cebekit

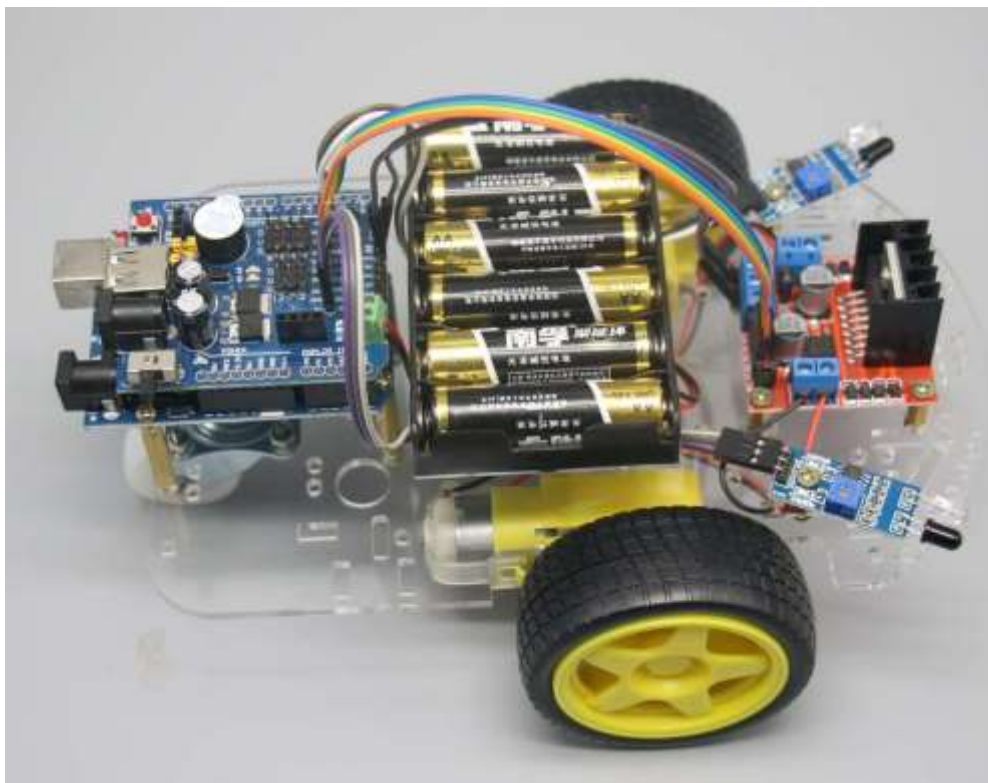## Robot with infrared system for obstacle detection

Arduino System

These instructions indicate how to build the same Arduino-type smart robot vehicle. It states how to install step by step robot chassis, Arduino compatible motherboard, Shield module, geared motors, battery holder and the other accessories as well as their wiring system.
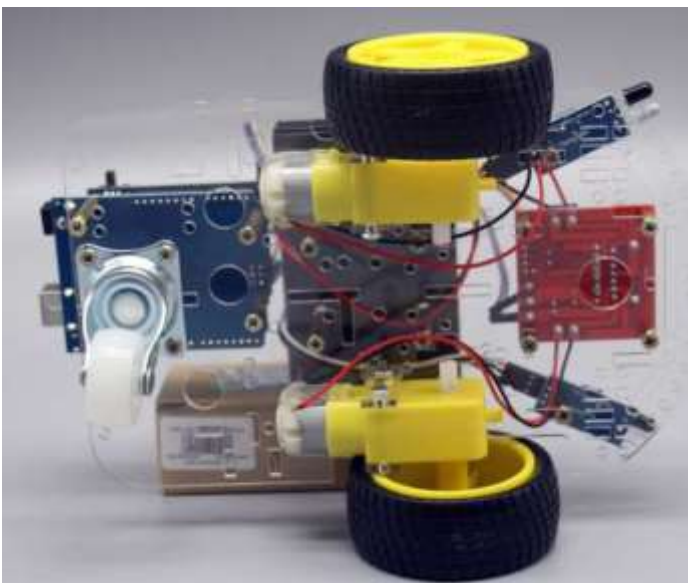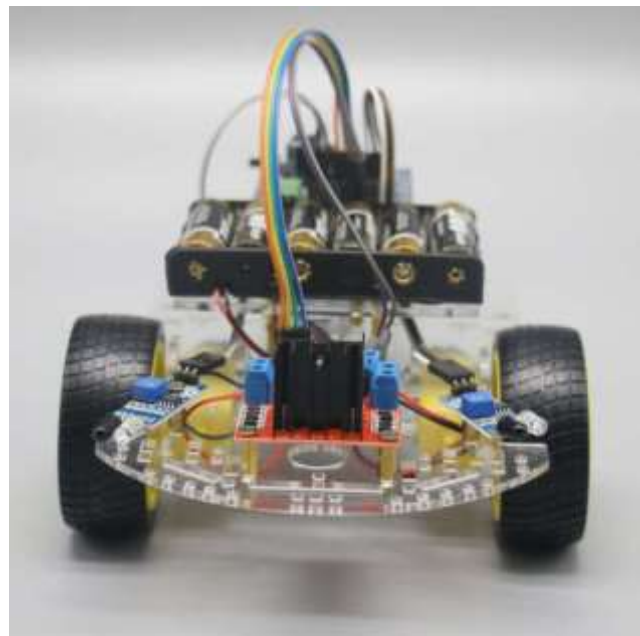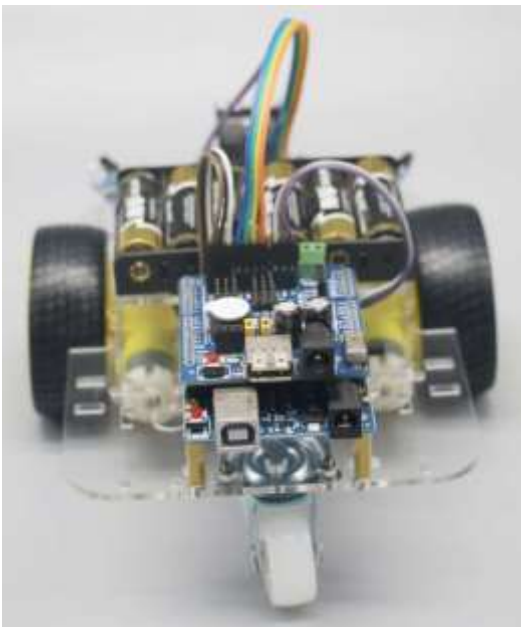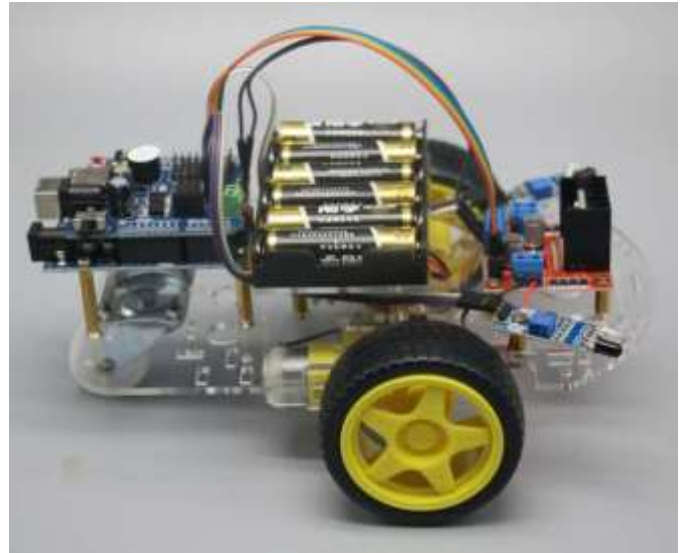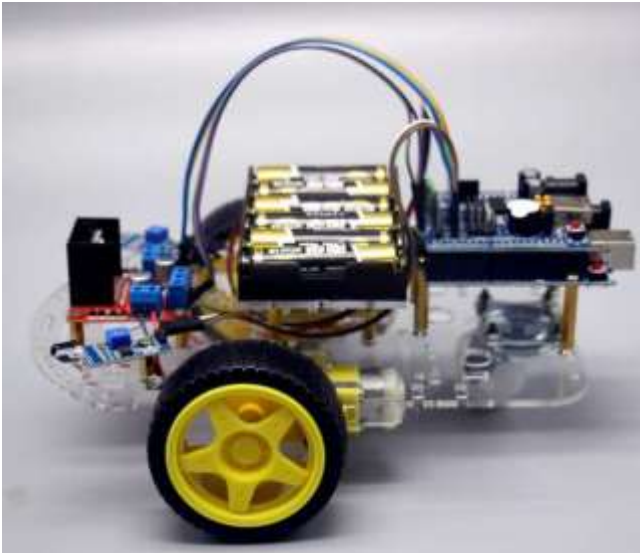
With this project, you will learn how to program the Arduino system and its learning platform.

It should be noted that to assemble this kit, only a screwdriver is needed, NOT INCLUDED included. All electrical and electronic **parts can be connected or screwed** into a terminal block or Clema.

The system of infrared light sensors that are mounted on the base of the front part, detects the obstacles that the intelligent robot will find on its way, to enable it to constantly search for a free passage.

Views of the built robot

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PACKING LIST

Nº	Name	Description	Qty.	Nº	Name	Description	Qty.
1	Control motherboard	Type Arduino UNO R3	1	14	Metal spacer	M3 x 10 mm	4
2	Shield Module	Interface for the motherboard	1	15	Cable with connectors 2 poles	Length 20 cm	4
3	Cable with connectors 4 poles	Length 20 cm Female- Female	1	16	Robotic free wheel	Omnidirectional	1
4	Cable with connectors 2 poles	Length 20 cm Male- Female	1	17	Clamps for cables		2
5	Wheel Ø65mm with rubber tire		2	18	Screw	M3 x 8 mm	30
6	Supports for motors	Acrylic material	4	19	Screw	M3 x 30mm	5
7	Control module for motors	L298	1	20	Nut	M3	12
8	Robot's Chassis	Transparent Acrylic Plastic 3 mm	1	21	Screw	M3 x 10 mm	3
9	Battery holder	Acrylic Plastic 3 mm	1	22	Module obstacle sensor	Infrared obstacle sensor	2
10	USB Line	Connection cable Robot-USB	1	23	Metal spacer	M3 x 25 mm	2
11	Motor with reduction 1:48	With double axis and cables	2	24	Cable with connectors 4 poles	Male-Female	2
12	Porte piles	For 6 batteries type AA or R6	1				
13	Metal separator	M3 x 25 mm	8				

Before starting the assembly, check that you have all the parts described in the previous list.

<u>Note</u> :

• Colors of the cable on the pictures can vary according to the photographed model.

• The screwdriver can have 2 extractable extremities. Please, use the more suitable according to the supplied screws.

