Robot with infrared remote control

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.

This smart robot can be controlled remotely thanks to its wireless controller, which emits infrared light, and the IR receiver built into the vehicle.

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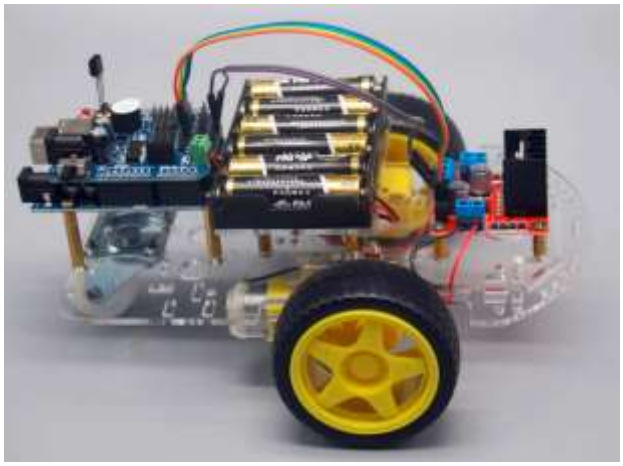
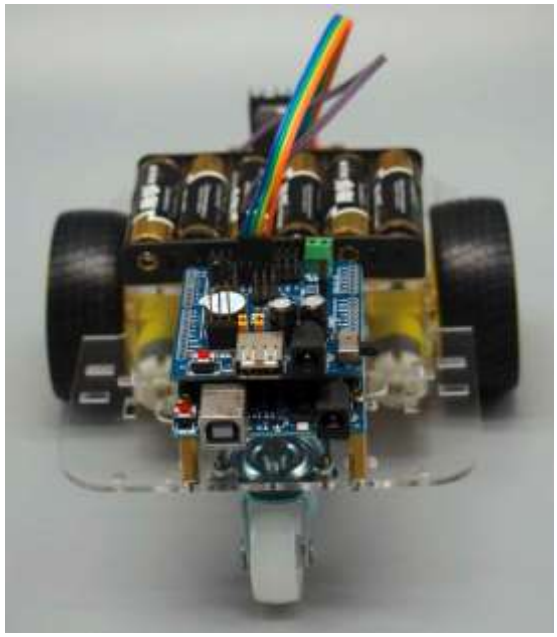
Views of the built robot





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PACKING LIST

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

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

Note :

- 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 Smart 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

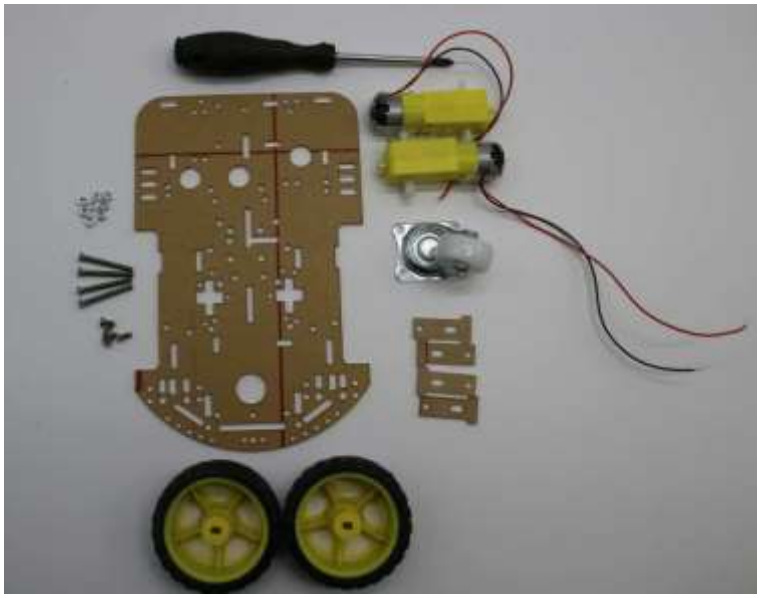


Figure 1 – 1 : Necessary pieces for the chassis assembly

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

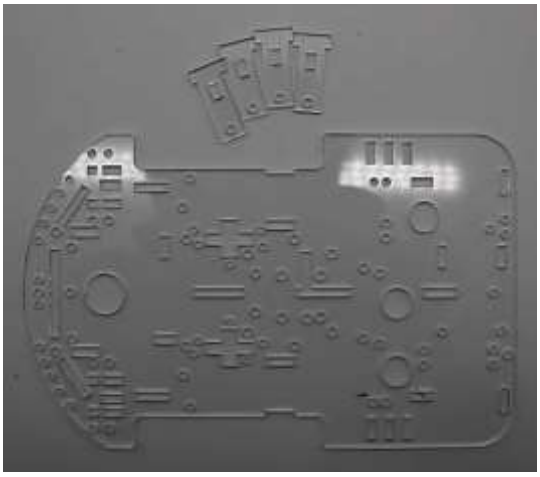


Figure 1 - 2

Gearbox with double axis

Figure 1 – 3 :

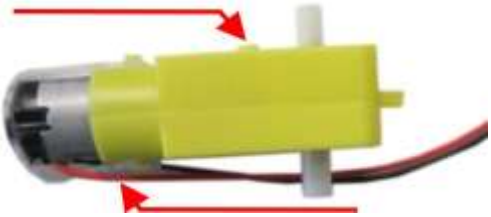
(A) Location of the grooves where the acrylic supports of the motors must be inserted

(B) Motors Acrylic supports

(C) Screws and nuts to fix motors to the supports

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

Outgoing element



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

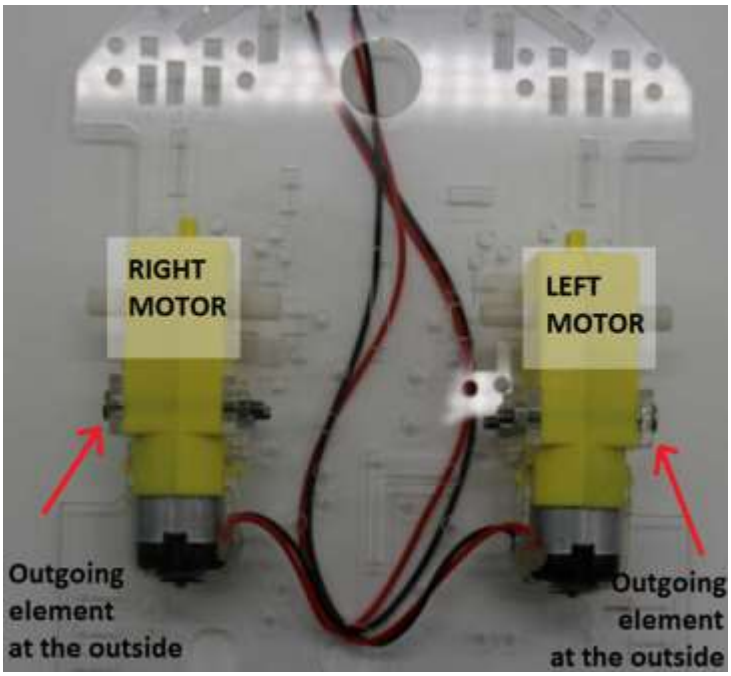


Figure 1- 5 : Motors Installation. View from the bottom part of chassis (motor side)

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.

