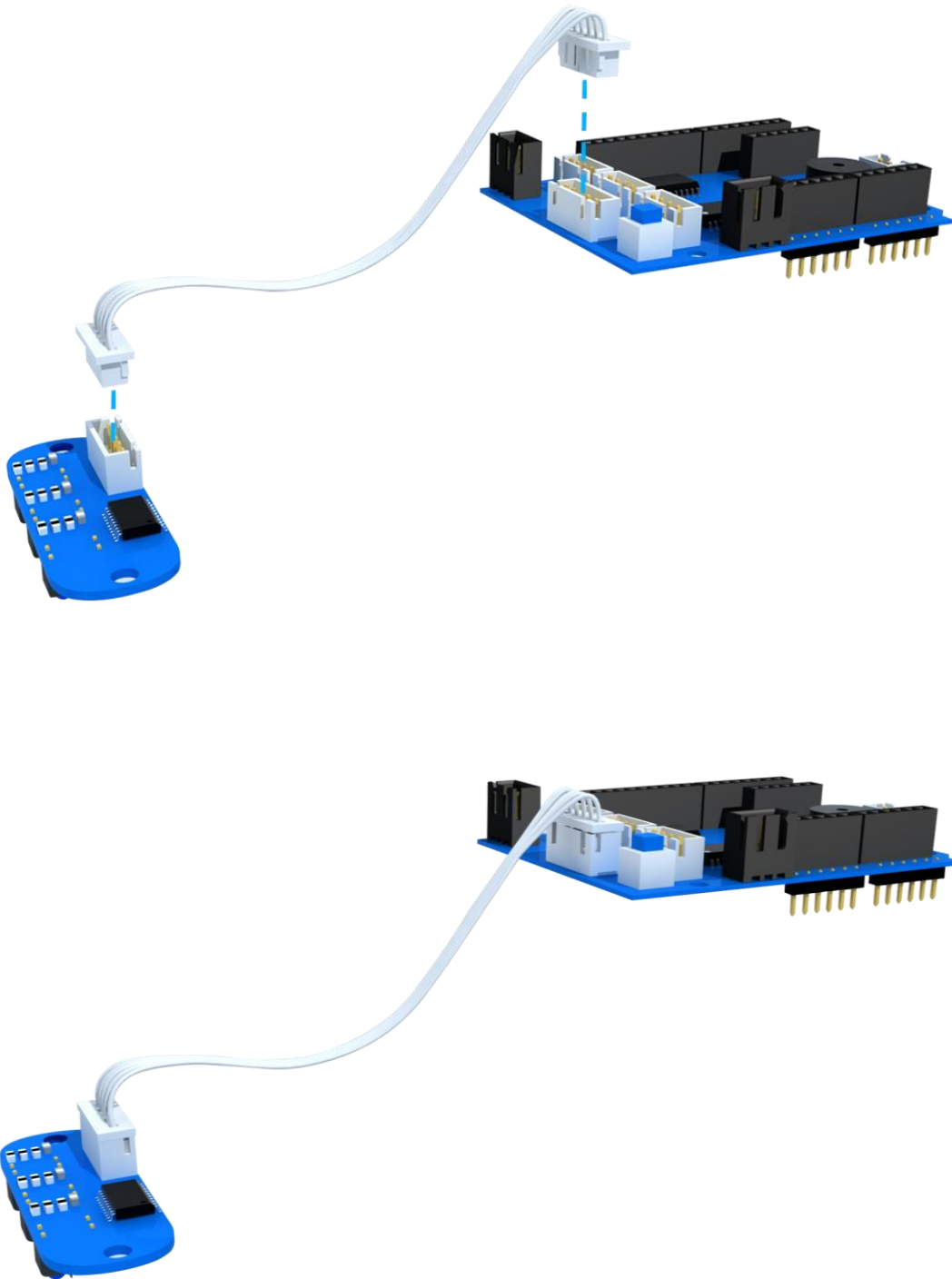
- Connect the camera module to the wifi adapter board



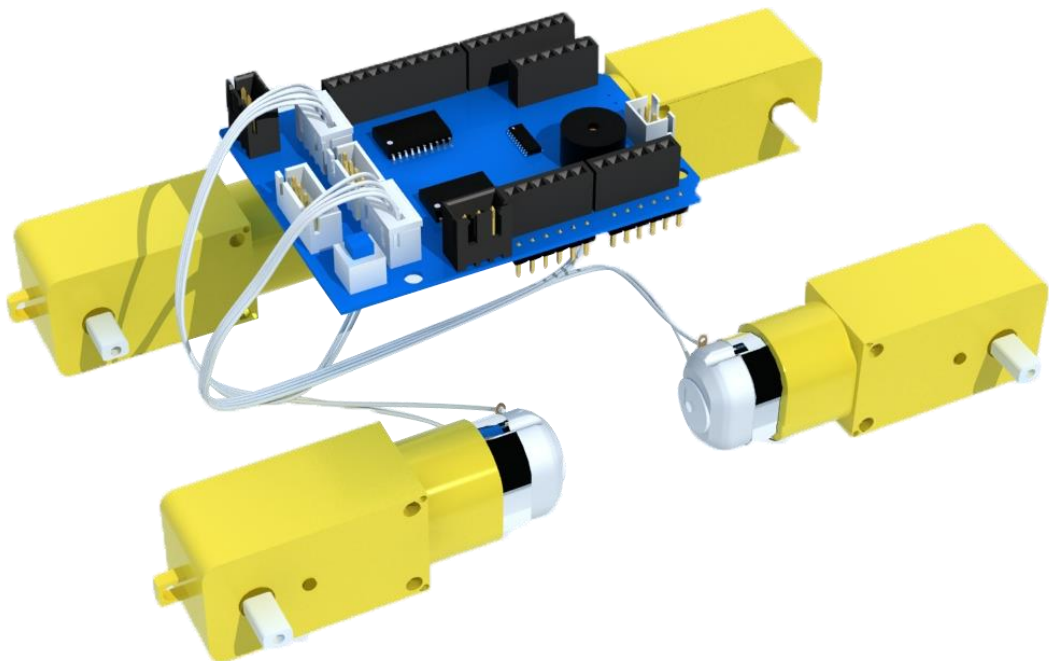
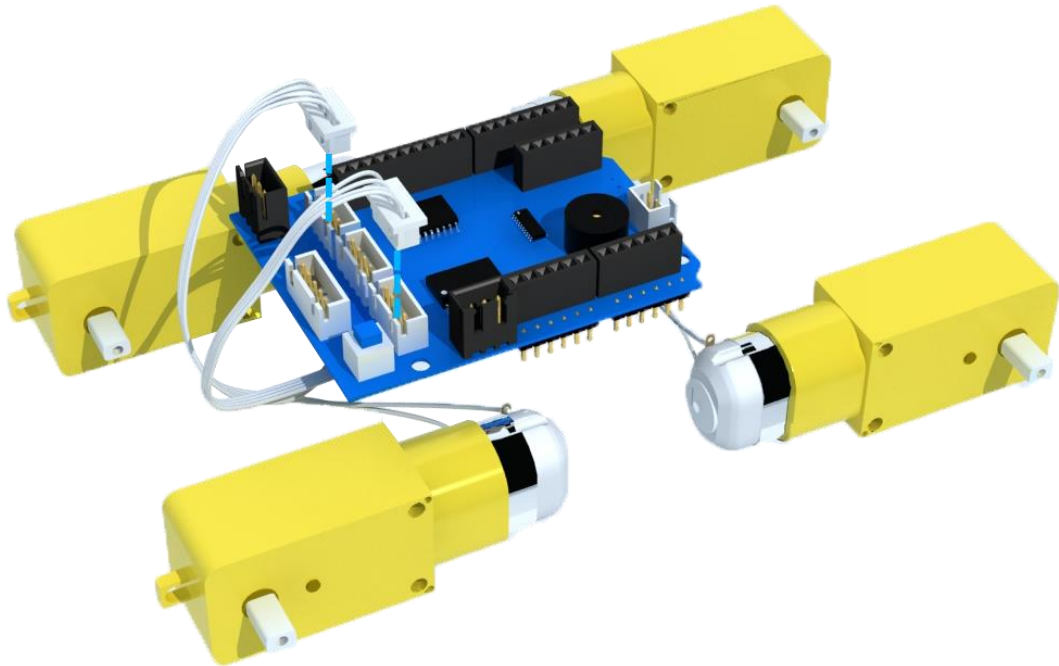
- Connect the ultrasonic sensor module to the L293D motor drive expansion board