INSTALLATION AND ASSEMBLY

Step 1: Chassis for the Arduino robot

We will use:

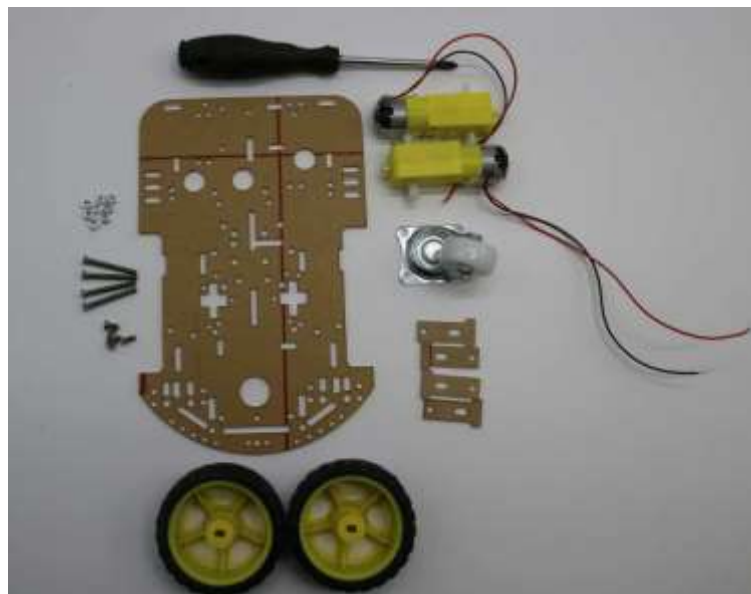|	
(1) Acrylic chassis for intelligent robot	1
(2) Acrylic support for motors	4
(3) Gearbox motor with double axis and cables	2
(4) Wheel Ø65mm with rubber tire	2
(5) M3 × 30 mm screws	4
(6) M3 Nuts	10
(7) M3 × 8 mm screws	4
(8) Robotic free wheel	1
(9) Tool needed: Screwdriver	1

Figure 1 – 1 :   Necessary pieces for the chassis assembly

Before to start the assembly, remove the acrylic protection film, as it is indicated hereafter.
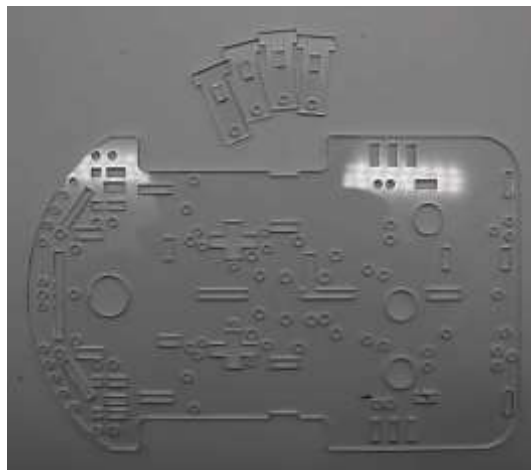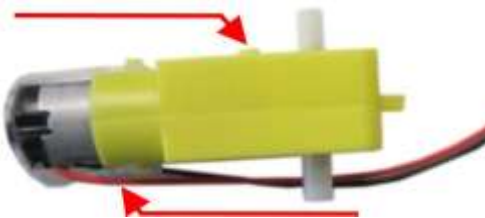

Figure 1 - 2

Gearbox with double axis

Figure 1 – 3 :
(A) Location of the grooves where the acrylic supports of the motors must be inserted
(B) Motors Acrylic supports
(C) Screws and nuts to fix motors to the supports

Outgoing element

It is recommended to fix the cable with a hot melt adhesive

Figure 1 – 4 : Pay attention to motors details in order to place them in the correct position

Right motor

Left motor

Outgoing element exterior side

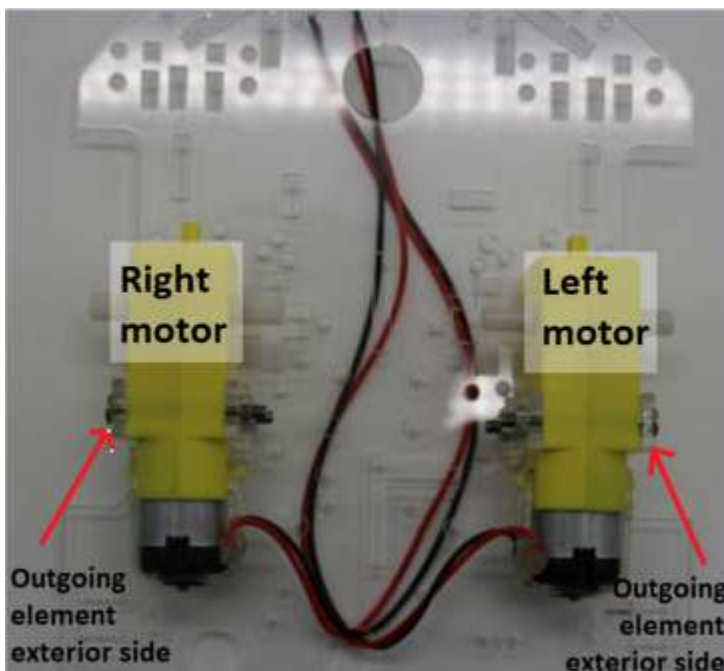Outgoing element exterior side

Figure 1- 5 : Motors Installation.
View from the bottom part of chassis (motor side)

Mark the cables of each motor.

The red cable is always on the upper part.

Mounting support and fixing of the motors

Figure 1- 6: Important

The chassis is not symmetrical. If you assemble it upside down you will not be able to install the control circuit board.

This image shows the chassis seen from the side of the motors (lower side).

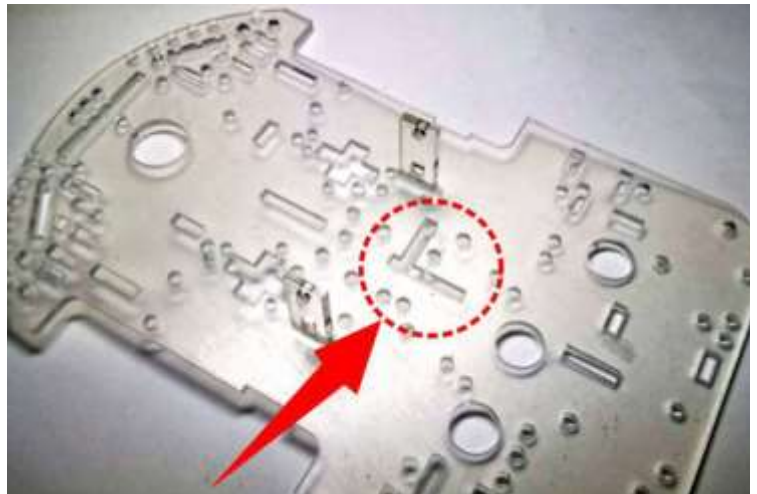The inverted "L" shaped groove indicates the correct position.

Figure 1- 7:

Insert one of the motor's support from the top of the chassis as shown in the figure.

Figure 1- 8:

Now, place the motor as shown in Figures 1-4 and 1-5 of the attached picture. The outgoing element must always remain on the outside of the chassis. Then place the other support, inserting it as indicated by the arrow.
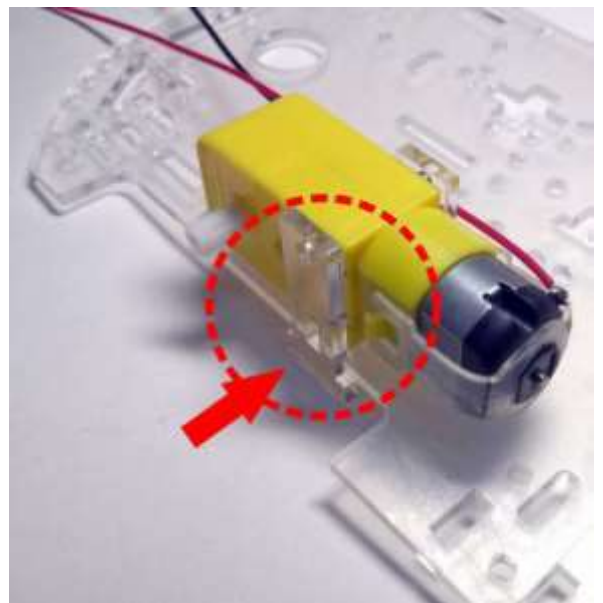
Figure 1- 9:

Then place one screw and one nut in the upper hole and another in the lower hole.

See added picture

The lower nut will not turn once the screw is tightened because it is in abutment with the chassis.
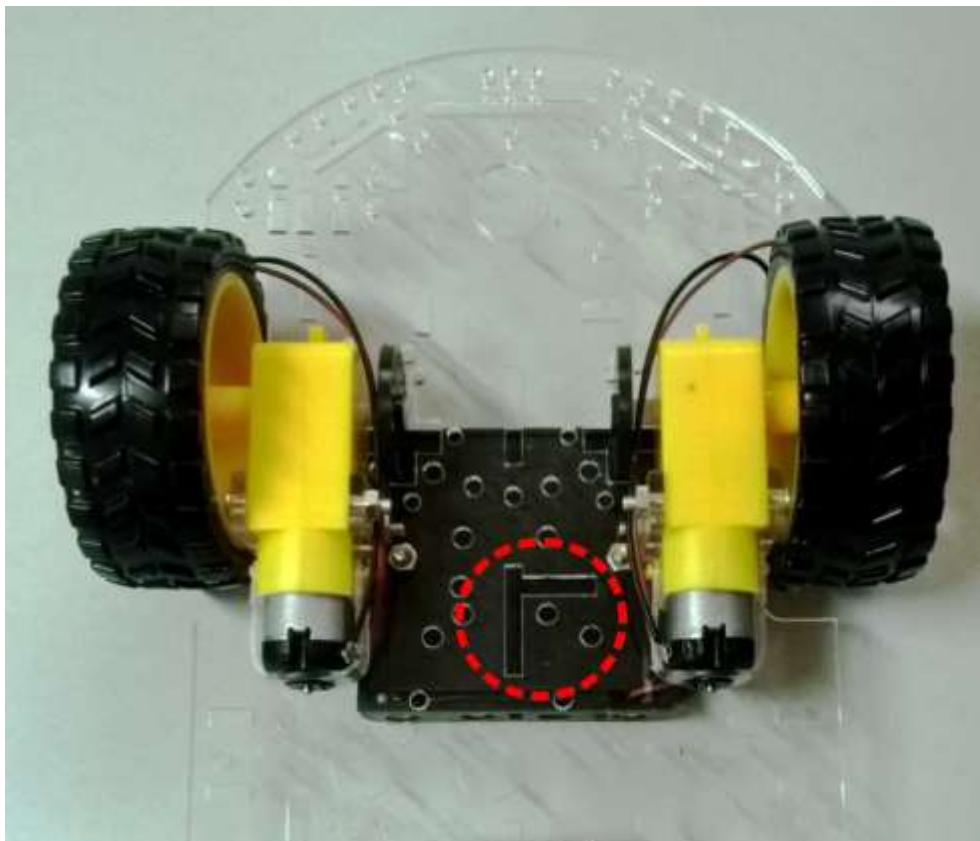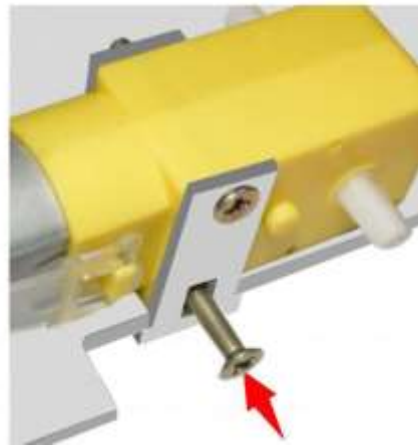

Figure 1- 10:

Install the other motor following the same instructions as for the first one.

In the picture below, you can see the correct chassis position indicated by the inverted "L" shaped groove. (View of the side of the motors)

If your chassis is assembled upside down, it will necessary to be disassembled and correctly reassembled it (see Figure 1-6).