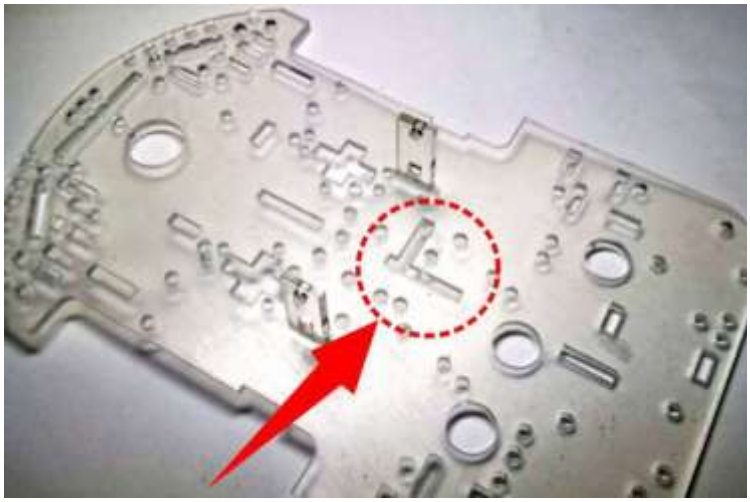
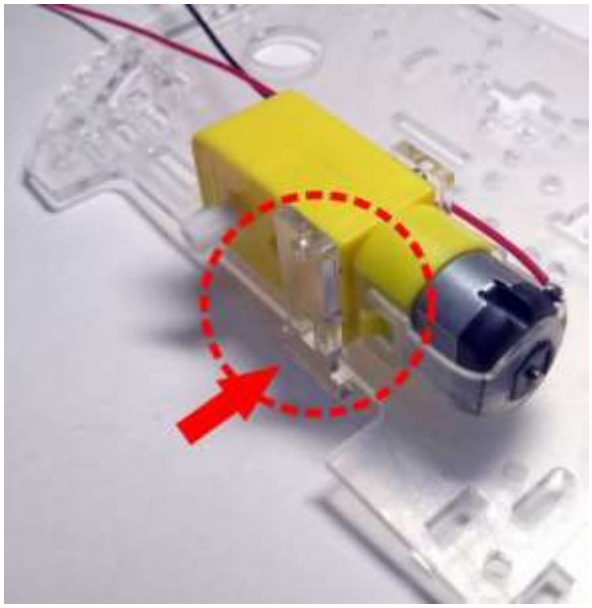


Figure 1- 7:

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.



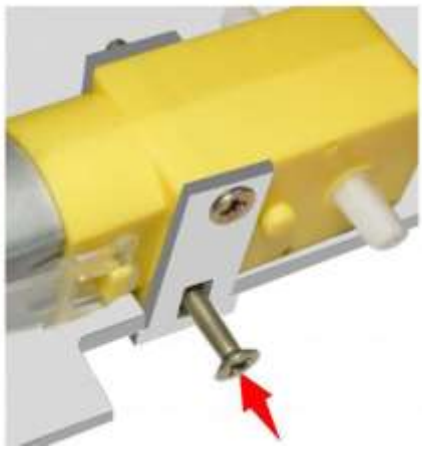


Figure 1- 9:
Then place one screw and one nut in the upper hole and another in the lower hole.

See added picture

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

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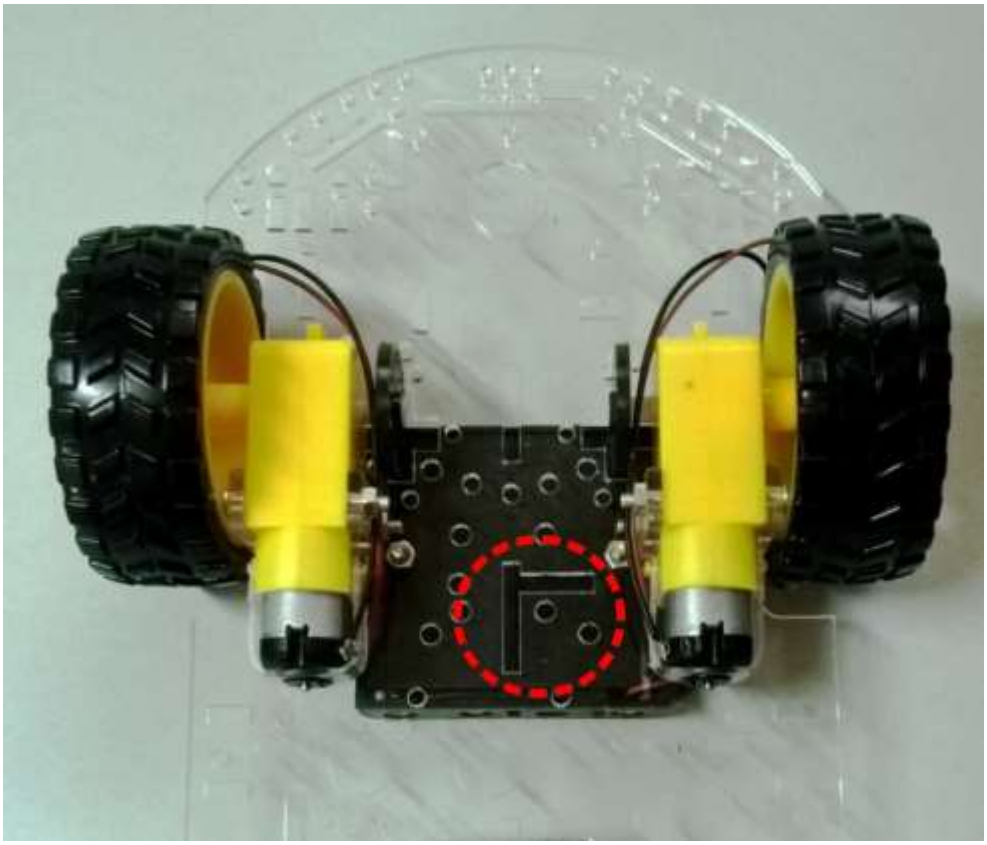


Figure 1- 10:
Install the other motor following the same instructions as for the first one.

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

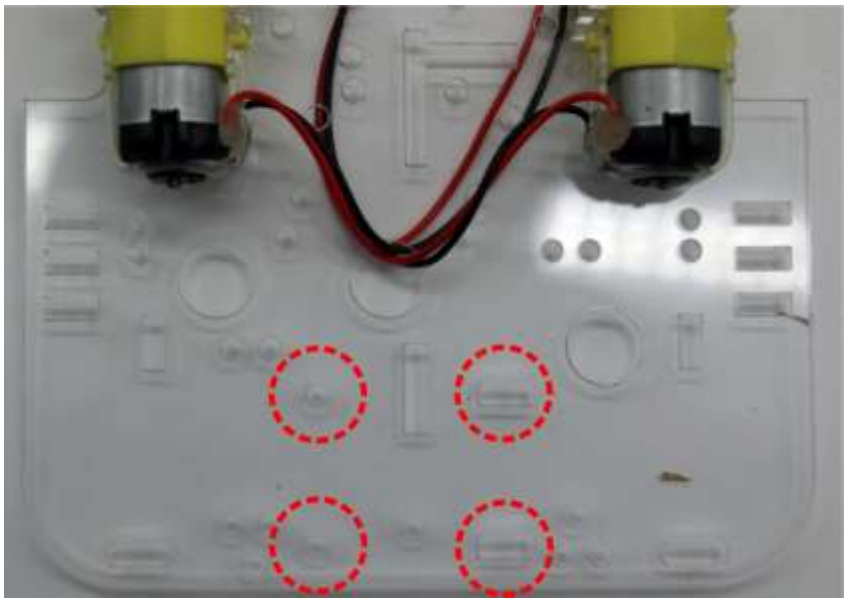


Figure 1- 11 ：Holes where must be fixed the wheel.