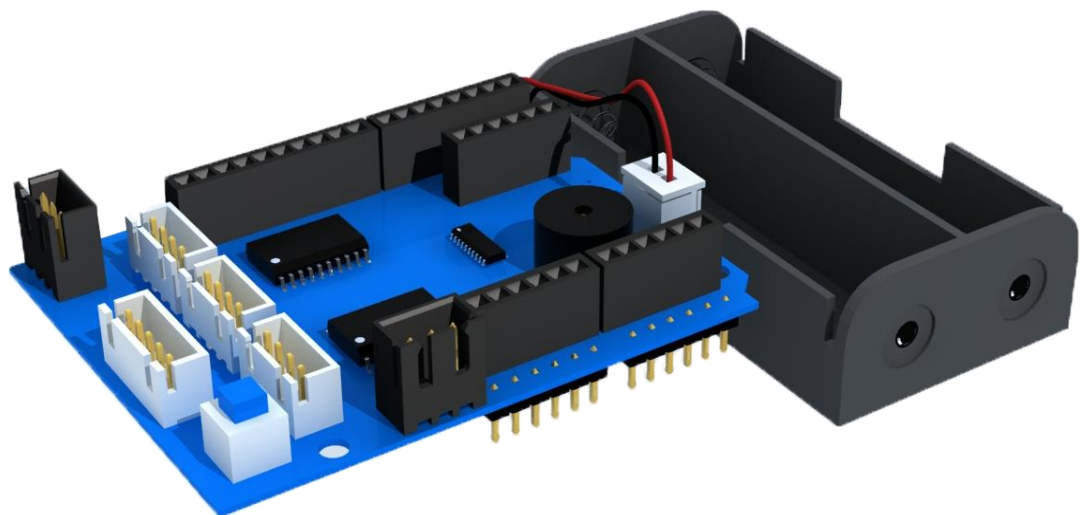
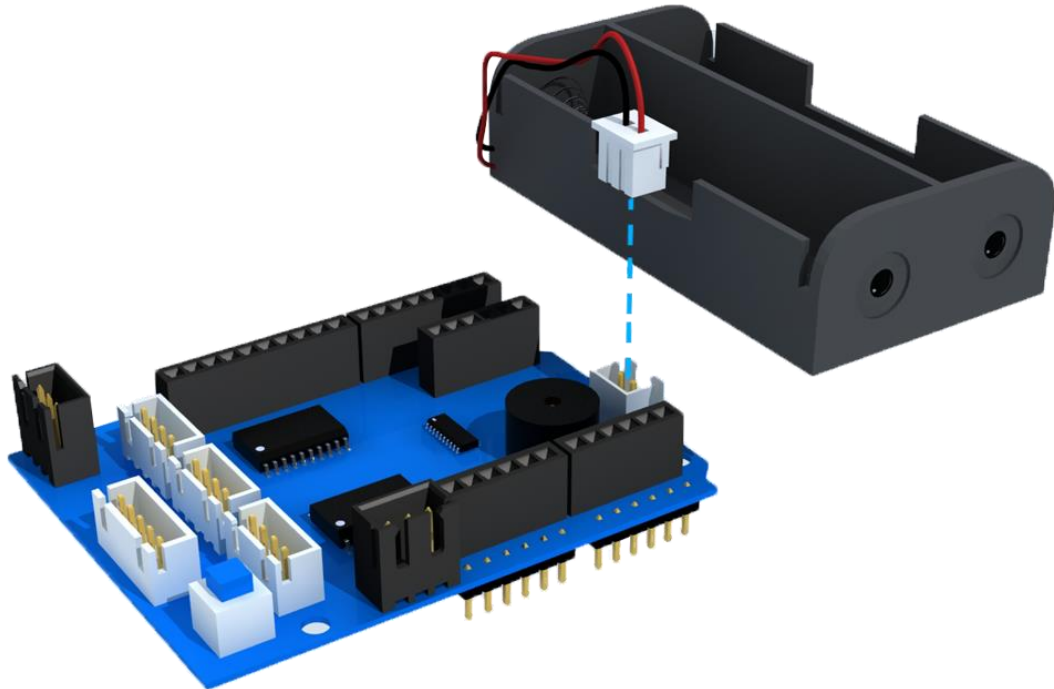
- Connect the line tracking module to the L293D motor drive expansion board



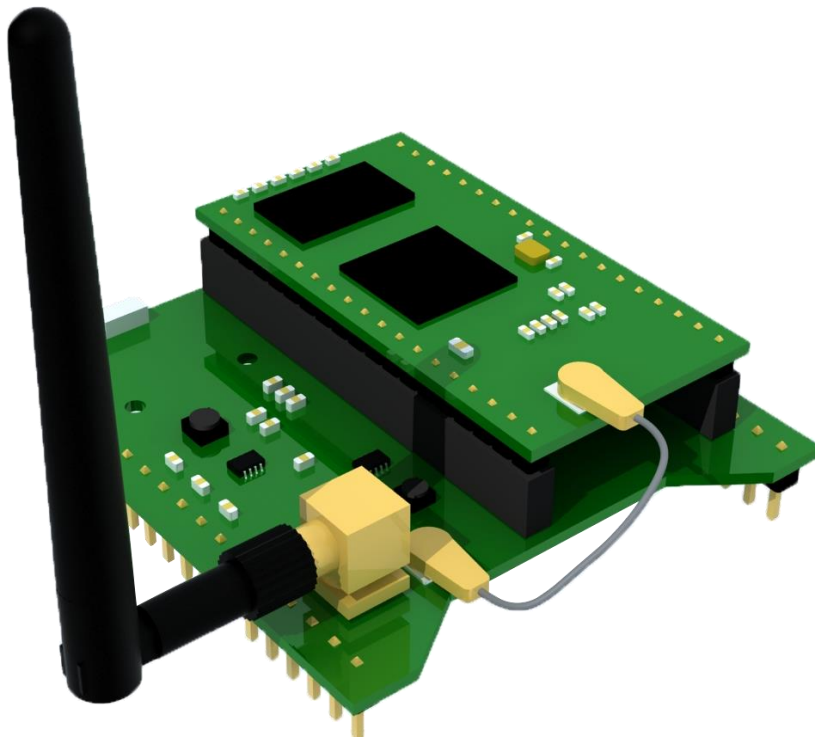
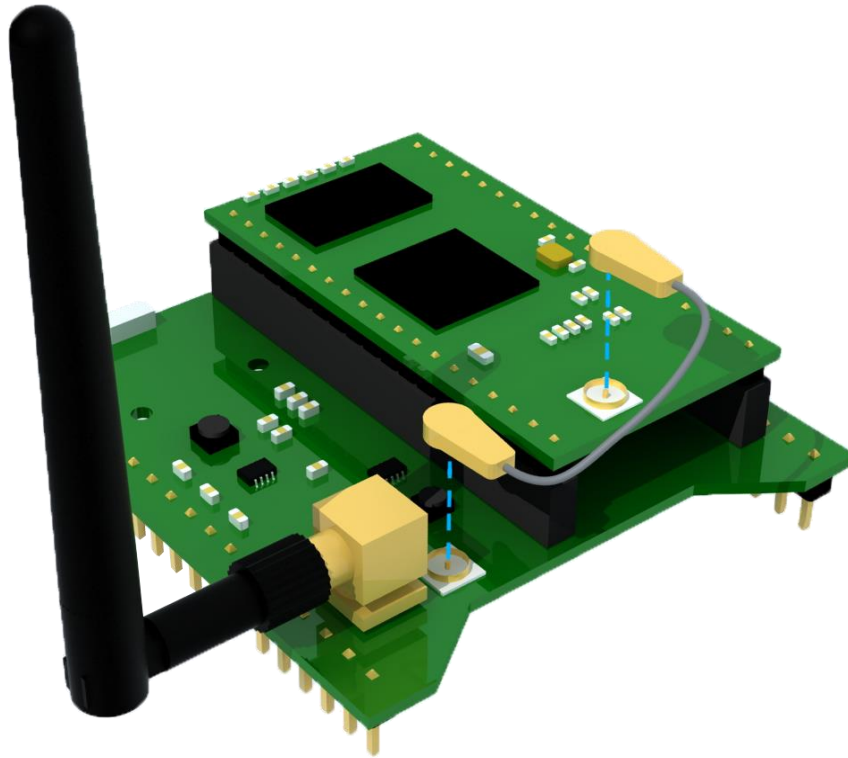
- Connect the DC motor to the L293D motor drive expansion board