Robotic Free wheel

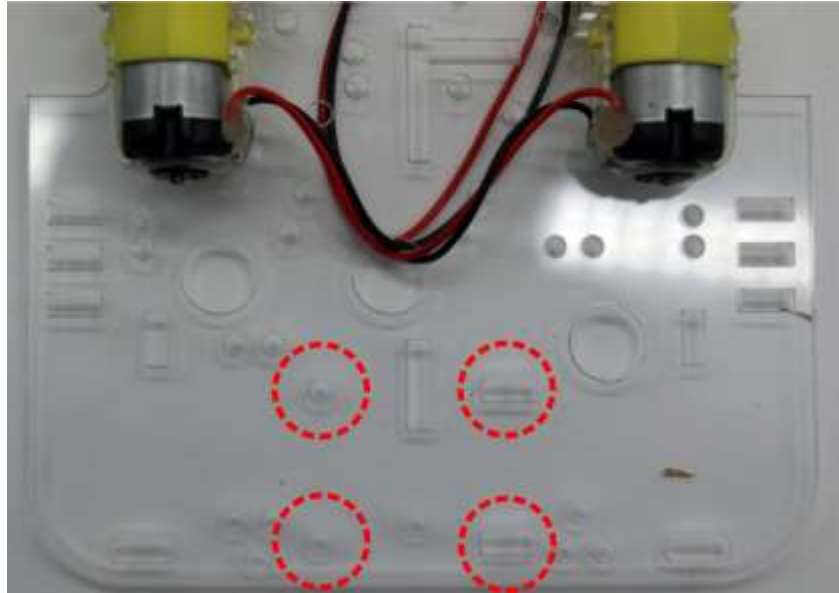Fix the wheel with M3×8 screws and M3 nuts, as it is indicated on following figures

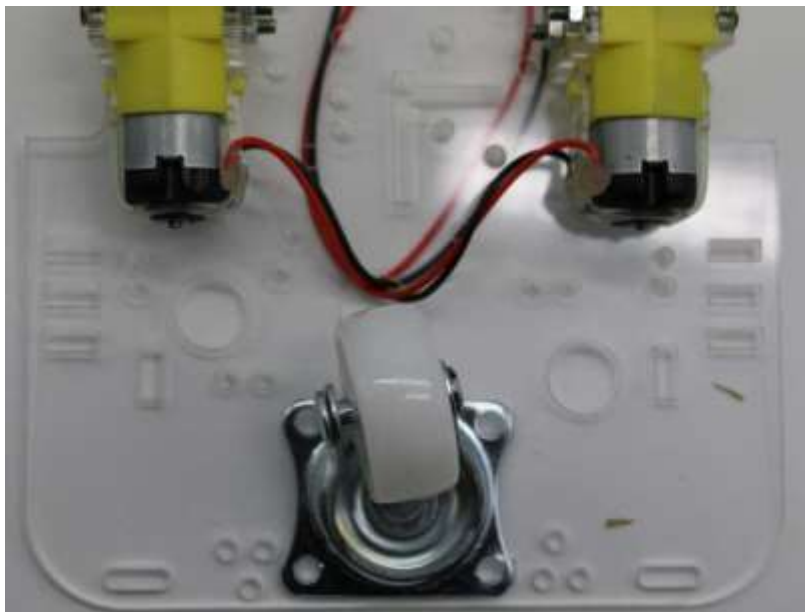**Figure 1- 11** : Holes where must be fixed the wheel.

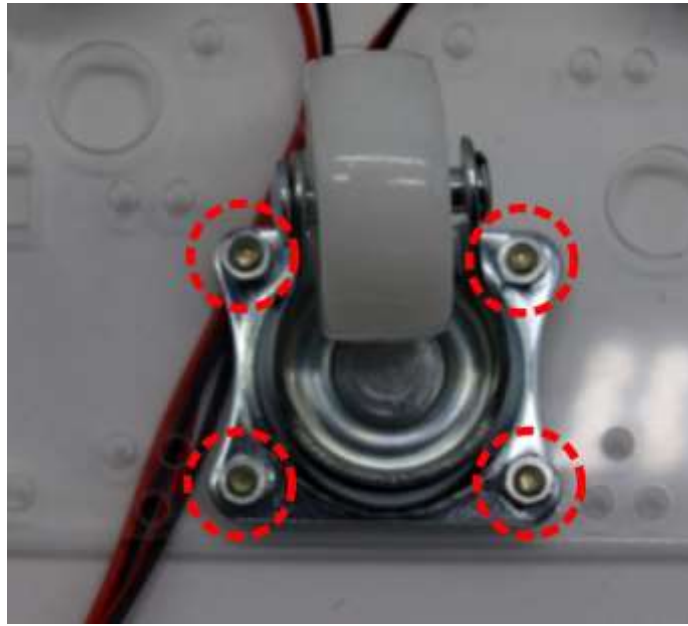**Figure 1- 12** : Wheel in its correct position before its fixing.

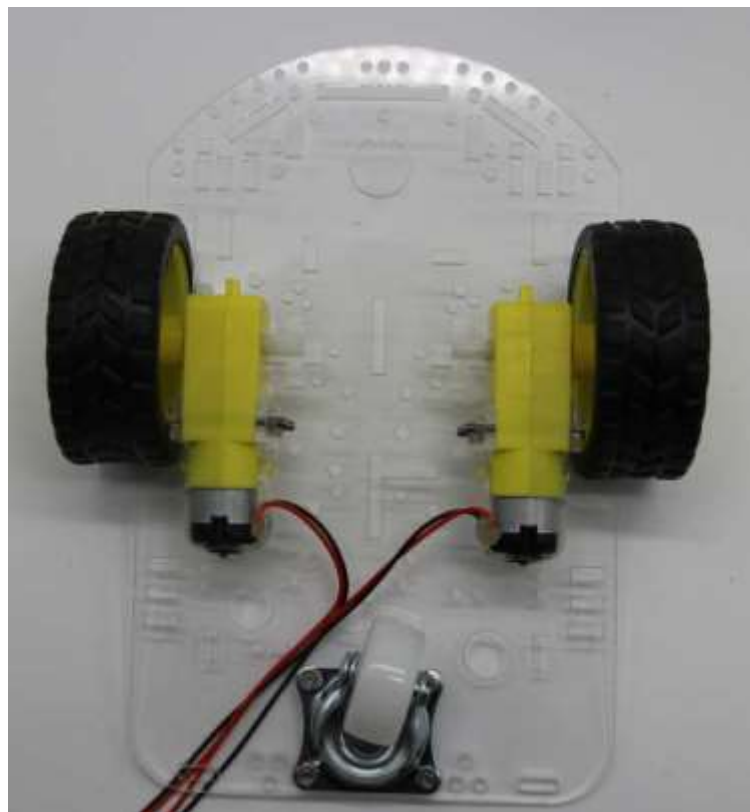**Figure 1- 13**：Nuts are placed on the lower parts of the chassis.

Figure 1- 14：Insert by pressure the two large wheels on the outer axis of each gearbox motor

Bottom view of the chassis
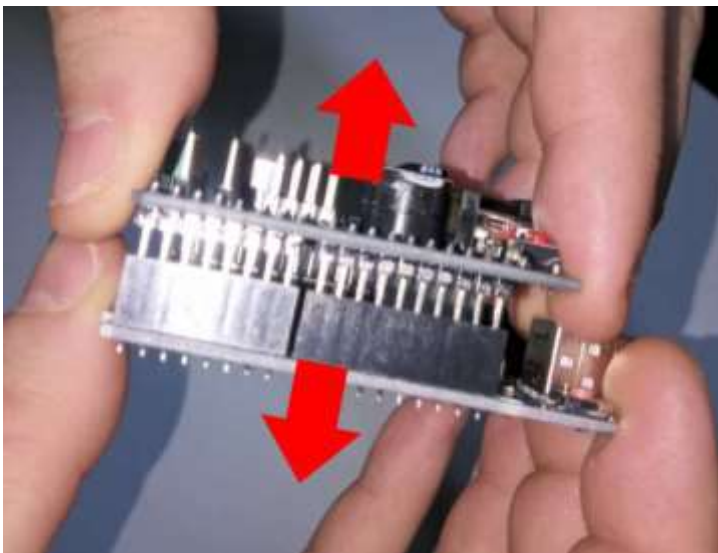
CAUTION: Disconnect the modules.

We will use:

    (1) Control board Arduino type   1

    (2) Shield Module   1

The Arduino main board is supplied already assembled with the Shield module in order to not damage connectors.
It will be necessary to unplug them according to the following instructions:

Firstly : First: Strongly grasp the two circuit boards as shown in the picture.

Secondly : Carefully separate the two plates by pulling on both circuits.

Thirdly: Be careful not to damage or bend the connector contacts. Check one by one that all pins are correctly aligned with the connector's holes in the main board.

These two points must be checked very carefully, to avoid that a short circuit instantly destroyed it, when the robot will be supplied.

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Step 2. Main control electronic Circuit, Arduino Uno Type

We will use:

（1）Smart Robotic chassis with all wheels   1

（2）Module Arduino Uno Type   1

（3）M3×8 mm Screw   8

（4）M3x25 mm Metal spacer   4
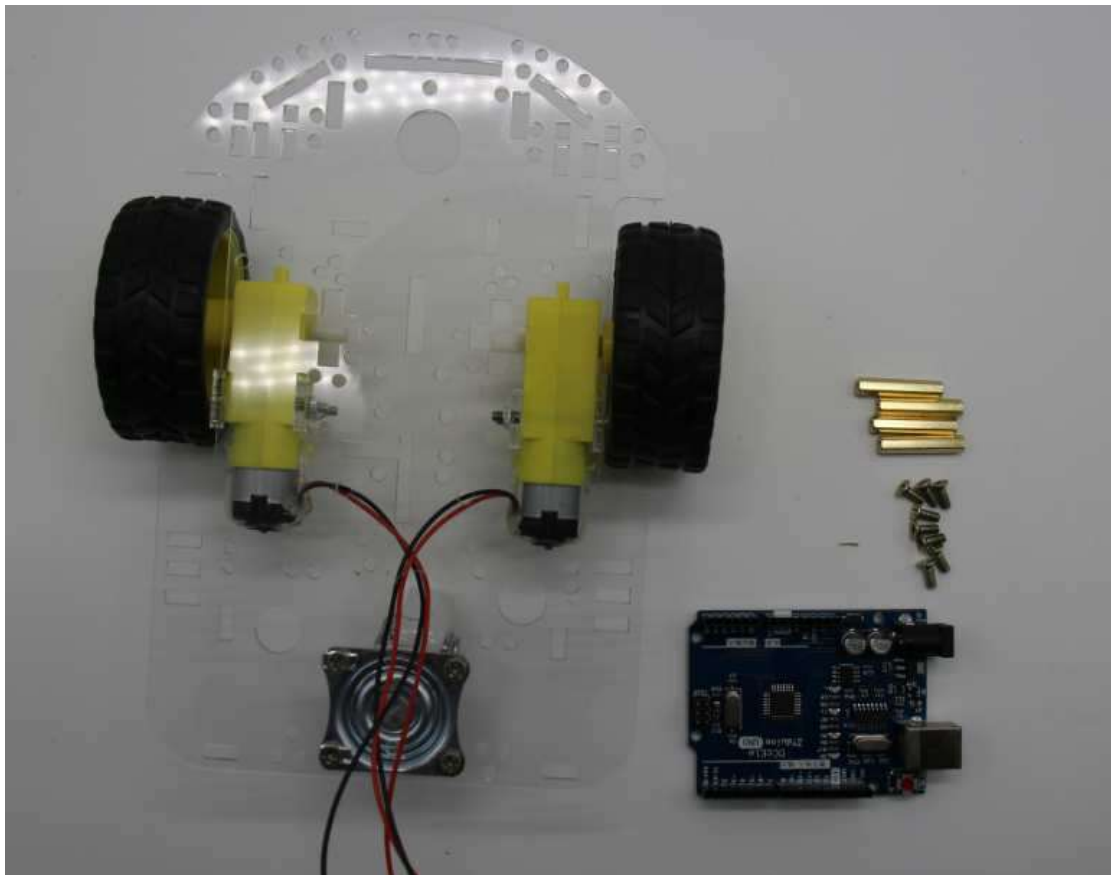
（5）Necessary tools: Screwdriver   1