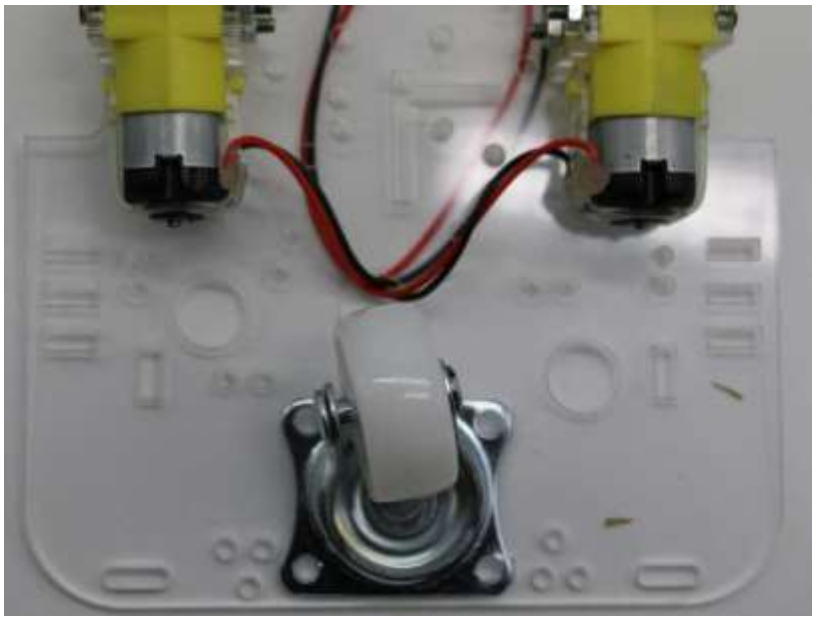


Figure 1- 12 ：Wheel in its correct position before its fixing.

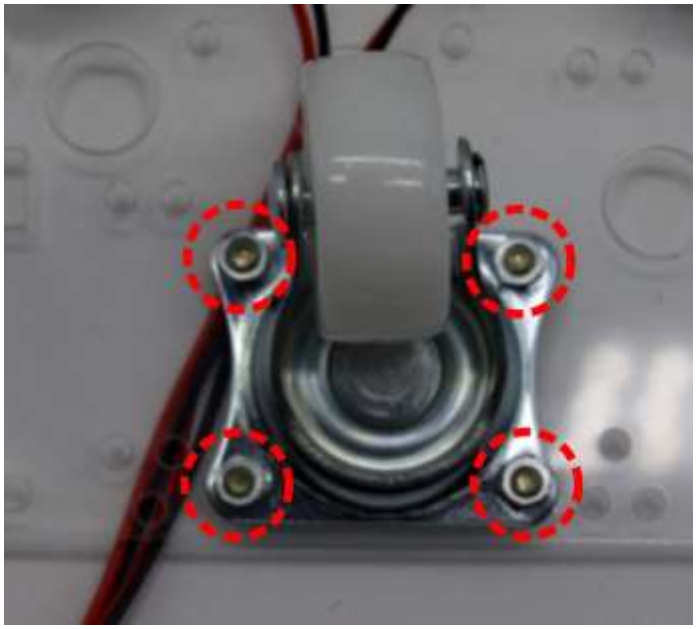


Figure 1- 13 : Nuts are placed on the lower parts of the chassis.

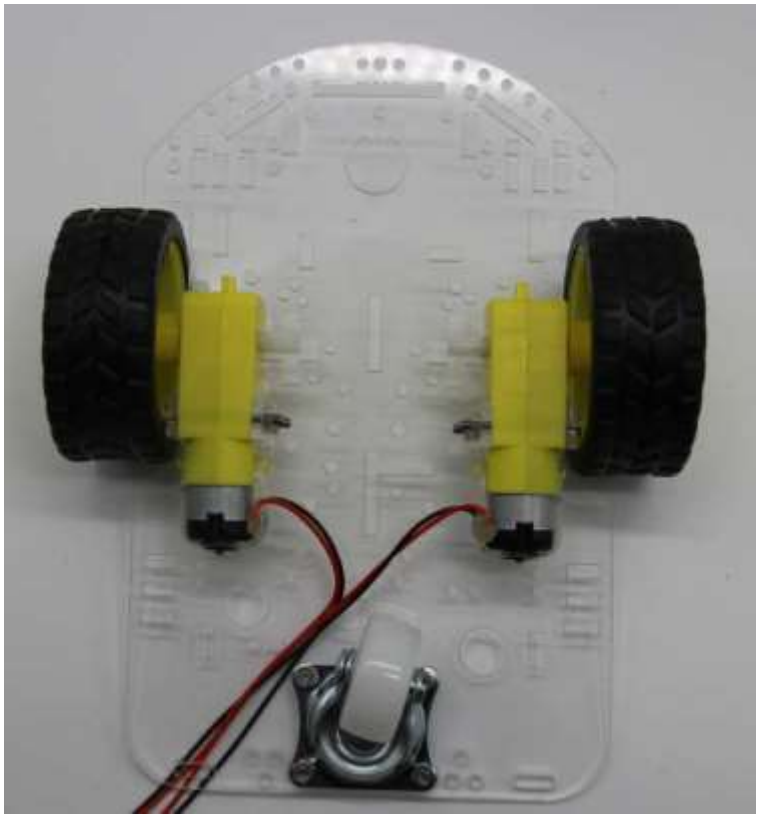


Figure 1- 14 : Insert by pressure the two large wheels on the outer axis of each gearbox motor

Bottom view of the chassis

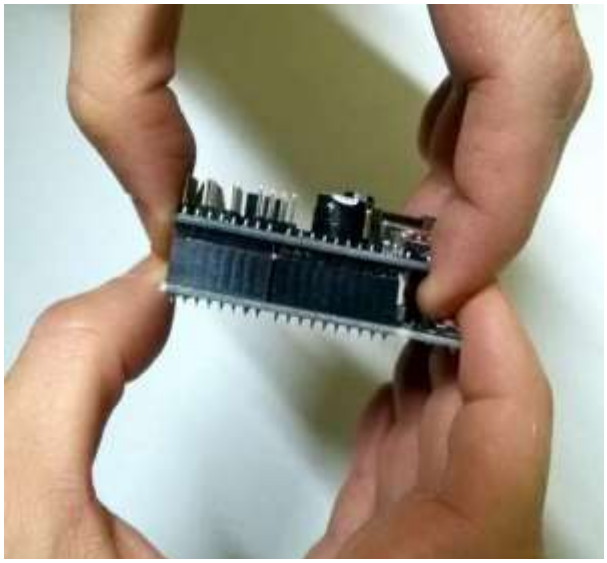
CAUTION: Disconnect the modules.

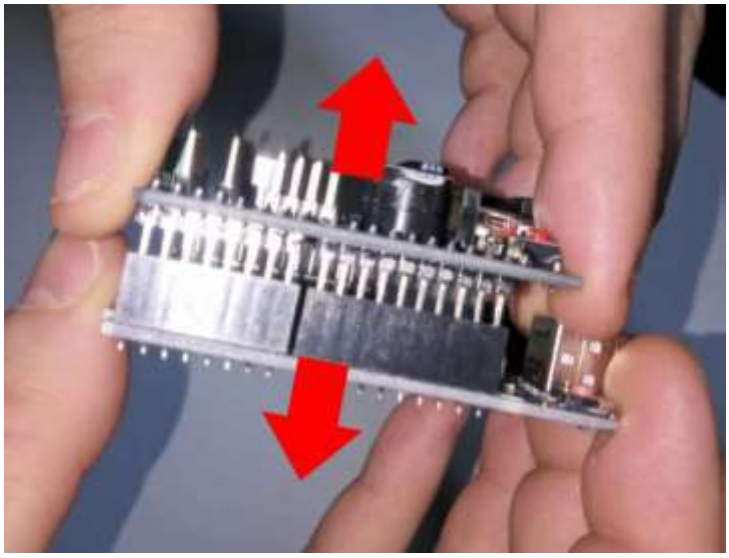
We will use:

(1) Control board Arduino type	1
(2) Shield Module	1

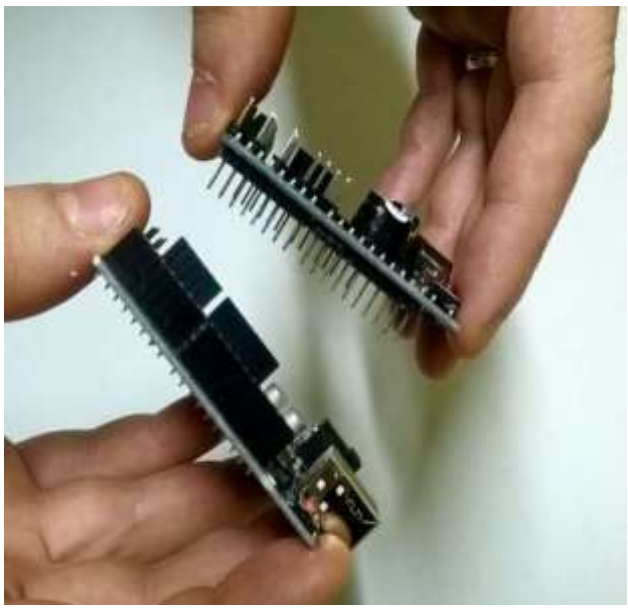
The Arduino main board is supplied already assembled with the Shield module in order to not damage connectors.
It will be necessary to unplug them according to the following instructions:

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.