- Connect the battery container to the L293D motor drive expansion board



- Connect the wifi core board with the wifi adapter board

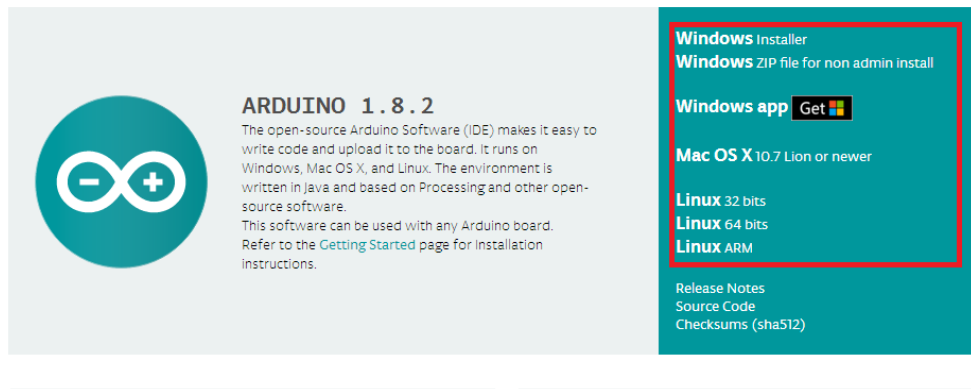


6. Start Programing

6.1 Install Arduino IDE

Step 1: Go to the arduino.cc website and click Software. On the page, check the software list on the right side under Download the Arduino Software

Download the Arduino IDE

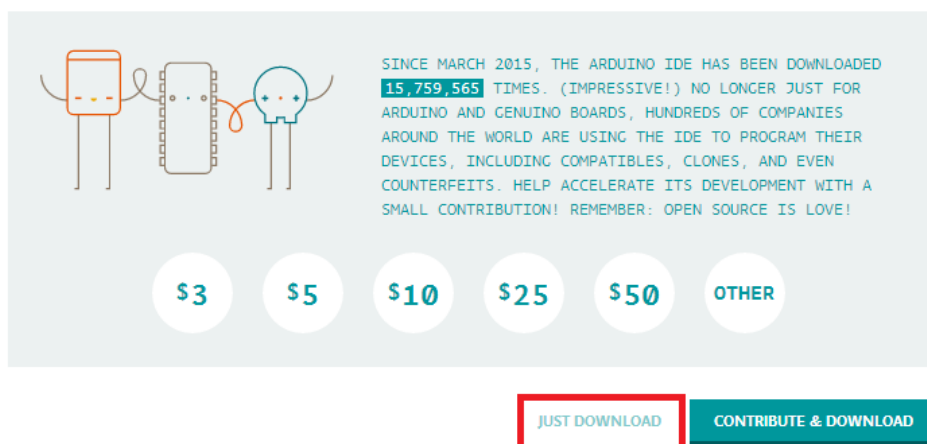


Find the one that suits your operation system and click to download. There are two versions of Arduino for Windows: Installer or ZIP file. You're recommended to download the former

Step 2: Press the button “JUST DOWNLOAD” to download the software

Support the Arduino Software

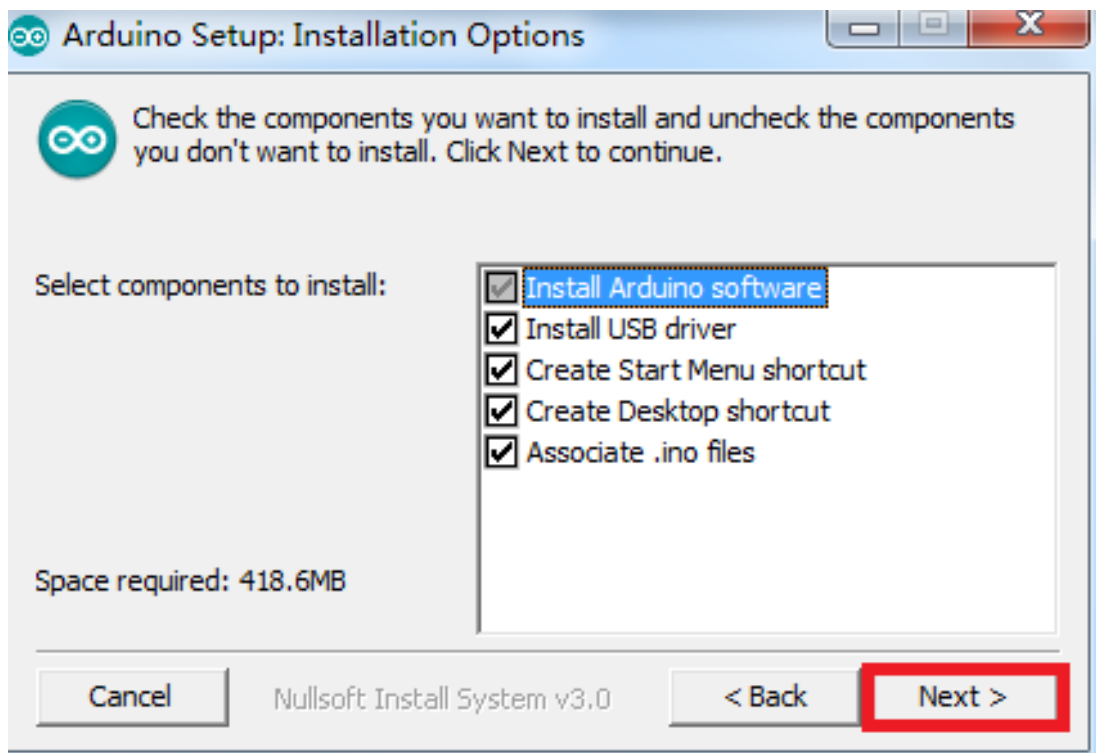
Consider supporting the Arduino Software by contributing to its development. (US tax payers, please note this contribution is not tax deductible). [Learn more on how your contribution will be used.](#)