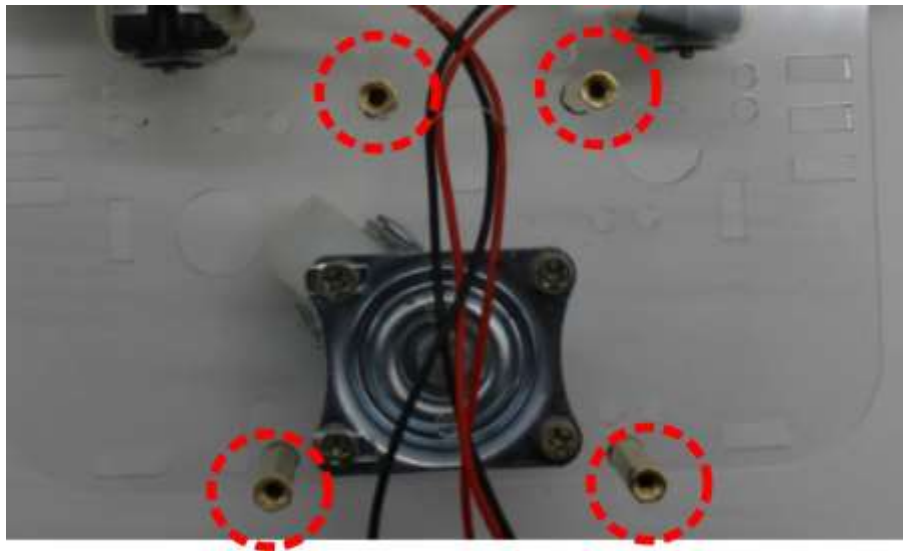**Figure 2- 1：** Necessary pieces to install the main control circuit

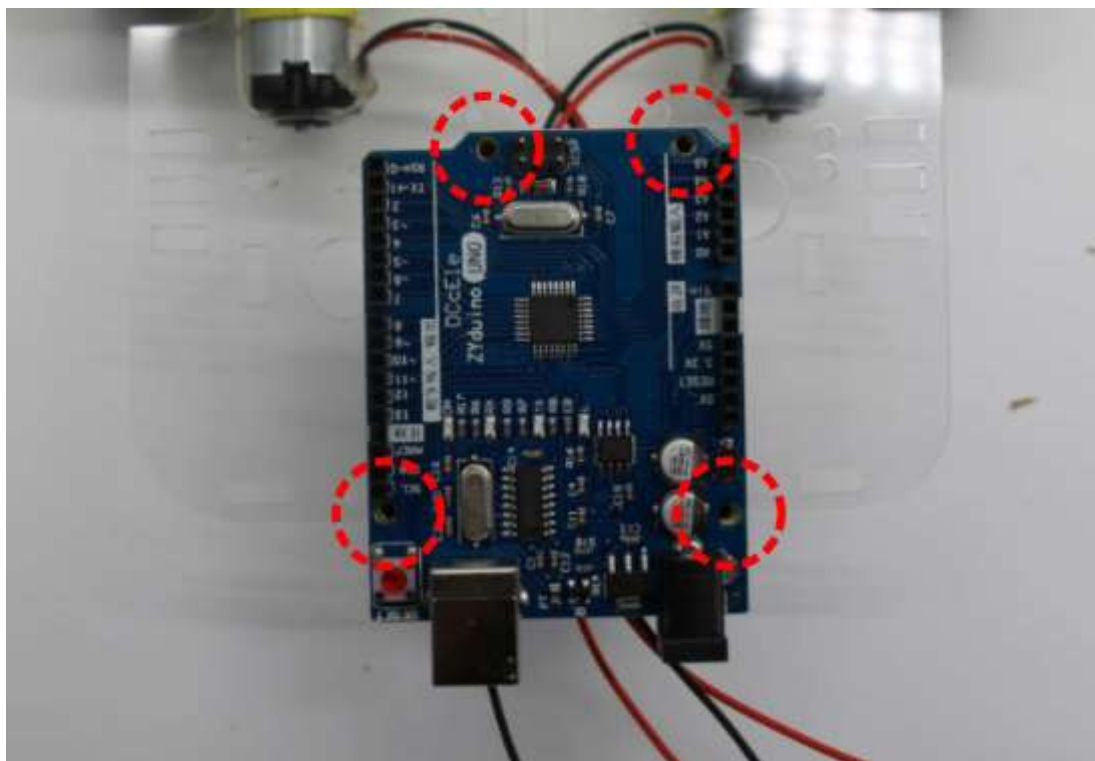**Figure 2- 2**：Fix the four cylindrical spacer as it is indicated on the figure

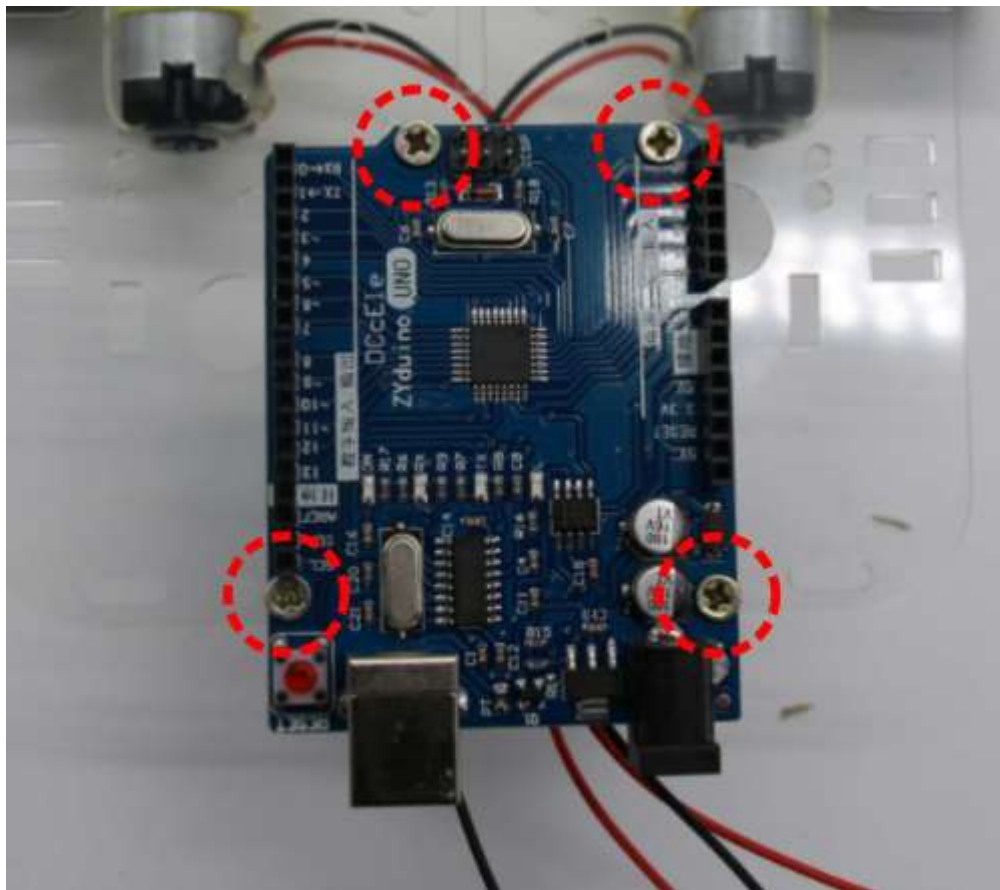**Figure 2- 3**：Main control circuit indicating the four fixing points

Figure 2- 4：Main control circuit fixed with screws

Step 3： **Shield Module (interface)**

We will use:

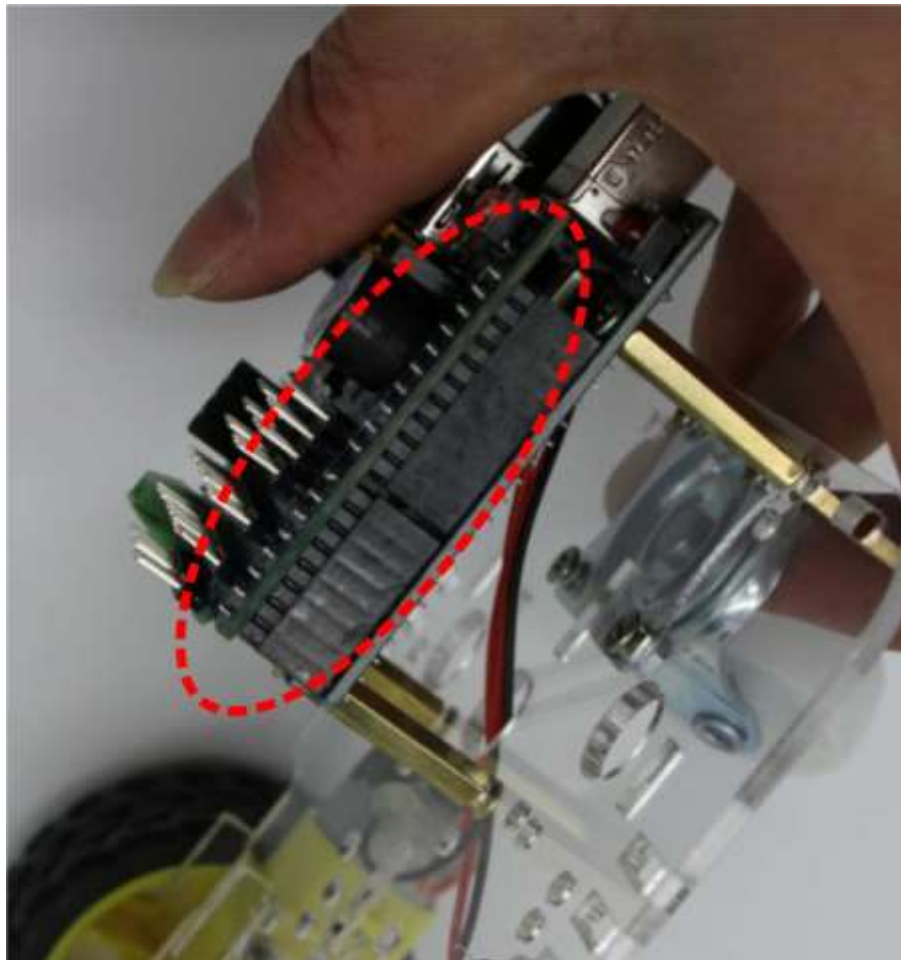| (1) Robot	1
(2) Shield Module	1

Figure 3- 1：Installation of the Shield module.
Carefully, connect once again the module on the main control board

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Attention with the Shield module and the Main control circuit

1.- Before connecting, carefully check the position of the Shield module and the main control circuit connector.

2.- Check, one by one, that all the pins are correctly aligned with the holes in the main control circuit connector.

Check, one by one, that all the pins are correctly aligned with the holes in the main control circuit connector

These two points should be carefully checked to avoid a short circuit when the robot is supplied and damage it irreparably.