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

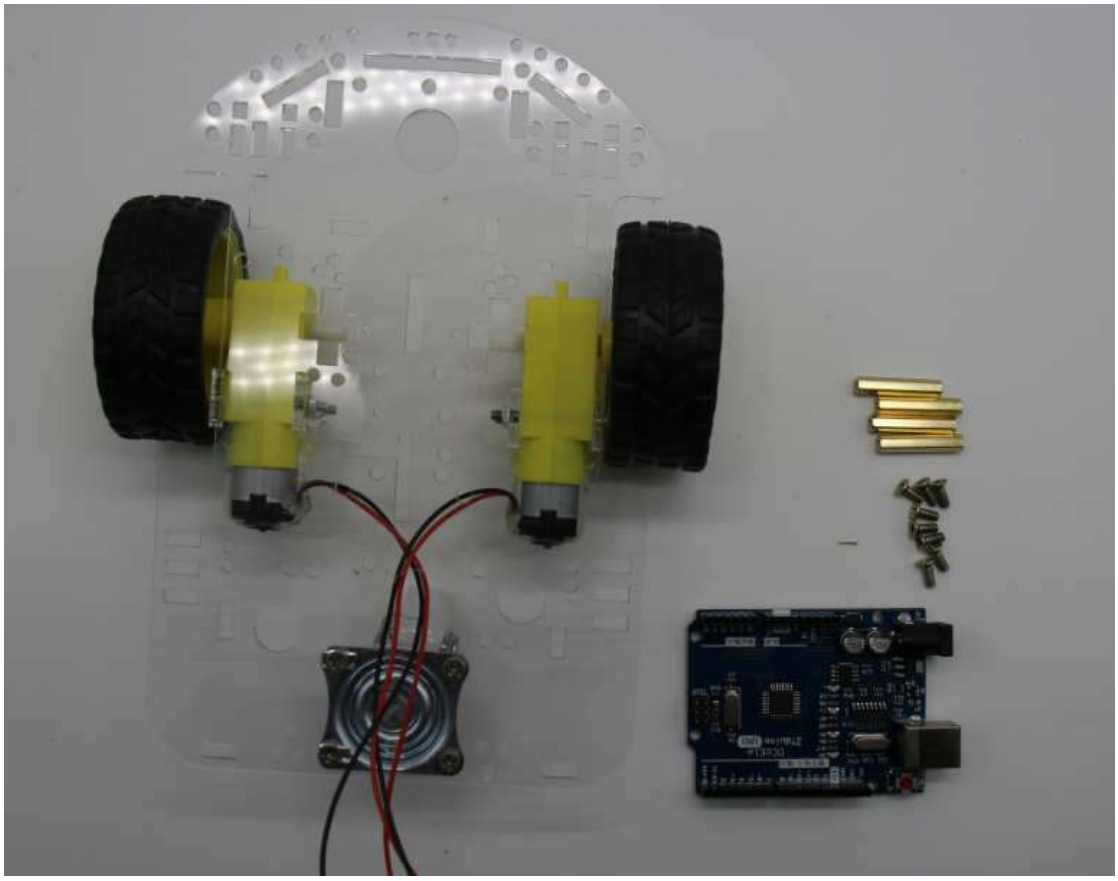


Figure 2- 1 : Necessary pieces to install the main control circuit

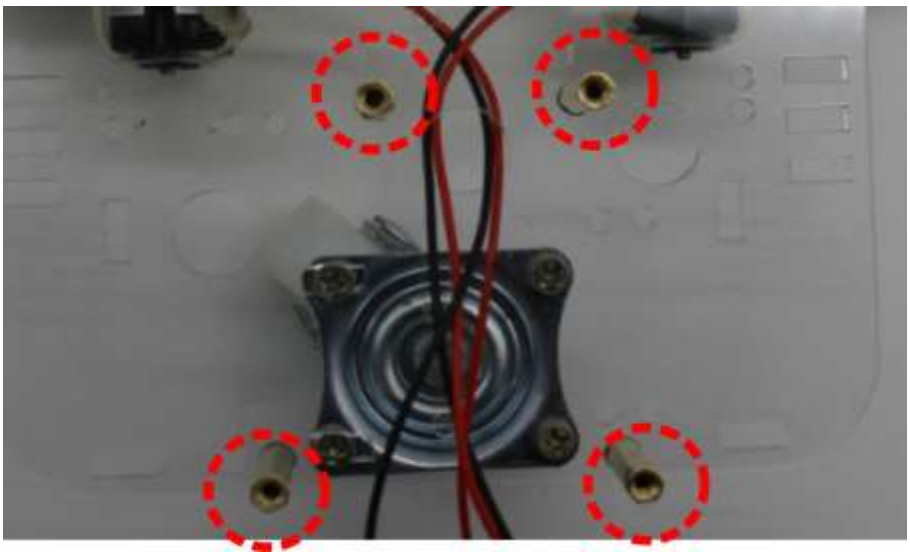


Figure 2- 2：Fix the four cylindrical spacer as it is indicated on the figure

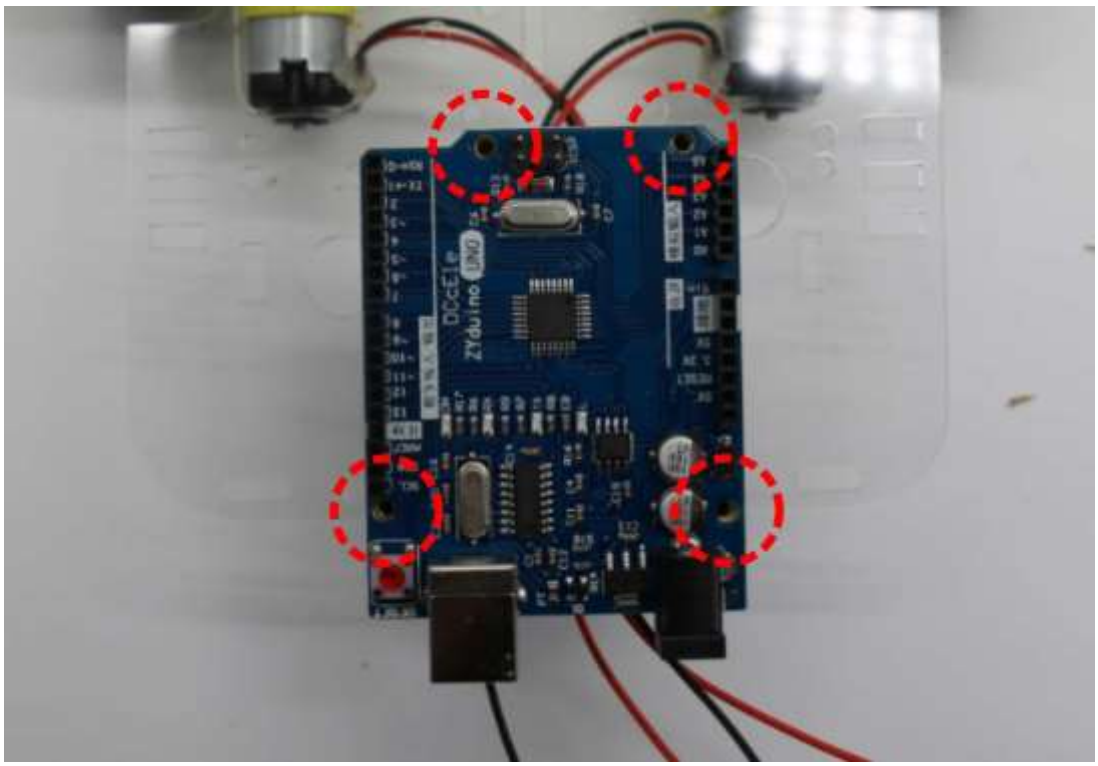


Figure 2- 3：Main control circuit indicating the four fixing points

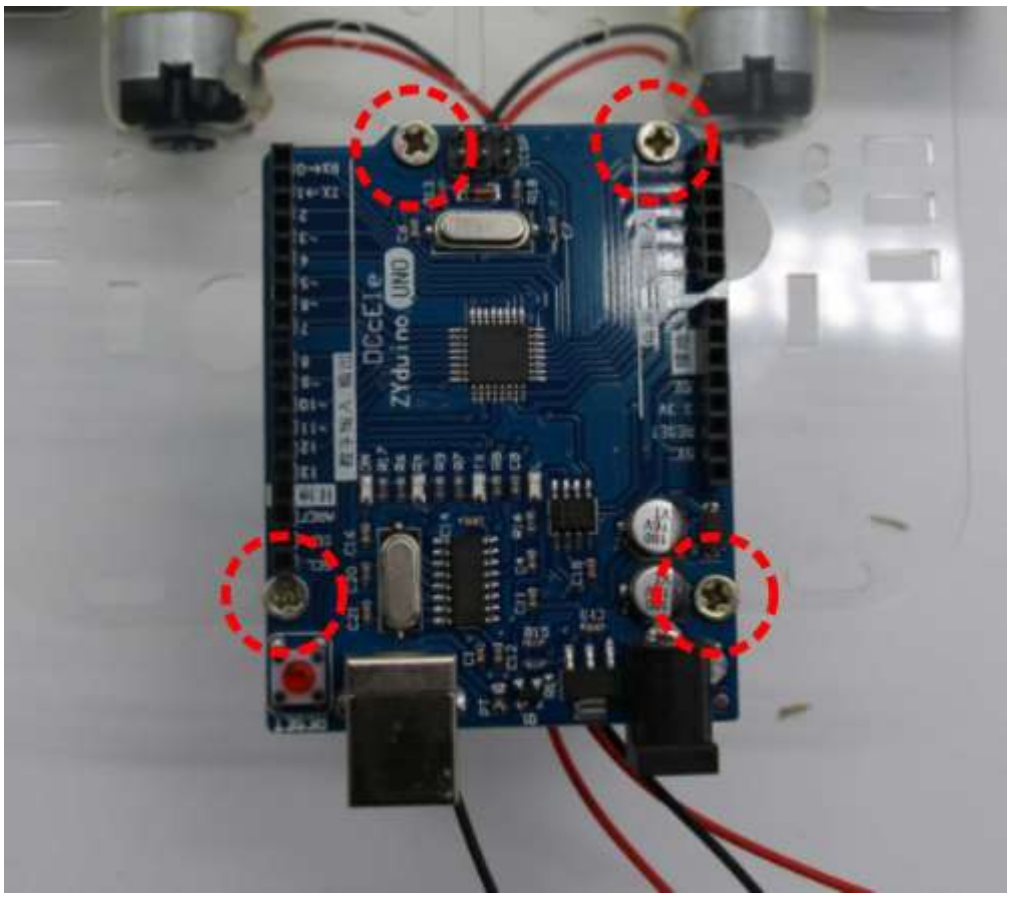


Figure 2- 4 : Main control circuit fixed with screws

Step 3 : Shield Module (interface)

We will use:

(1) Robot	1
(2) Shield Module	1

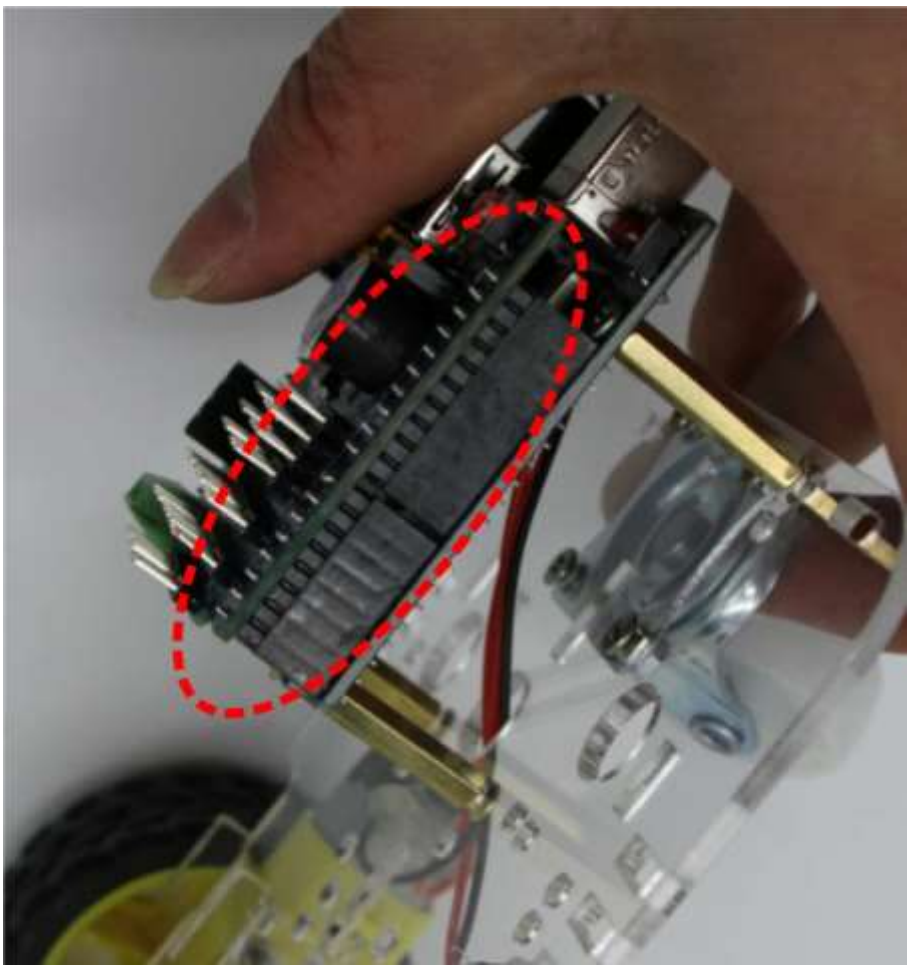


Figure 3- 1 : Installation of the Shield module.
Carefully, connect once again the module on the main control board

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 mm 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