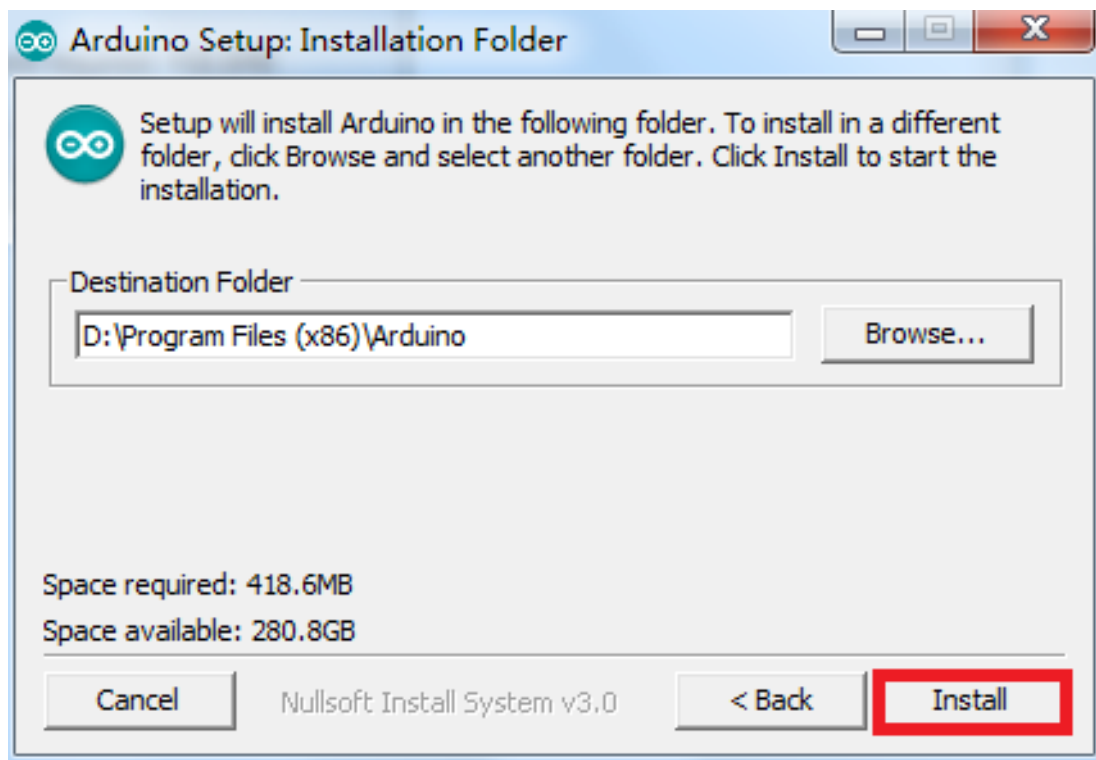
Step 3: Double click the .exe file and the following window will show up. Click "I Agree"



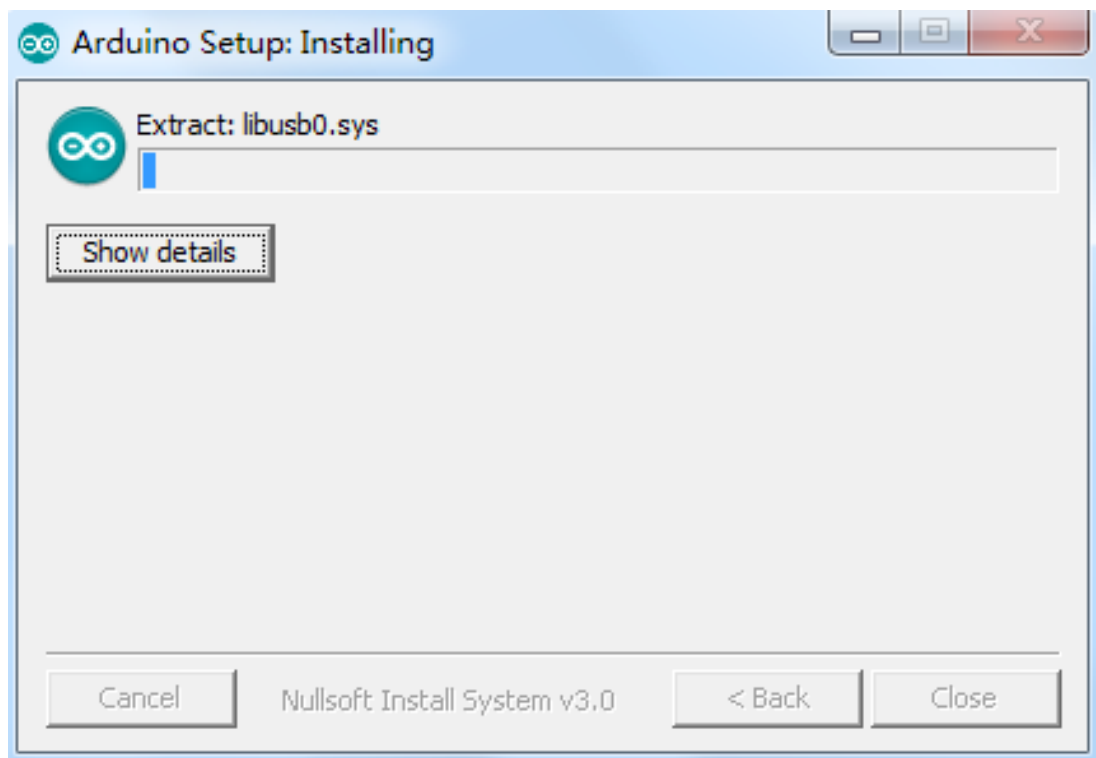
Next



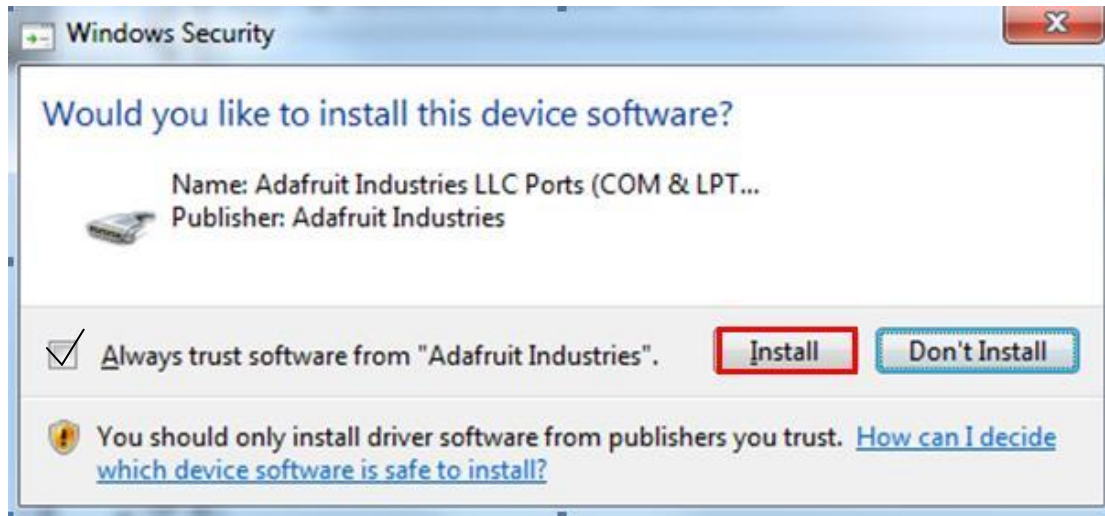
Step 4: Click “Browse” to choose the installation path or enter a directory at the Destination Folder. Click “Install” to initiate installation