Step 4：Batteries-holder

We will use:

（1）Robot   1

（2）Batteries-holder   1

（3）M3×25 ㎜ Metal spacer   4

（4）M3 × 10 mm screw   10

（5）Support acrylic board of the batteries holder   1

（6）M3 Nut   2
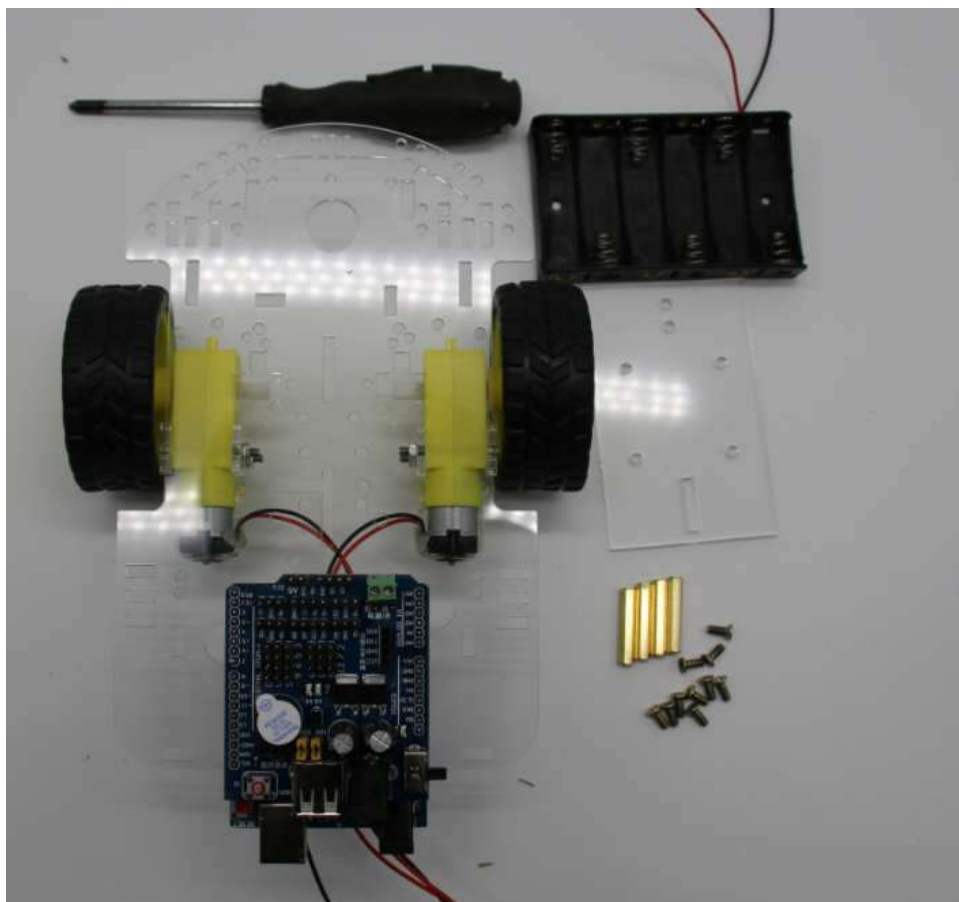
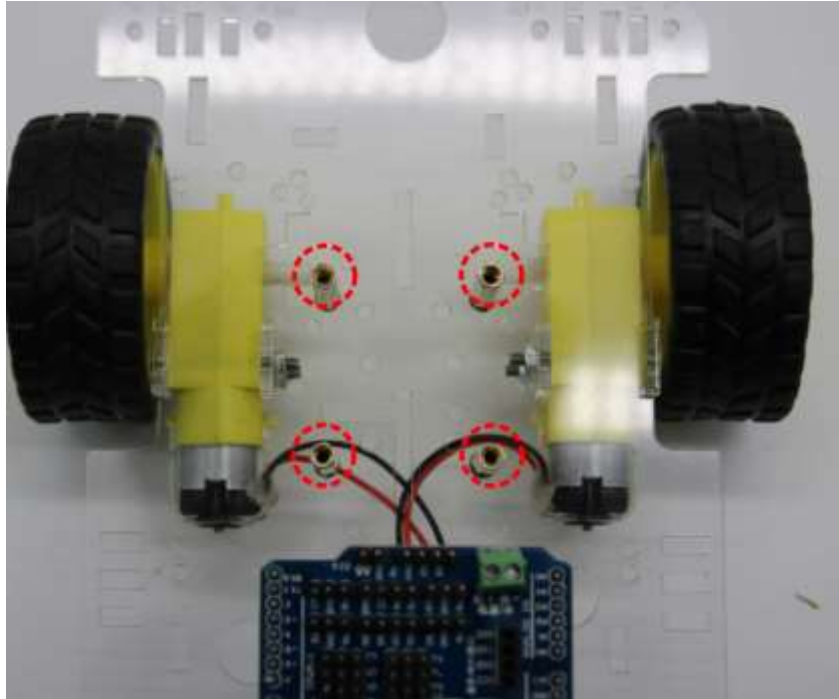（7）Necessary Tools : Screwdriver   1

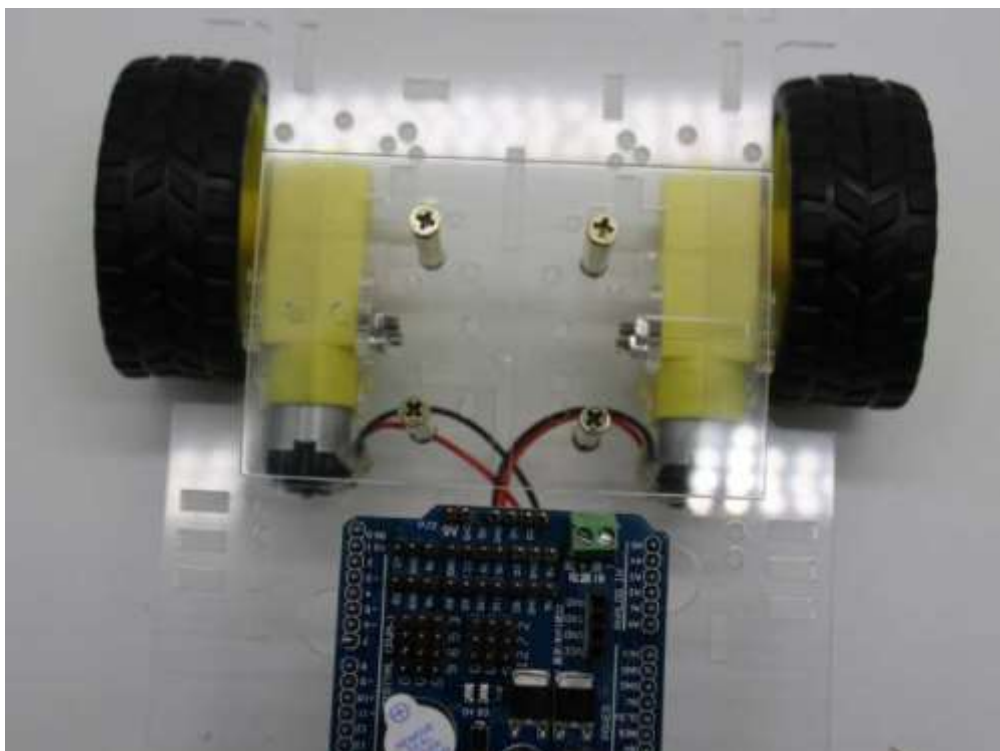**Figure 4- 1**：Necessary pieces

Figure 4- 2：Spacers location
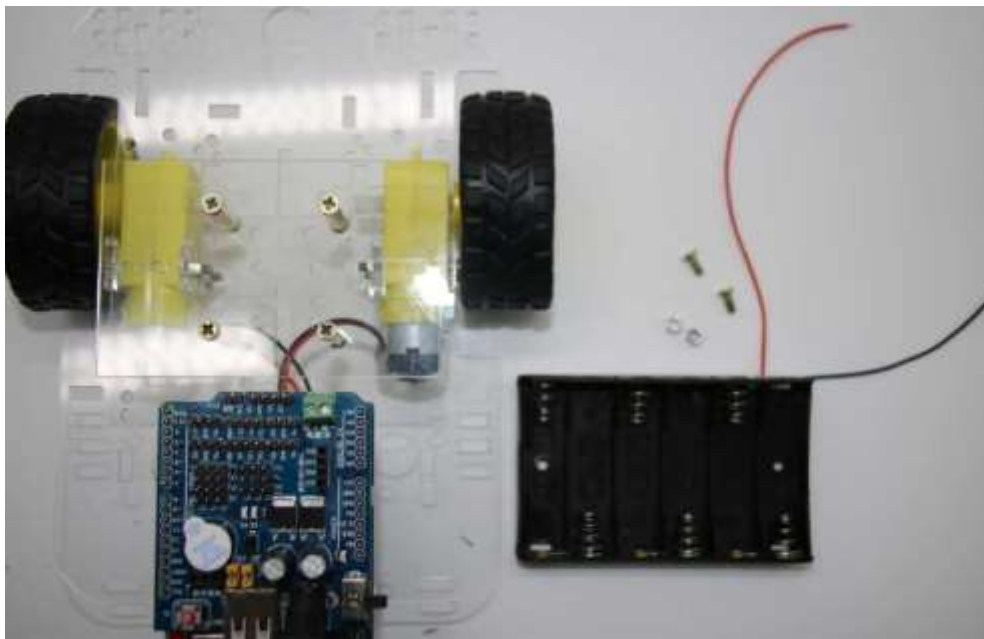

Figure 4- 3：Acrylic board fixing

Figure 4- 4：Preparation to fix the batteries-holder

Figure 4- 5：Batteries-holder once
screwed fixed

Step 5: Control Circuit of motors

We will use:

（1）Robot   1
（2）Control circuit of motors   1
（3）M3×10 mm Metal spacer   4
（4）M3 × 10 mm Screw   4
（5）M3 × 8 mm Screw   4
（6）Necessary tools : Screwdriver   1

Figure 5- 1：Pieces that we will use to fix the control circuit of motors

Figure 5- 2：Spacers positions

Figure 5- 3：Control Circuit once fixed

Step 6 - Modules to avoid obstacles using infrared sensors

   We will use:

(1) Basic Robot previously assembled   1

(2) Infrared module (IR) to avoid obstacles   2

(3) M3 × 10 mm Metal spacer   2

(4) M3 × 10 mm Screw   2

(5) M3 × 8 mm Screw   2

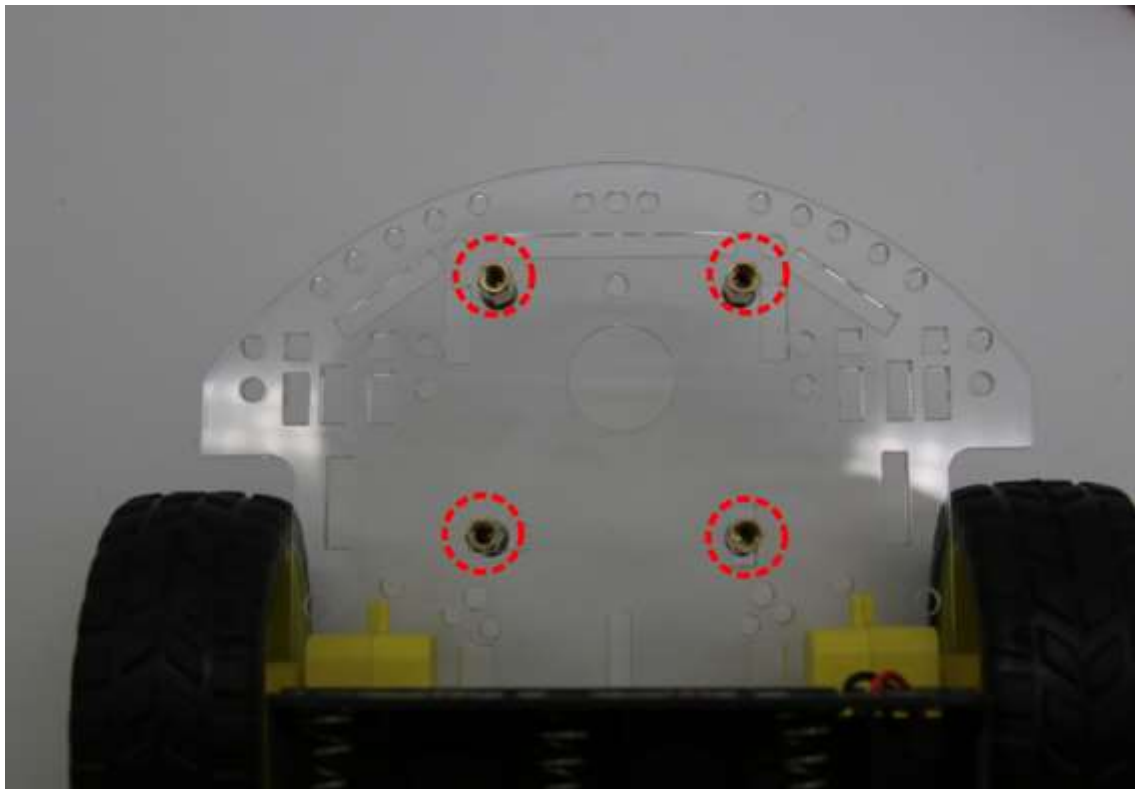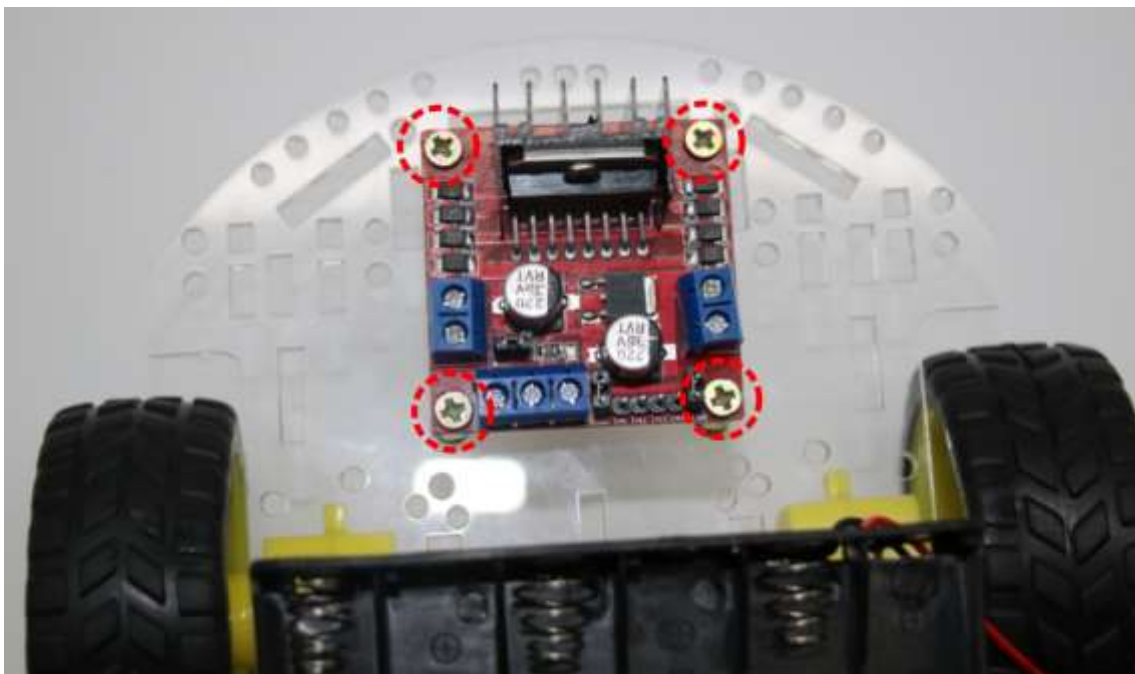(6) Necessary tolls : Screwdriver   1
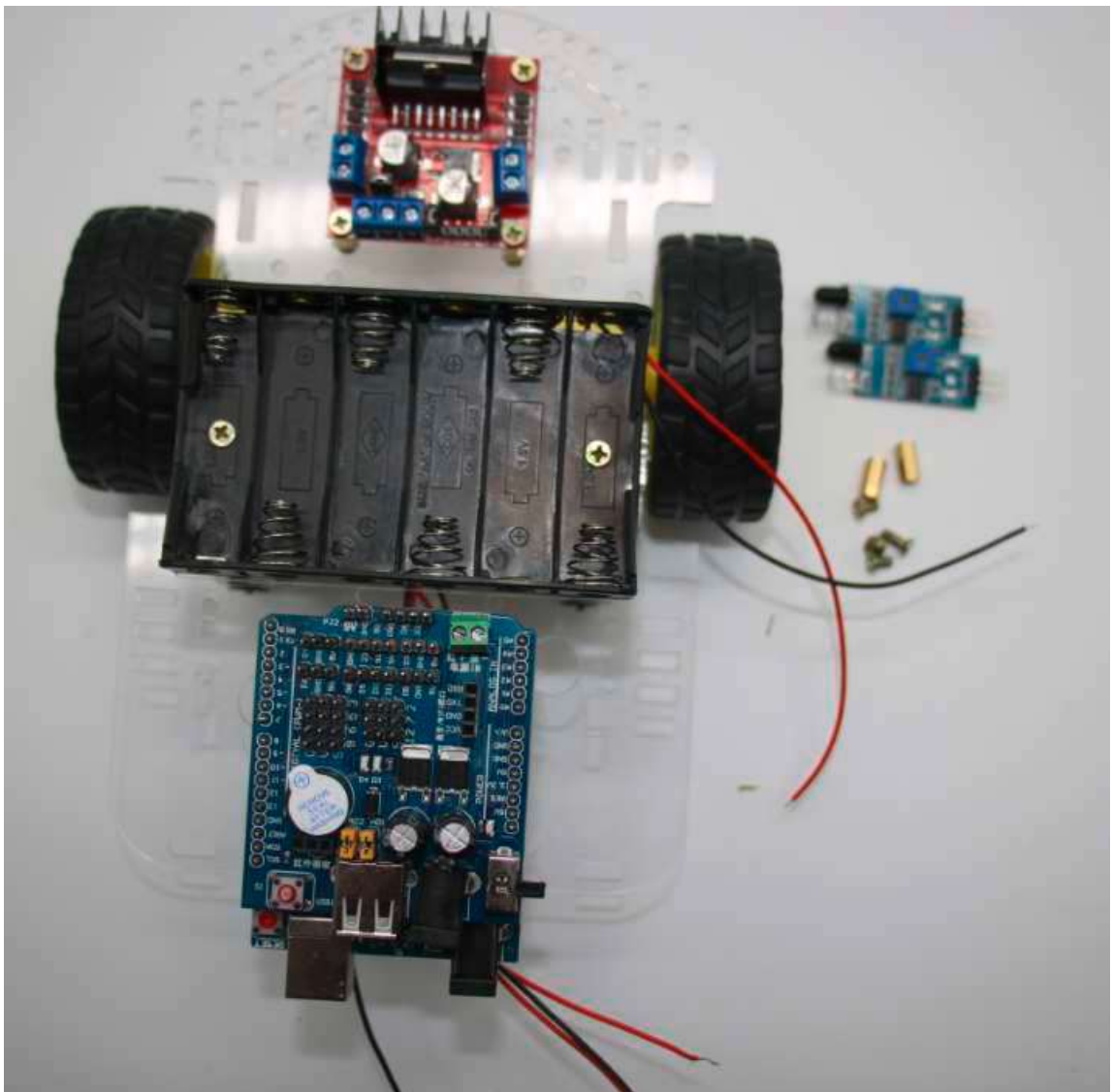

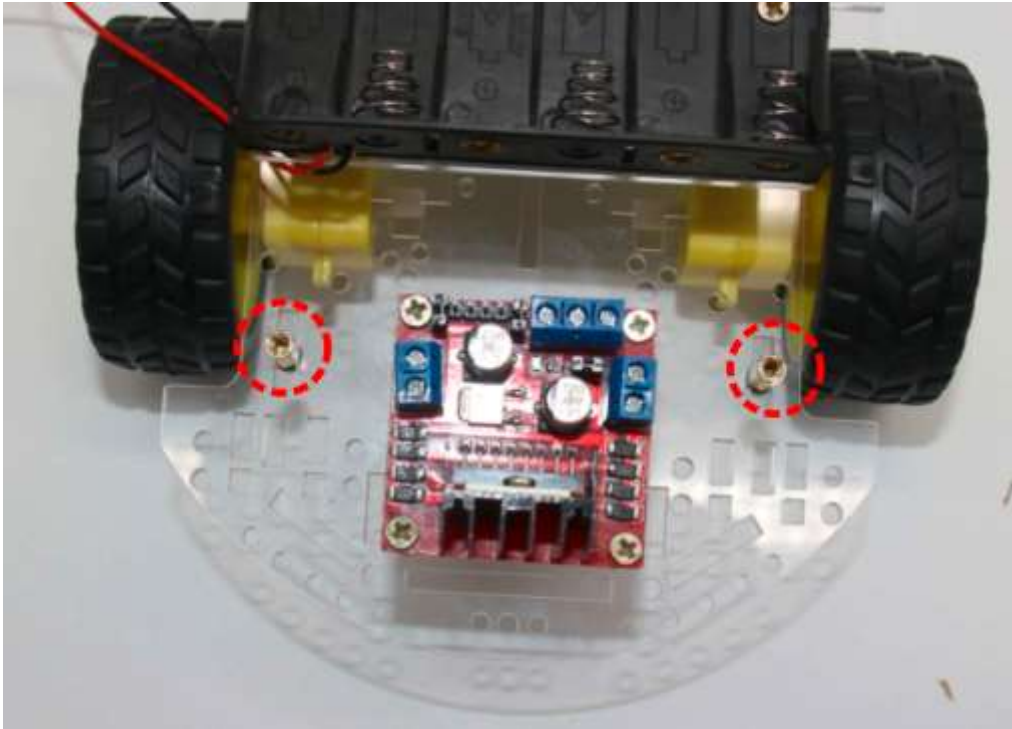**Figure 6 - 1** : Necessary pieces

Figure 6- 2 : Installation of the two separators using M3 x 10mm screws.**.**
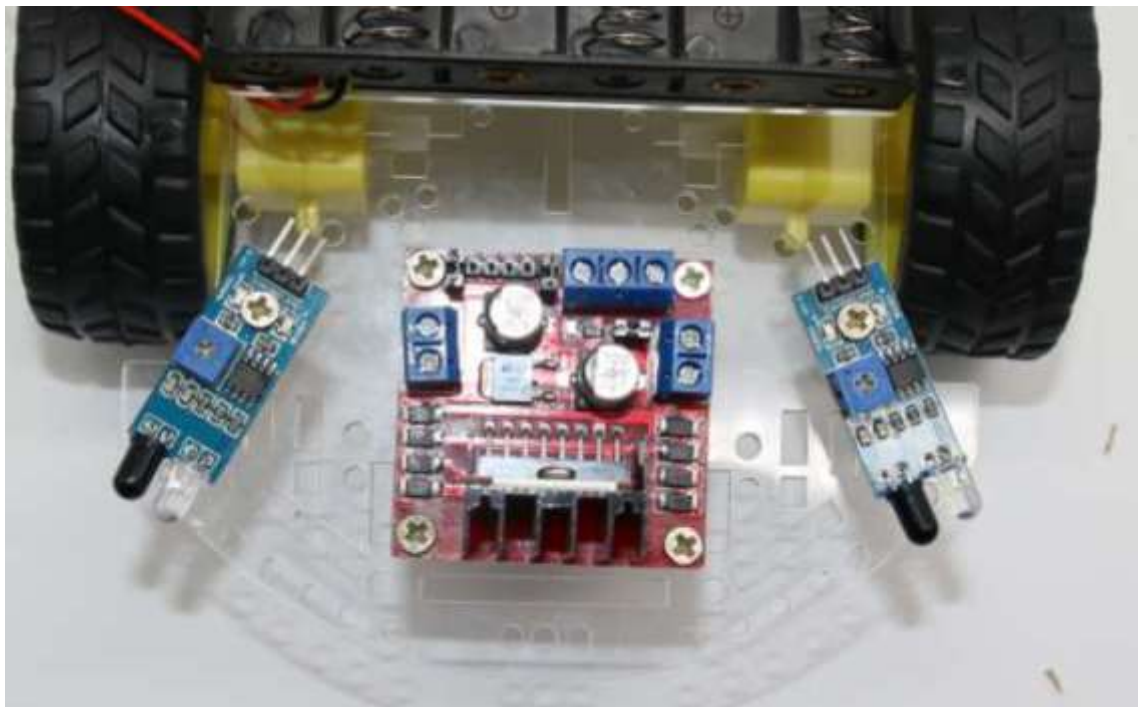

Figure 6- 3 : IR modules to avoid objects fixed with M3 x 8mm screws.
Fix the two sensors in the same position as the image.