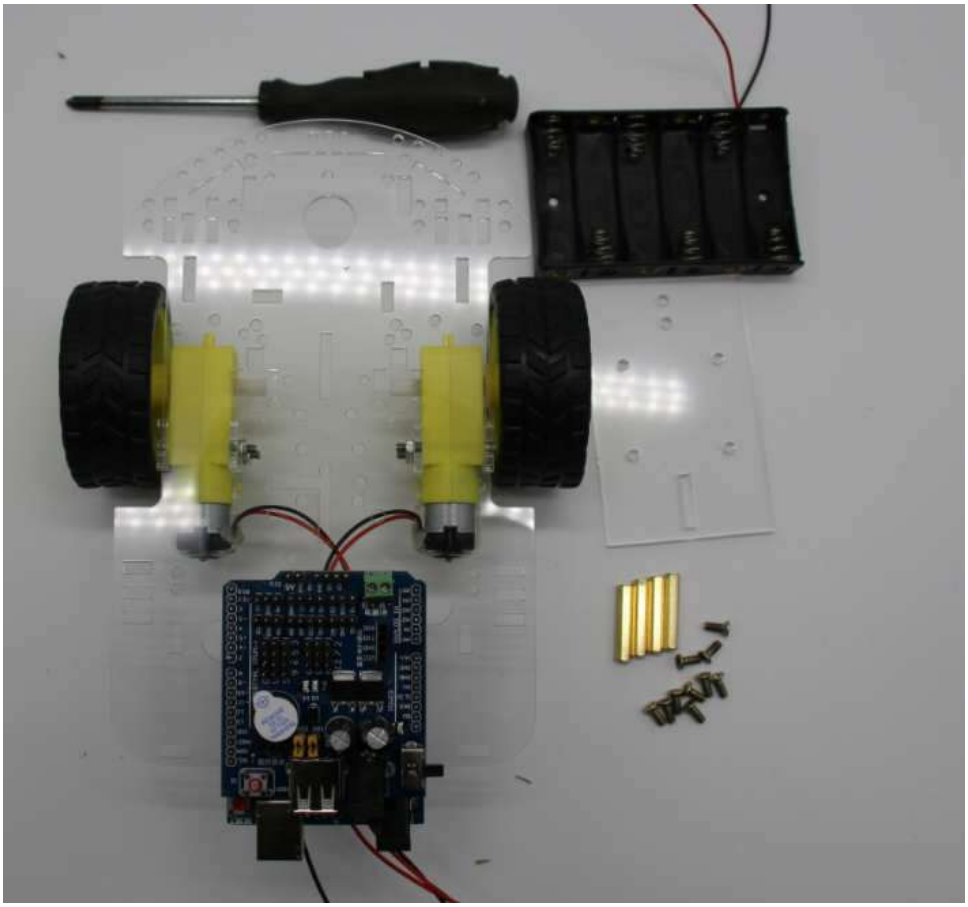


Figure 4- 1：Necessary pieces

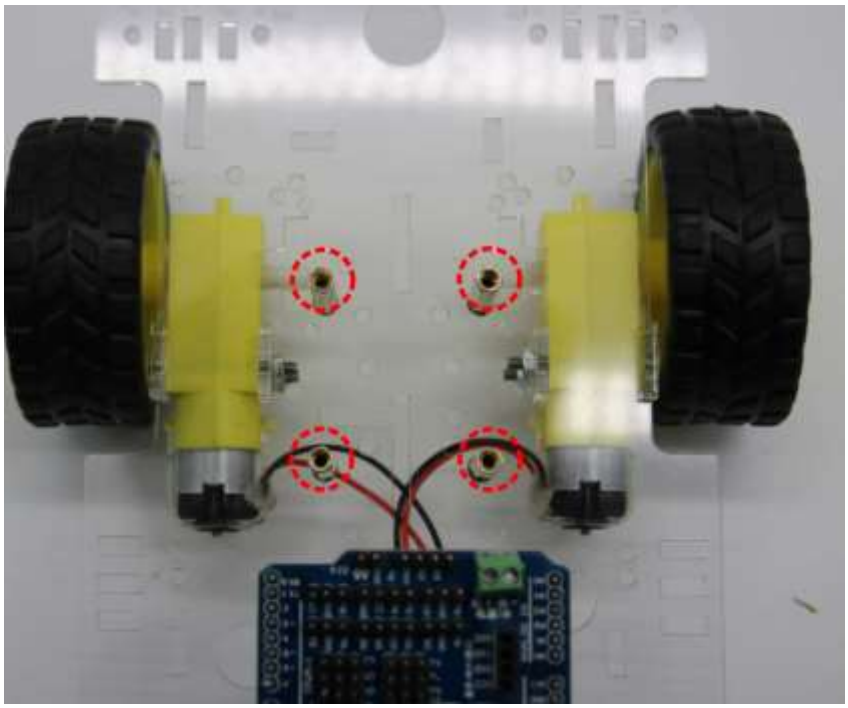


Figure 4- 2 : Spacers location

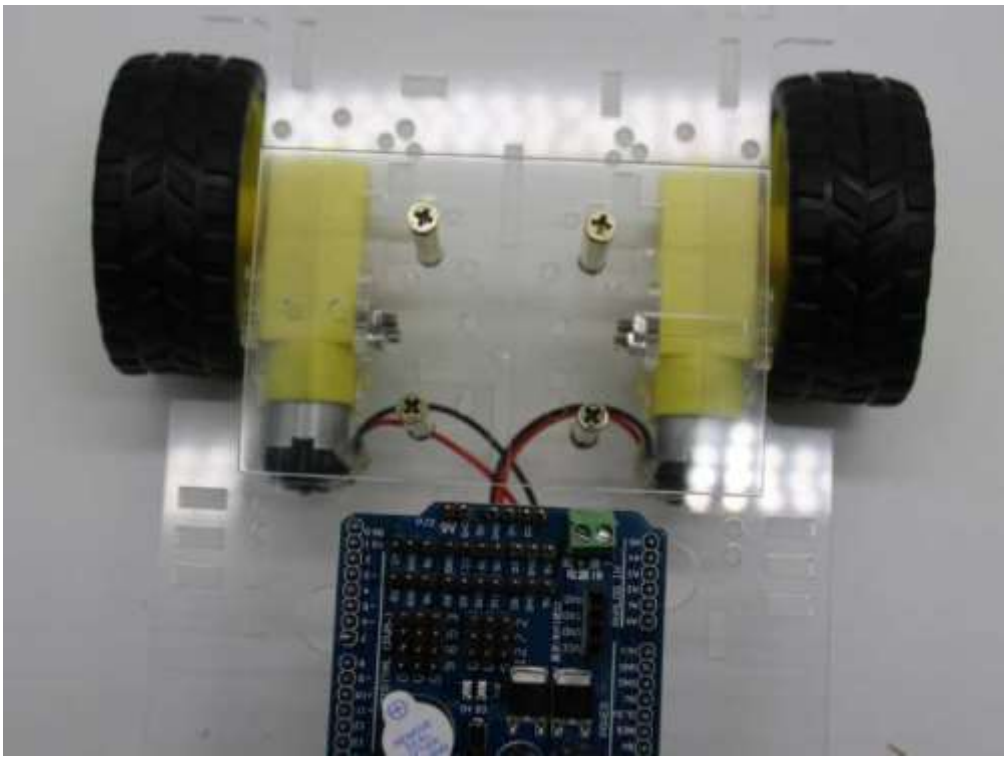


Figure 4- 3 : Acrylic board fixing

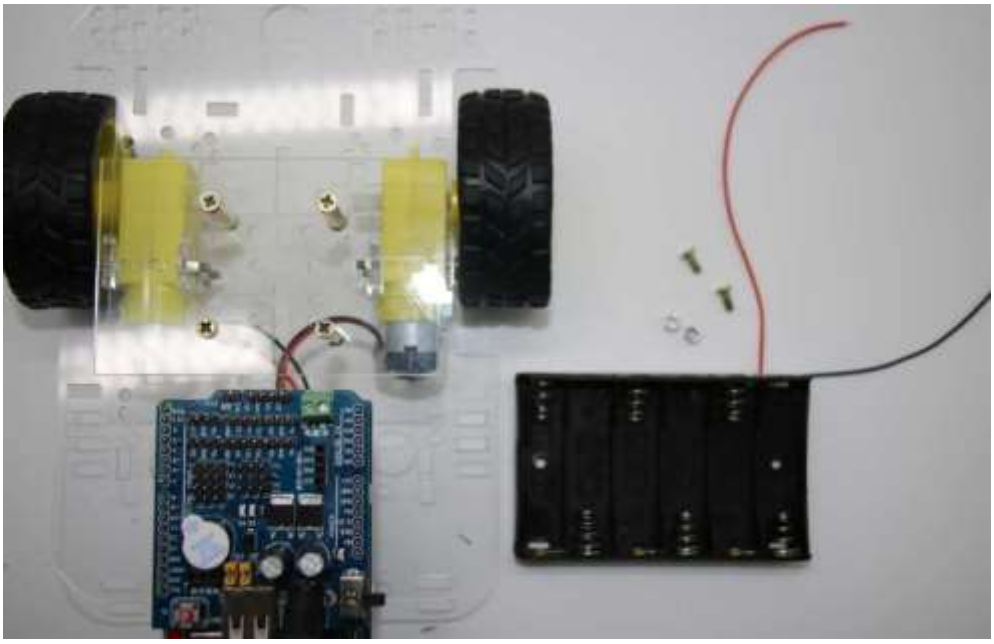


Figure 4- 4 : Preparation to fix the batteries-holder

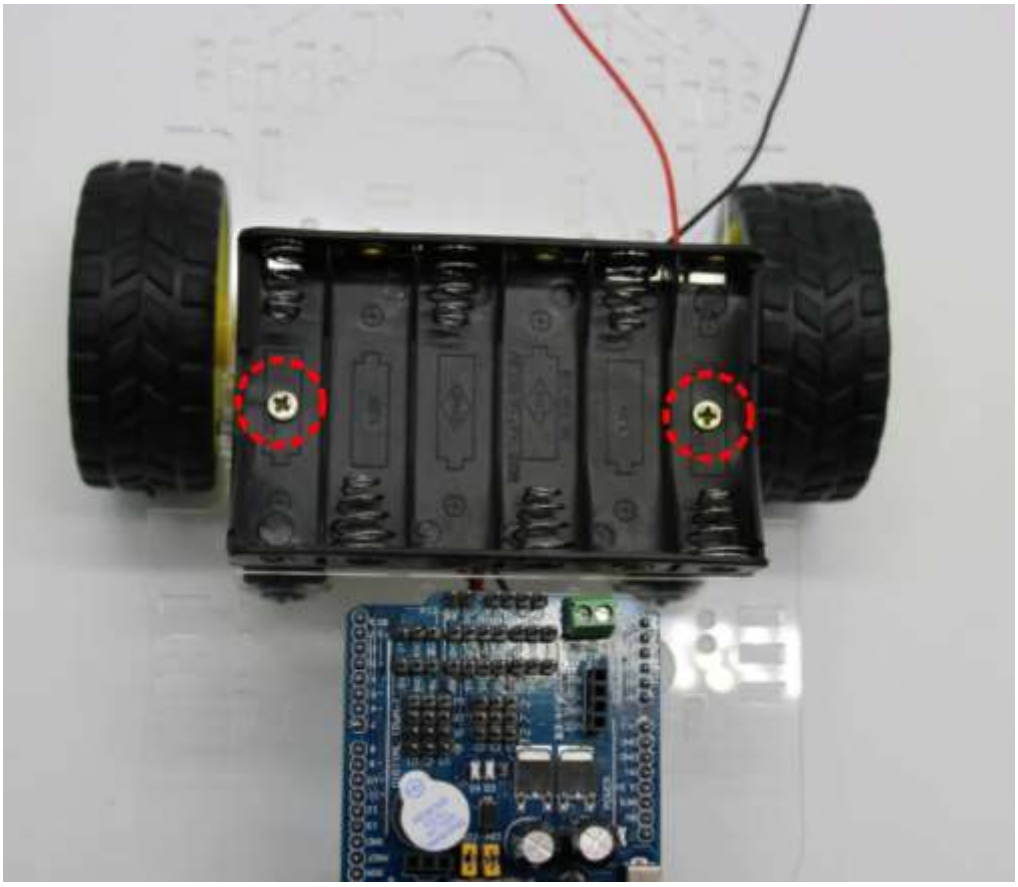