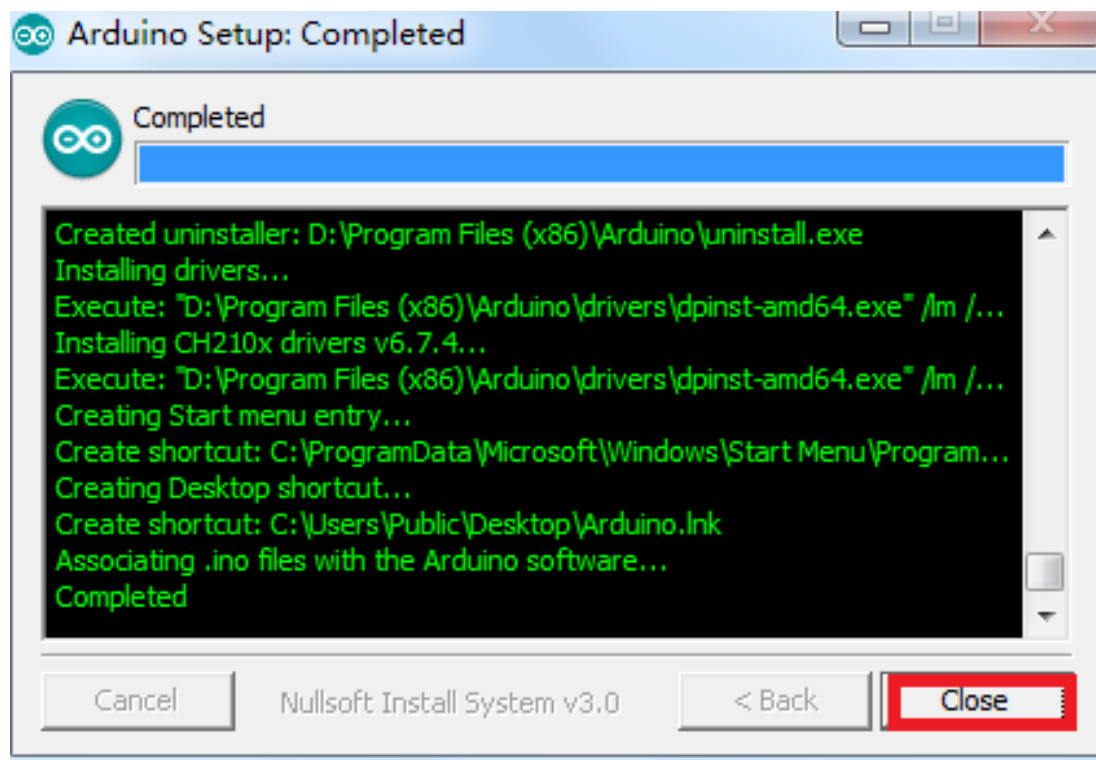
Step 5: After the installing progress bar goes to the end, the “Close button” may be enabled for some PC. Just click it to complete the installation



Step 6: Then a prompt appears. Select Always trust software for "Adafruit Industries" and click "Install"



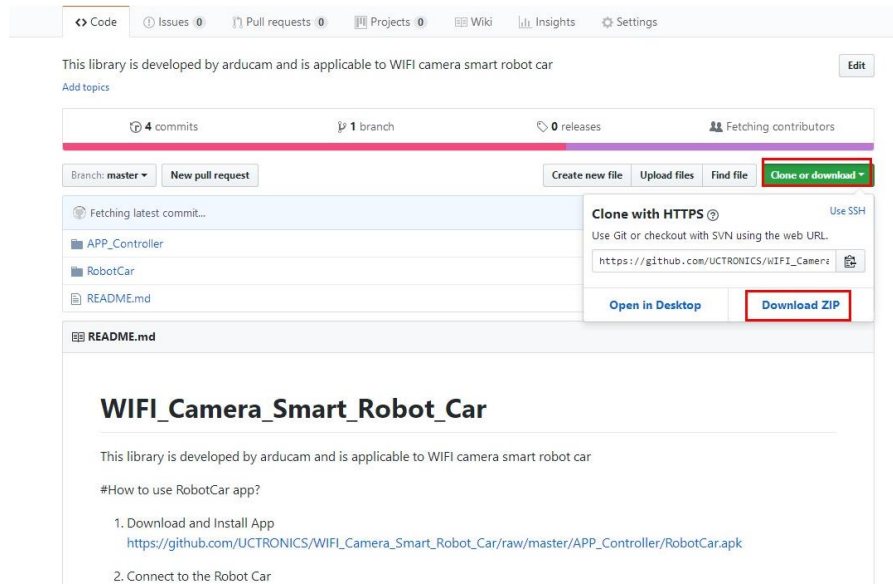
Step 7: After the installation is done, click Close. Then an Arduino icon will appear on the desktop:



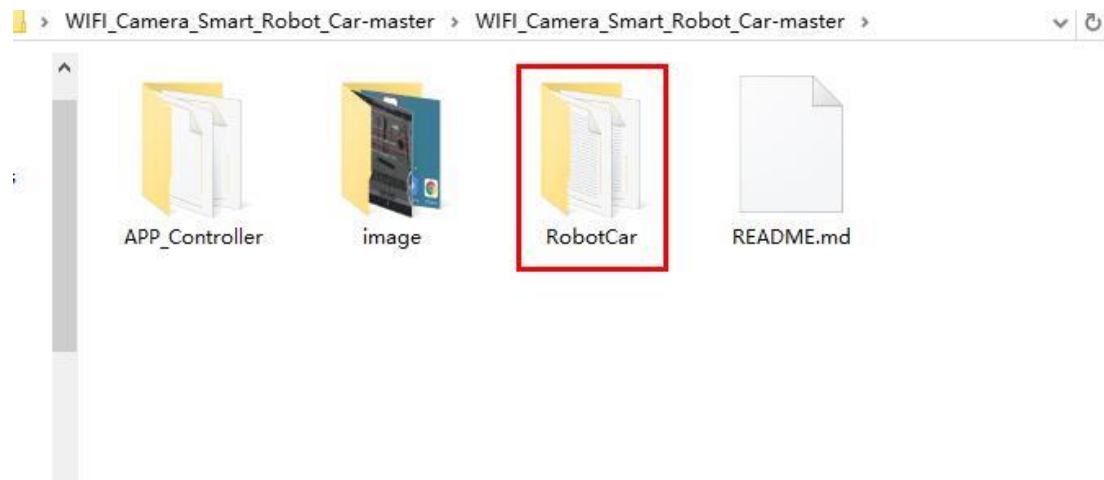
6.2 Add Libraries

Step 1: Download and unzip the file

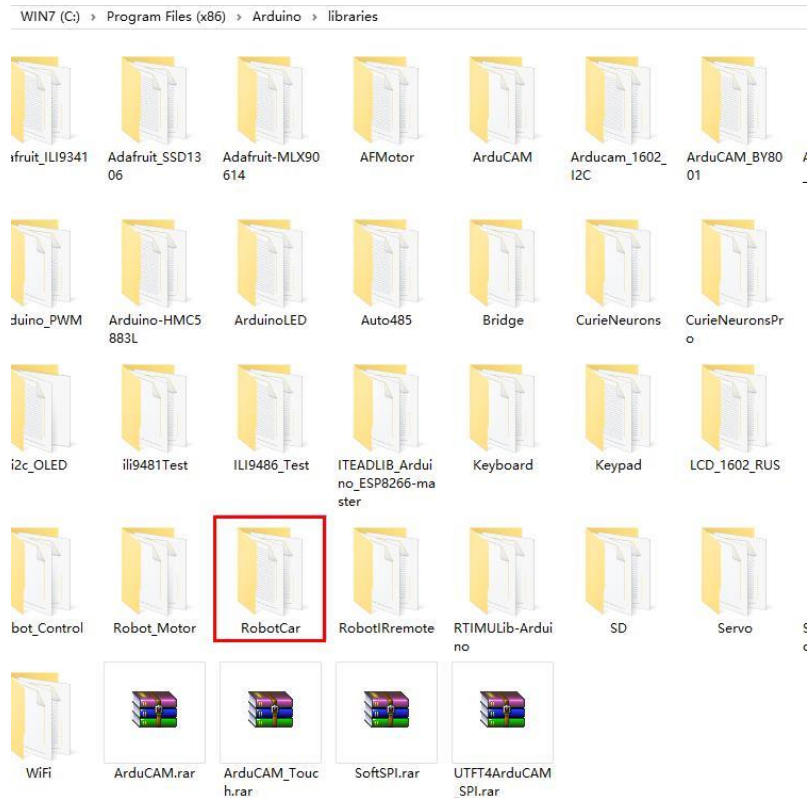
https://github.com/UCTRONICS/WIFI_Camera_Smart_Robot_Car.git



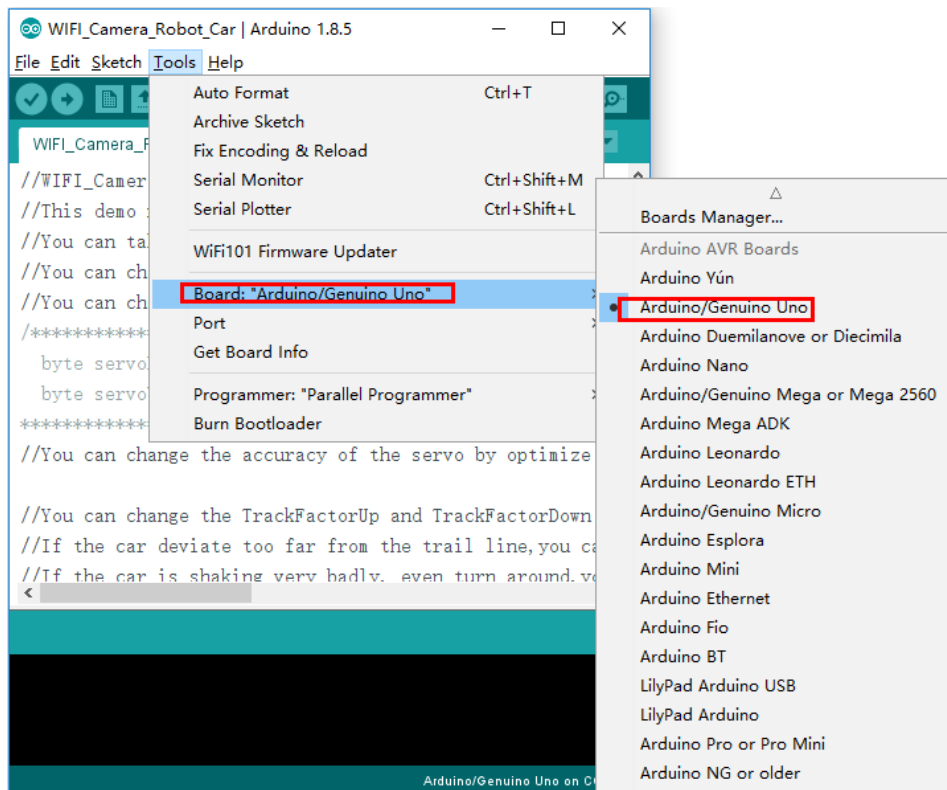
Step 2: Open the documents "WIFI_Camera_Smart_Robot_Car-master"



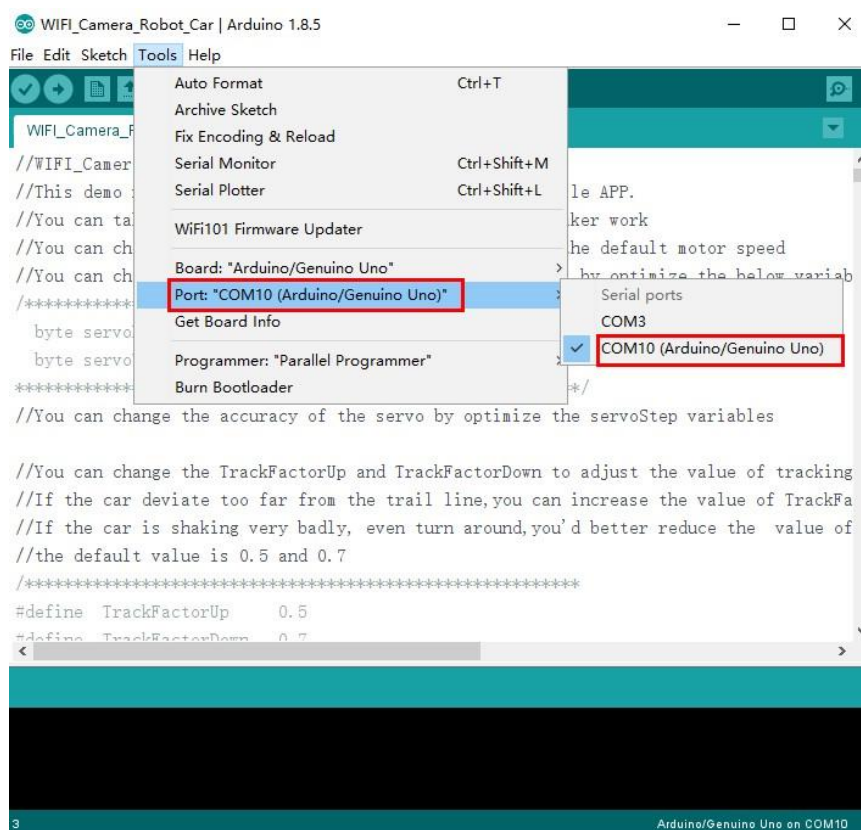
And then, Copy "RobotCar" to .. \ Arduino \ libraries (under the installation path of Arduino)



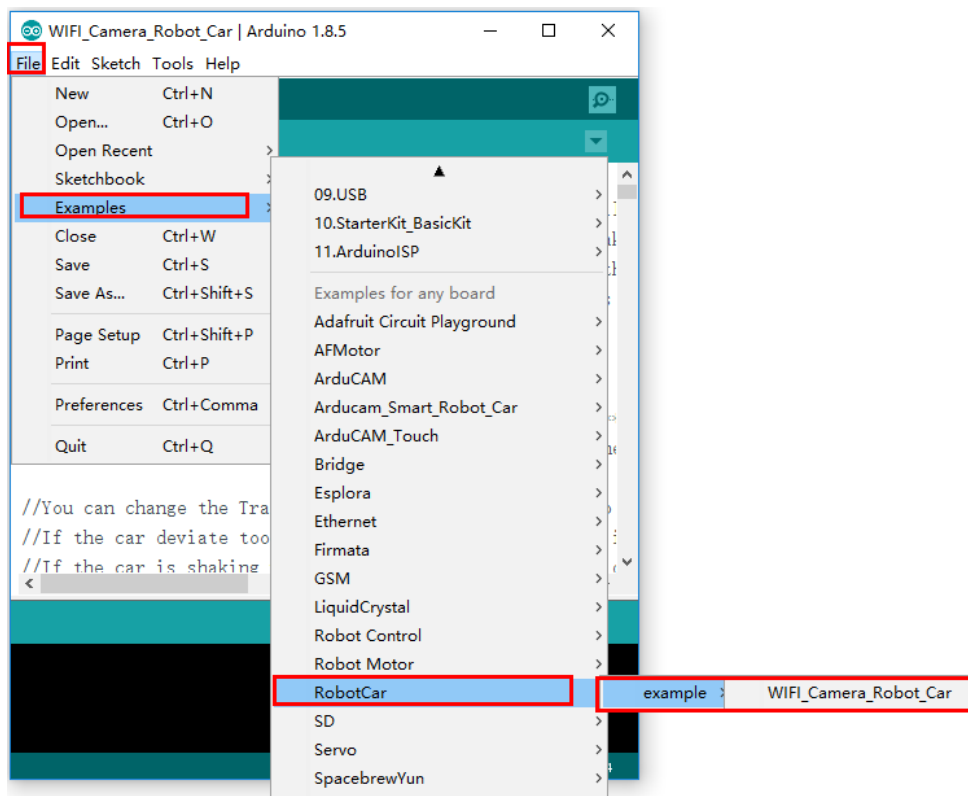
Step 3: Open Arduino IDE, click "Tools" -> "Board: Arduino/Genuino Uno" -> "Arduino/Genuino Uno"