Attention to the position: Do not install it upside down.

Étape 7: Smart robot wiring

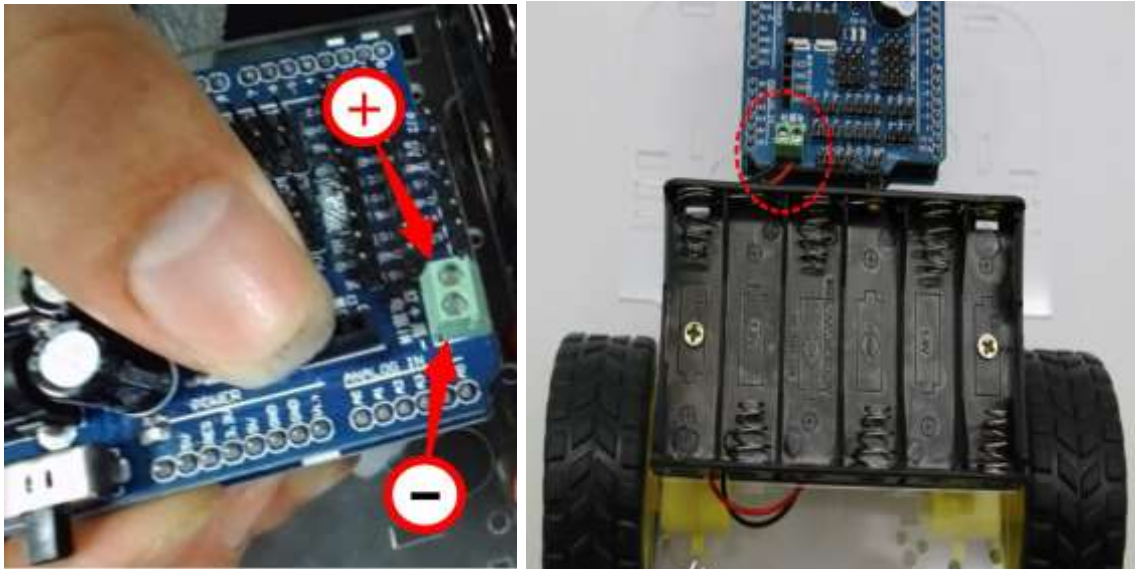1. **Connection of the Batteries-holder**

Figure 7- 1 : Batteries-holder wiring

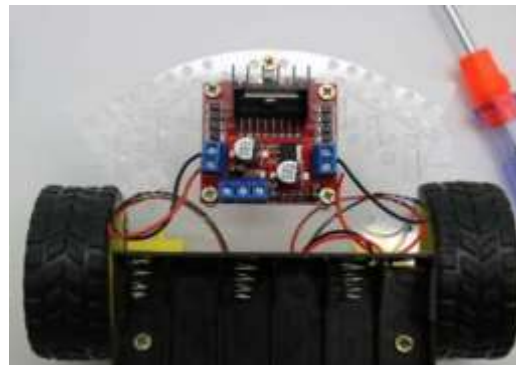| Batteries-holder	Circuit Arduino UNO type with the Shield module assembled
RED Cable	Terminal + (positive) of the terminal block feed
BLACK Cable	Terminal + (negative) of the terminal block feed

2. Motors connection

Figure 7- 2：

Insert the motor cables through the hole in the center of the acrylic support and up to motor control module.

**LEFT
Motor**

**RIGHT
Motor**

Figure 7- 3：

Connect the left motor cables to the left side of the motor control module (A1 and A2 terminals) and those of the right motor to the right side (B1 and B2 terminals).

Motor	Motors Control Module
Left motor– Red cable	Output terminal A : A2
Left motor – Black cable	Output terminal A : A1
Right motor – Red cable	Output terminal B : B2
Right motor – Black cable	Output terminal B : B1

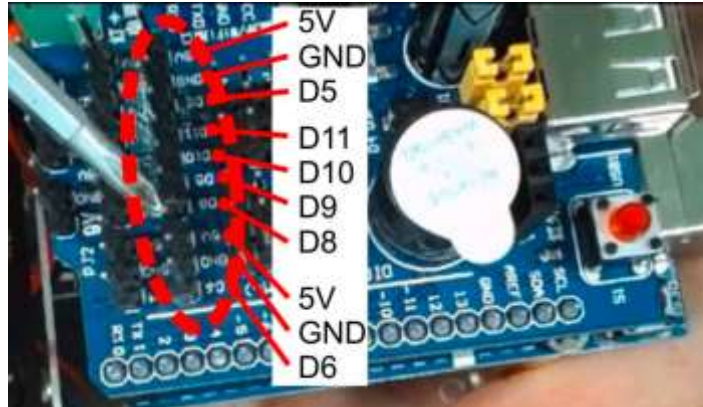**Étape 8: Connection between motors control module and shield module**

Figure 8 – 1 : Locations of contacts on the Shield module

It consists of three groups: two groups of three connections for the right and left sensors respectively. The other four central connections correspond to the control of the motors.
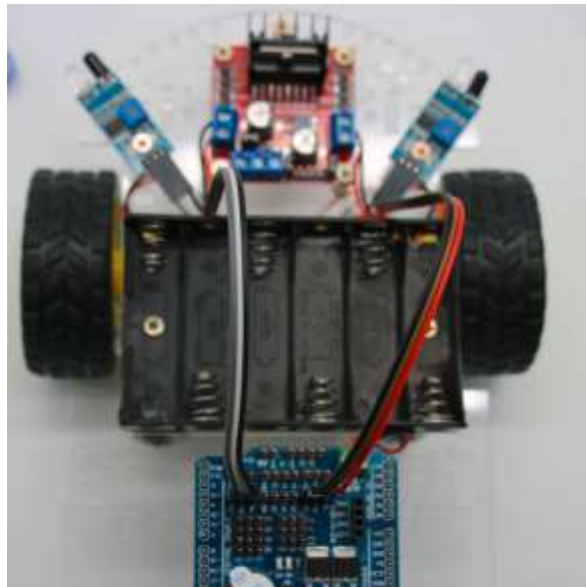

Figure 8 - 2 : Location of each sensor with the Shield module. Pay attention to the polarity

It is best to run these cables between the battery holder and the acrylic frame.
Once the sensors are connected, tighten the screws again so that they are in the same position as the image

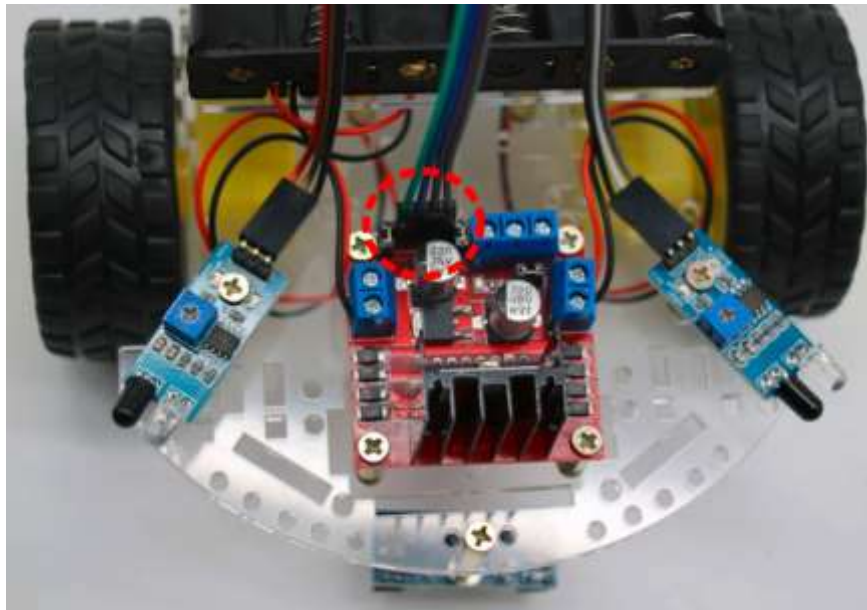| Sensors	Shield Module
Right sensor- VDC	5V
Right sensor - GND	GND
Right sensor - OUT	D5
Left sensor - VDC	5V
Left sensor - GND	GND
Left sensor - OUT	D6

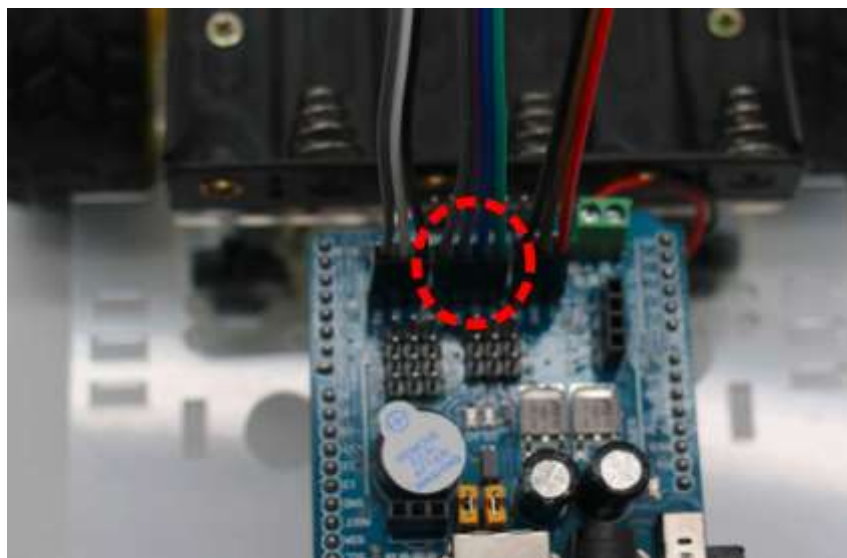**Figure 8 – 3** : Location of motors power supply

Figure 8 – 4 : View of the other end of the cables connected to the Shield module.

Pay attention to the polarity according to the following table. It is best to pass this cable between the battery holder and the acrylic frame.

Motors control Module	Shield Module
IN1	D8
IN2	D9
IN3	D10
IN4	D11

Connection of the power supply of motors control module

Figure 8 – 5 : For the power supply of the motor control module, it is necessary to use a special cable.
At one end it has two connectors with two male lug pins that are connected to the terminal block of the motor control module.
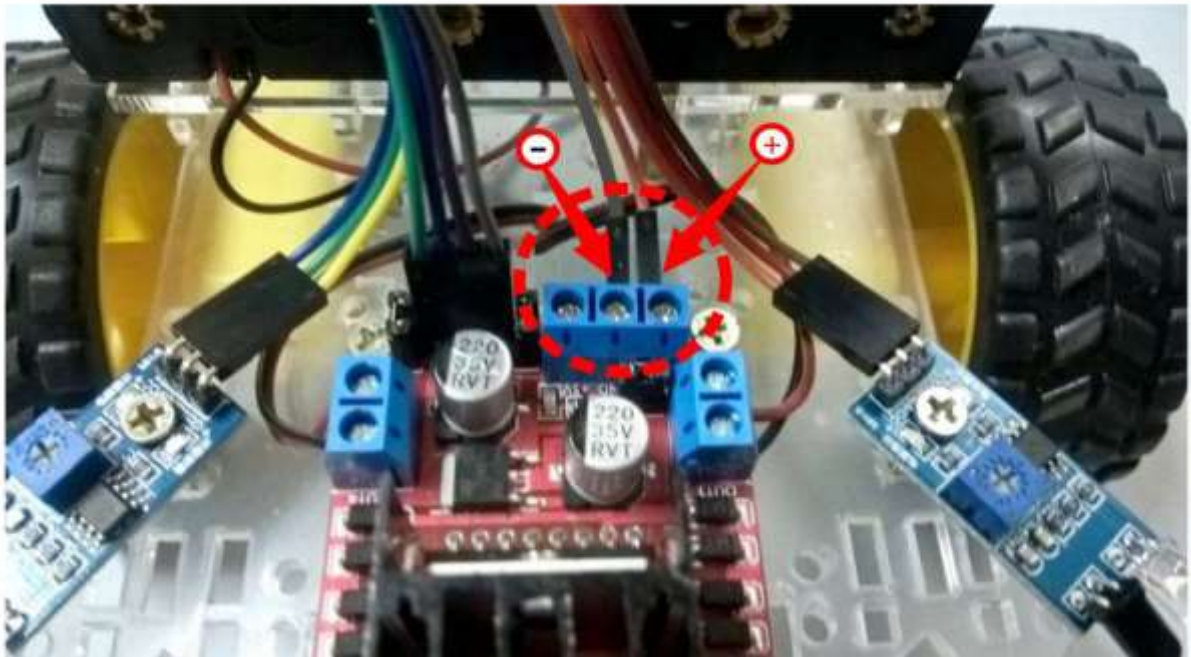

Figure 8 – 6 :

Connection of the power supply of motors control module

Attention to the polarity.