Figure 4- 5 : Batteries-holder once screwed fixed

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

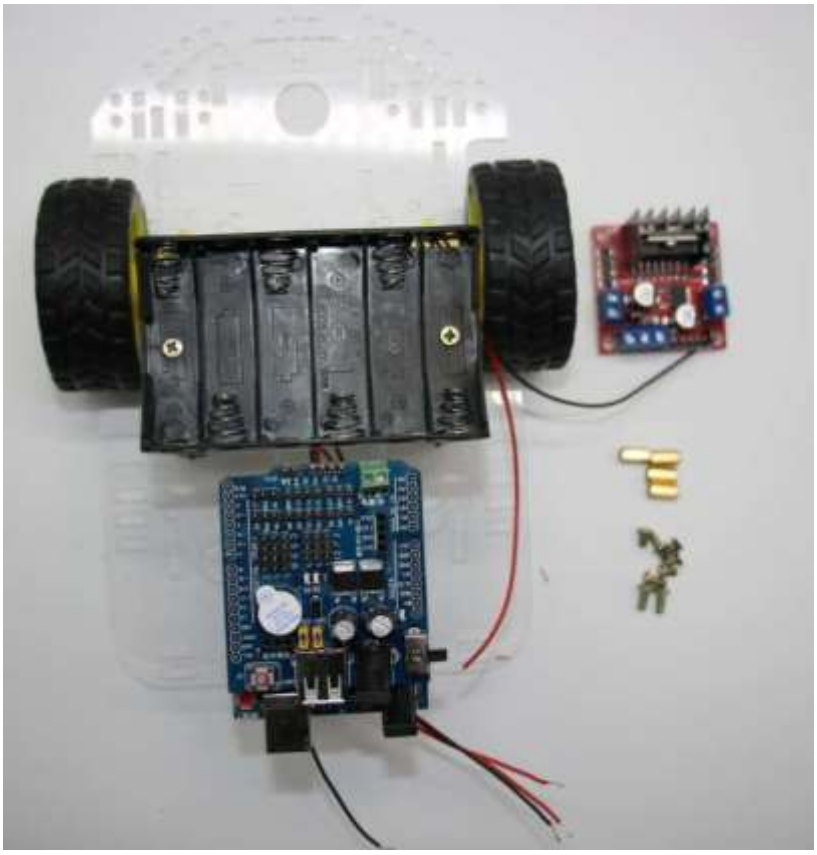


Figure 5- 1 : Pieces that we will use to fix the control circuit of motors

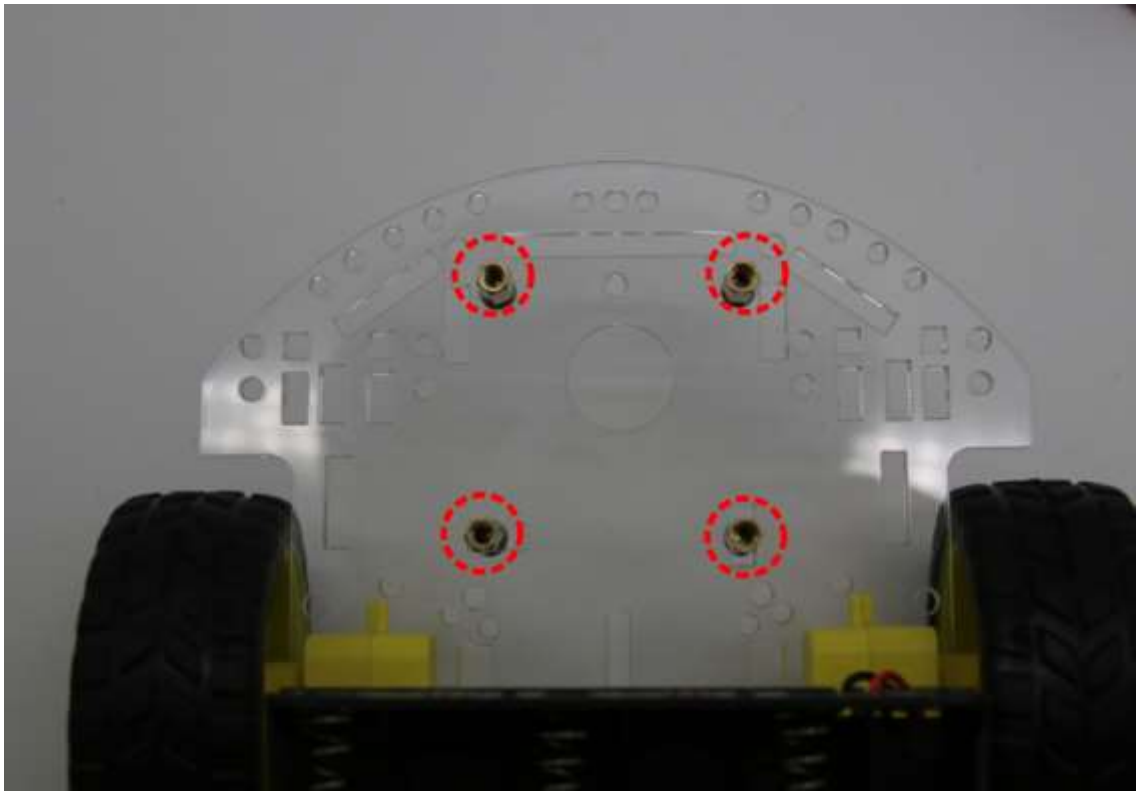


Figure 5- 2 : Spacers positions

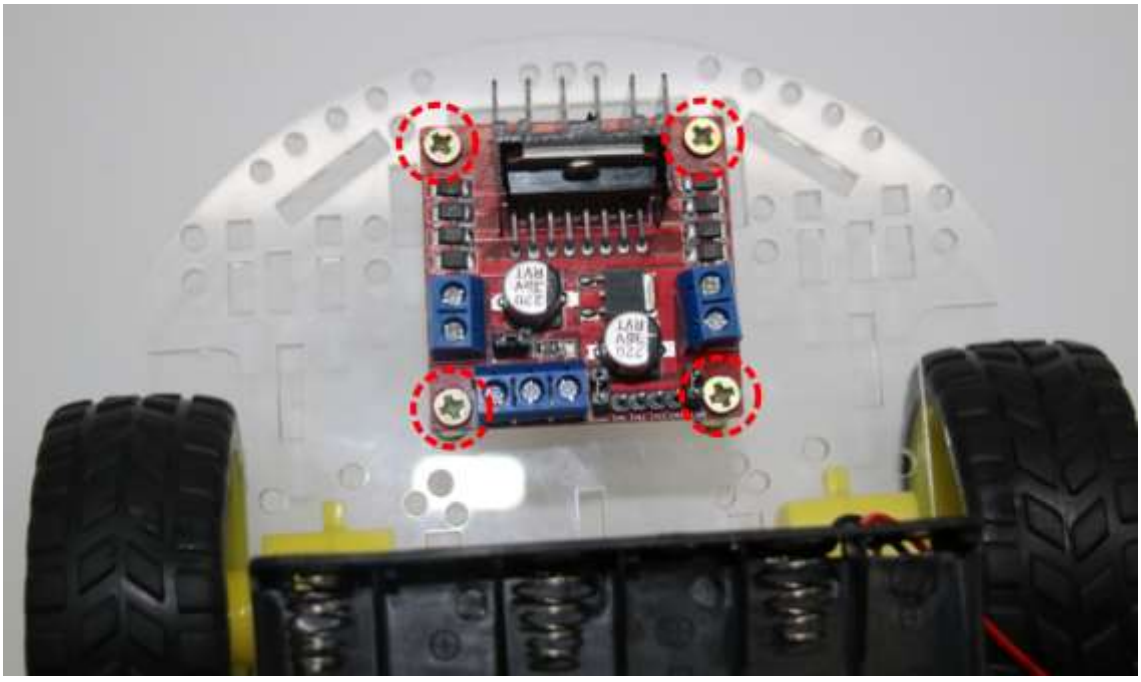


Figure 5- 3 : Control Circuit once fixed

Step 6: Smart robot wiring