Step 4: Click "Tools" to select the serial port

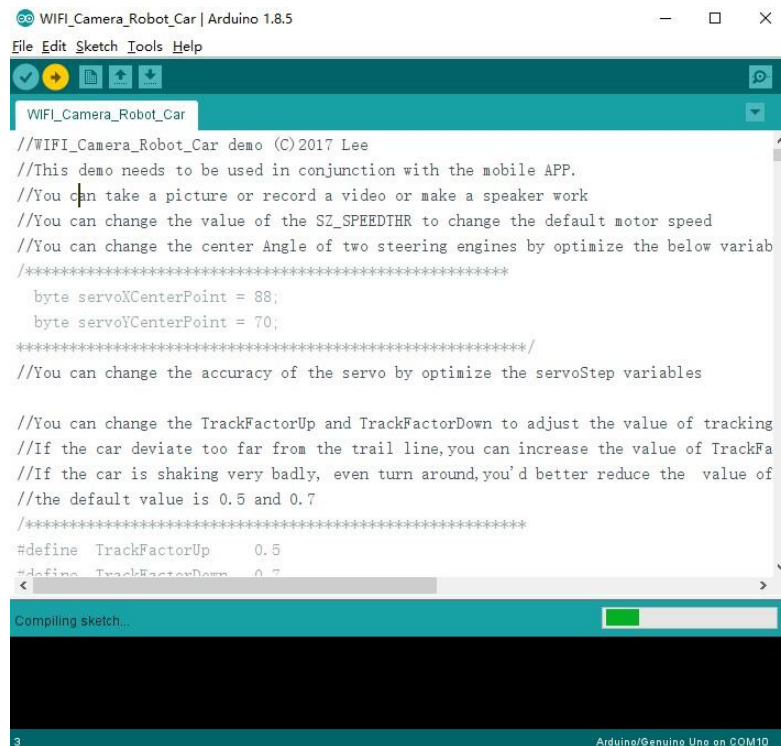


Step 5: Click "File" -> "Examples" -> "RobotCar" -> "WIFI_Camera_Robot_Car" to select the library



Step 6: Compile and upload

Note: Before you compile the code, please read the demo explanation first.



Any questions, please refer to our trouble shooting link:

https://github.com/UCTRONICS/WIFI_Camera_Smart_Robot_Car/blob/master/APP_Controller/TroubleShooting.md

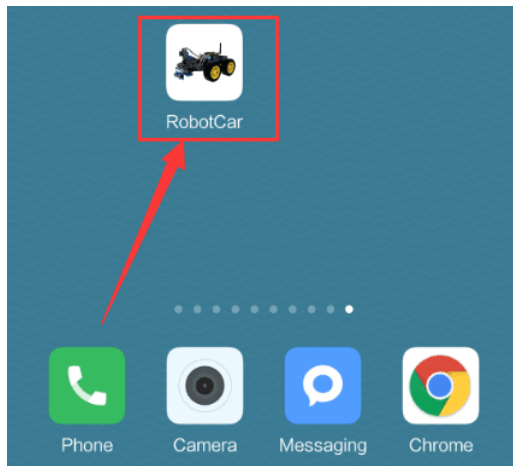
7. RobotCar App for Android

The app is specially designed for Uctronics wifi smart robot car. It can control the movement of the car, avoid the obstacles, start line tracking, adjust the camera direction, take photos and videos.

7.1 Download and Install App

https://github.com/UCTRONICS/WIFI_Camera_Smart_Robot_Car/raw/master/APP_Controller/RobotCar.apk

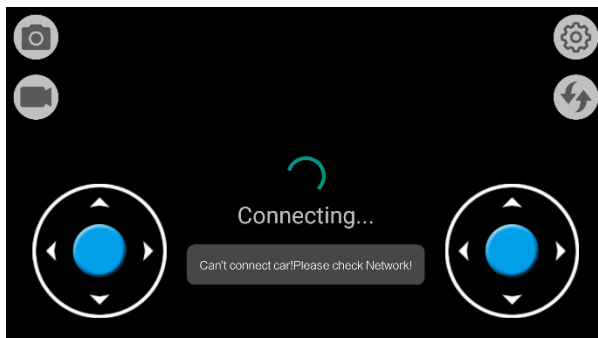
7.2 Connect to the Robot Car



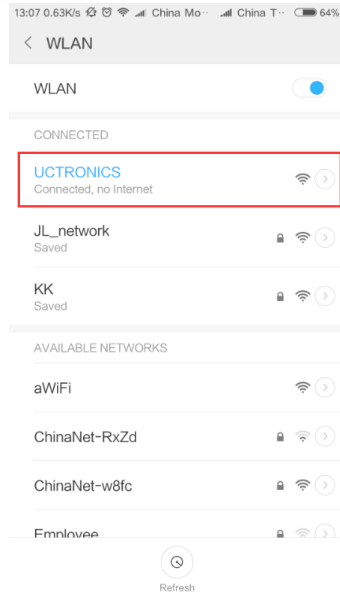
Open the 'RobotCar' app



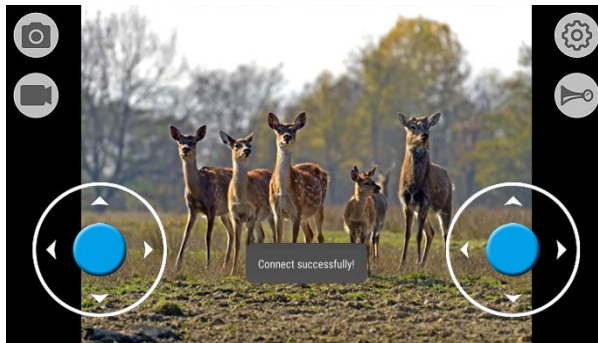
This is the boot screen



If the app remind "Can't connect car! Please check Network!" Don't worry, you should check your wifi to ensure you have connected to the 'UCTRONICS' hotspot



As the picture shows the 'UCTRONICS' hotspot

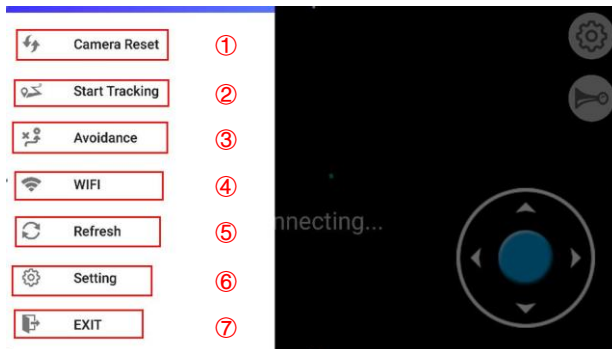


If connect successful, the app will remind you 'Connect successfully!' Now you will see the scene from the car's camera. At the same time, you can operate the joystick on the screen to control the car. The left joystick is to control the car. The right joystick is to control servo and the right joystick is to control the motor.