The positive pole (12V) corresponds to the corner terminal of the motor control module (see image).

The terminal which is more centered on this terminal block is not used.

Figure 8 – 7 :

The other end of the cable has two female connectors that will connect to the pins of the Shield module.
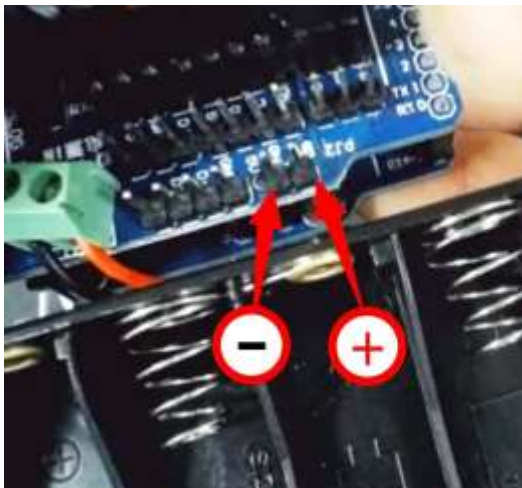
Figure 8 – 8 :

View of the location of the terminals on the Shield module.
They are indicated on the module as:
9V (positive) and GND (negative)

Figure 8 – 9 :

Cable connection on the Shield module.
Pay attention to the polarity.

L298 Motor Controller Pinout

Motors control module	Shield Module
+12V	9V
Power Supply GND	GN

Note:

before activating the robot, remove the protection label from the loudspeaker of the Shield module

PROGRAMMING the ROBOT

Software

1) If you don't have the program ARDUINO software, you have to connect to the website
https://www.arduino.cc/en/Main/Software and download the suitable software on your
computer.
For it:

2) Connect the batteries to the robot

3) Connect the robot to the computer using the USB cable of the kit

4) Install the Arduino Software in the robot

5) Install the software included in this CDROM: **avoid.ino**

6) Disconnect the USB cable from the robot

7) Connect the robot switch (ON position). The indicator light will flash

8) Press the S1 button on the Shield module. The robot buzzer will sound and it will be ready to
be used.

9) When you will be sufficiently comfortable with the handling of this robot, if you wish, you can
learn to program with Arduino and/or experiment and modify the software at your
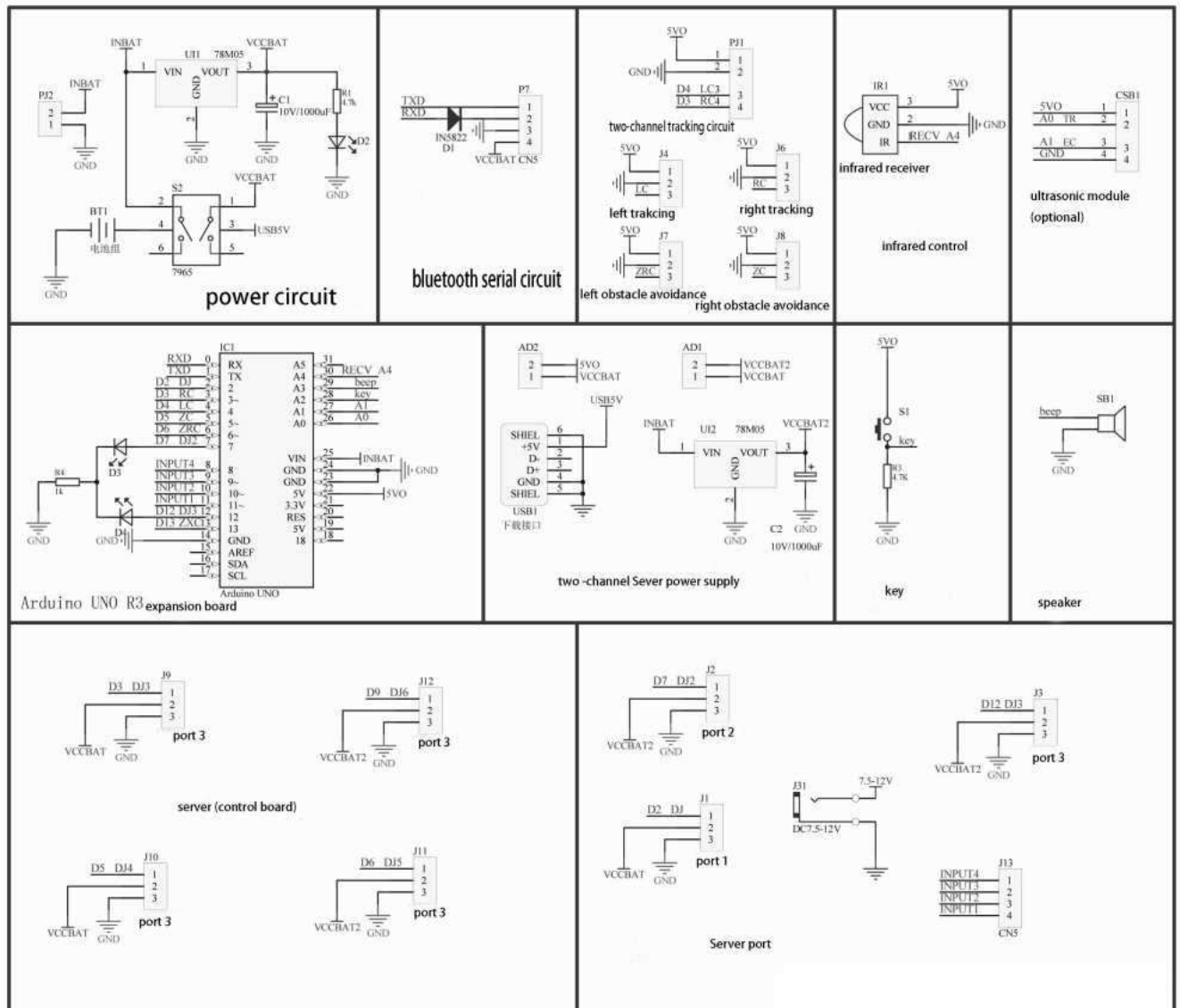convenience.

In case of problems with the new software, you only have to install again the software avoid.ino

Annex:
- avoid.ino

Diagram of the control board:
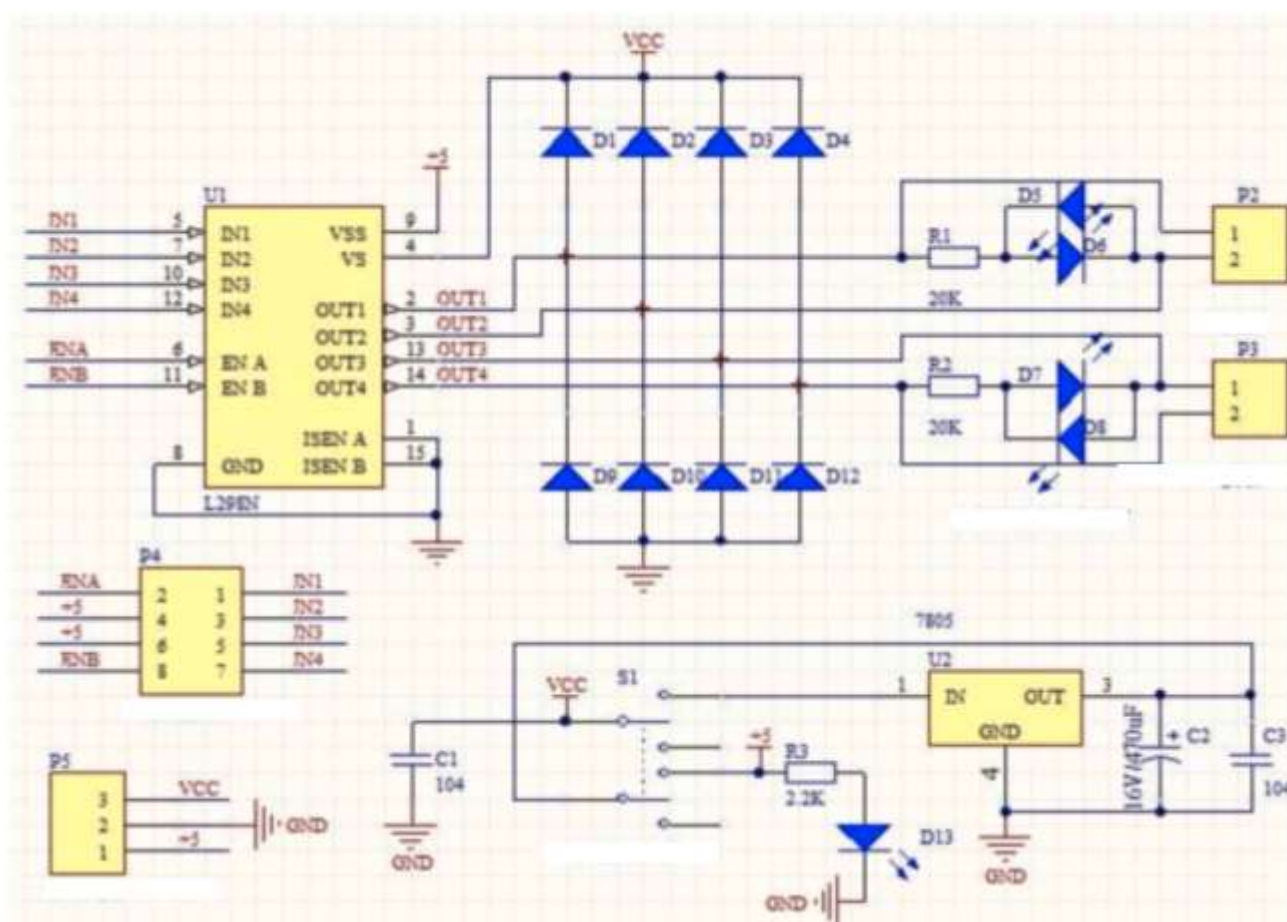

Arduino(TM) UNO Rev3

Diagram of the Shield module:

This is the complete drawing of the Shield module

Depending on the selected kit, only certain parts of the module will be used.

Drawing of the motors control module

ATTENTION

1.- This kit is for an educational use under the supervision of adult instructors
2.- It is not recommended for children under 14 years because of the mechanical and electrical mounting of the kit and software use.
3.- Keep the kit away from children under 3 years old. It contains small parts, danger of asphyxiation.

Precautions with batteries

1.- To place, remove or change batteries, it is necessary an adult to do this.
2.- Do not short-circuit contacts of the batteries-holder or their compartments.
3.- Remove old batteries from the device to prevent acid leakage.
4.- Never mix new and used batteries or batteries of different types.
5.- Never mix alkaline, standard (coal-zinc), or rechargeable (nickel-cadmium, Ni-MH or other types) batteries.
6.- Batteries must be inserted with the correct polarity.
7.- Never try to reload non-rechargeable batteries.
8.- Rechargeable batteries can only be reloaded under the supervision of an adult.
9.- Rechargeable batteries must be removed from the device before reloading.

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