7.3 Function introduction

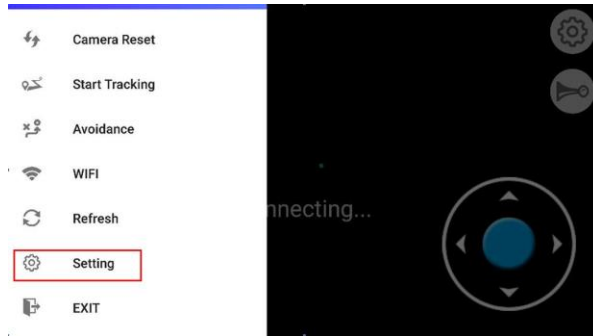


You can take a picture or record a video or make a speaker work. Click this button then you will come into setting windows.

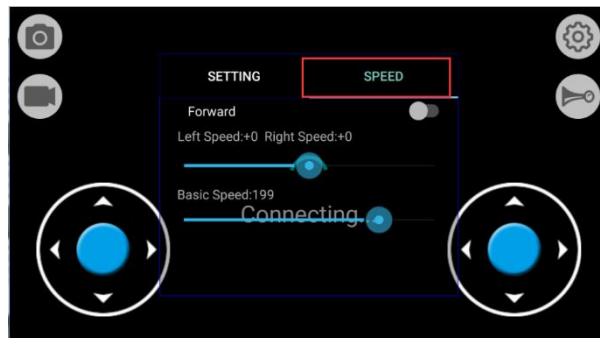
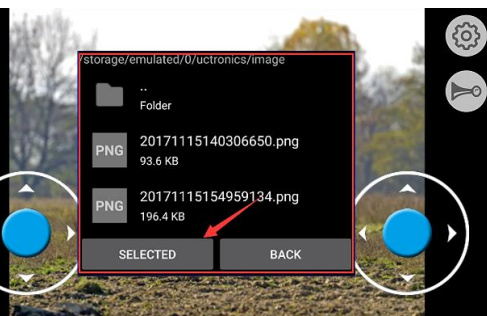
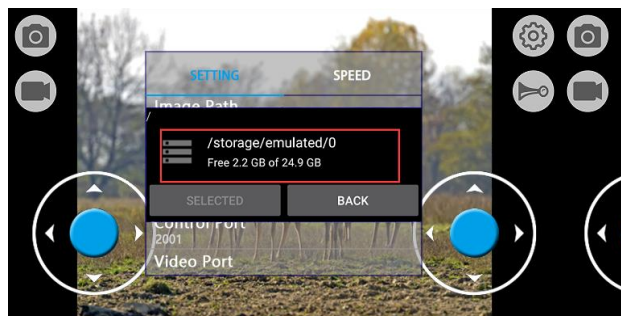
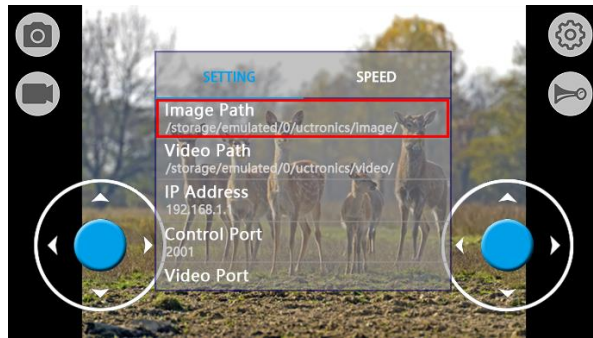


1. Reset the servo to the middle position
2. Start tracking mode. After clicked, it will changed to stop tracking
3. Automatic avoidance of obstacles
4. Choose wifi
5. Refresh the app In case of accident.
6. Setting choose
7. Exit the application

Basic setup



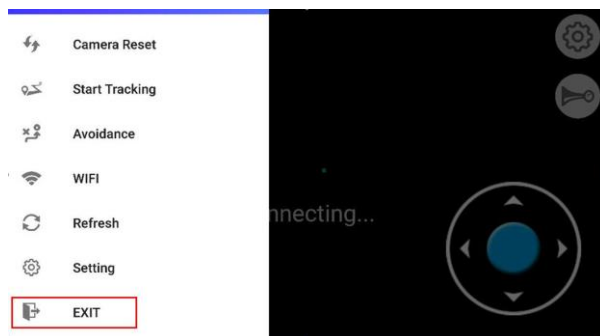
After click the setting button, you can configure the Image path/Video path/IP Address (192.168.1.1)/Control port (2001) and Video Port.as normal you should not change the default IP Address /Control port and Video port



Calibration and speed setting

You can change the value of Froward to compensate for the speed difference of the motor.

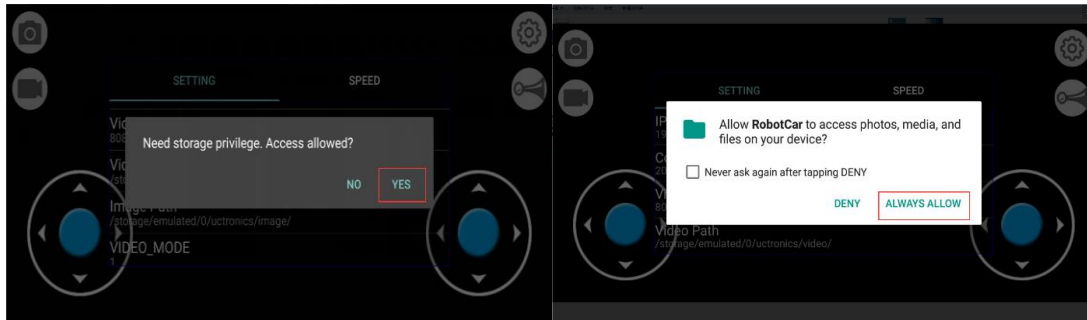
You can change the value of basic speed to control the motor speed.



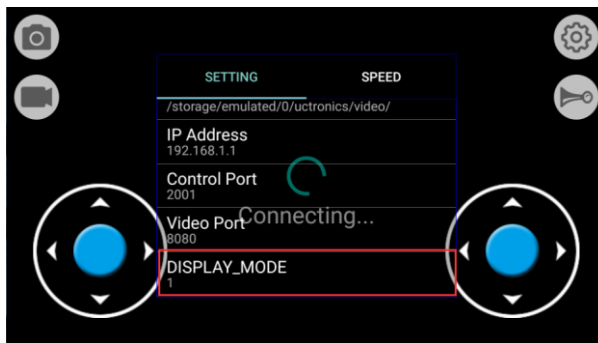
Exit the application

[Notice]

1. When using the function of taking picture or recording video, you need to get the right to read or write the memory. The detail steps are as follows:



2. The video still does not display even if 'Connect successfully' is appeared, and the problem can't be settled down through refresh. That may be caused by a low Android version. At this moment, you can click 'Setting' and choose 'DISPLAY_MODE' to change the mode to 2.



For examples and documentation, please visit:

https://github.com/UCTRONICS/WIFI_Camera_Smart_Robot_Car.git

If any problems or suggestions for the tutorial or the robot car please feel free to contact us by following ways:

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Email: support@uctronics.com

Tel: +86 025 84271192

Skype: fpga4u