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

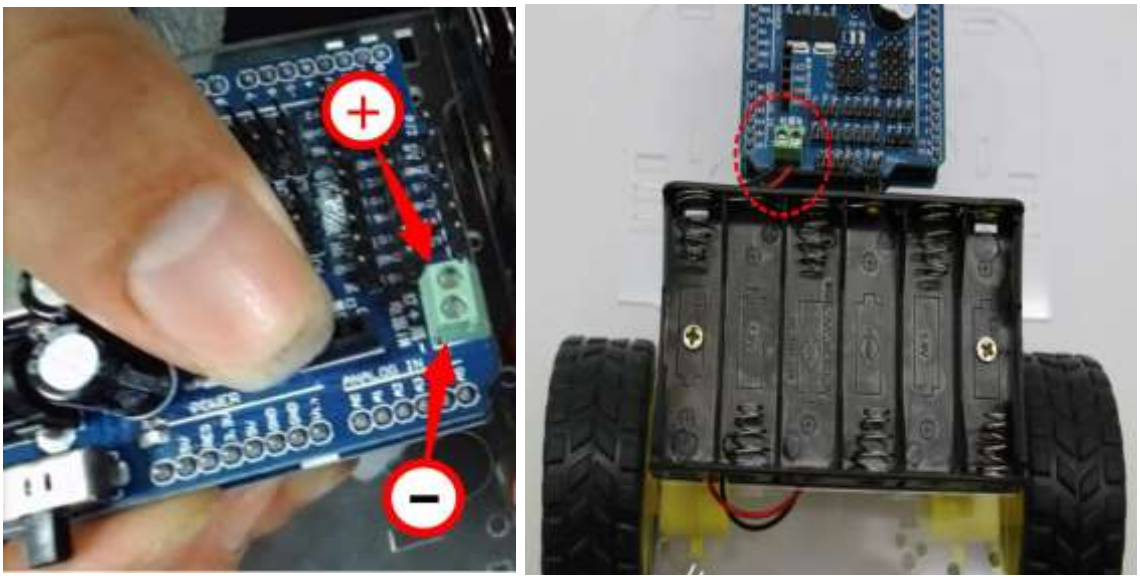


Figure 6- 1 : Batteries-holder wiring

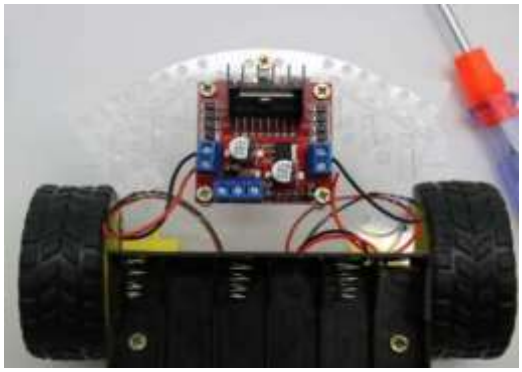
Batteries-holder	**Circuit Arduino UNO type with the Shield module assembled**
RED Cable	Terminal + (positive) of the terminal block feed
BLACK Cable	Terminal + (negative) of the terminal block feed

2. Connexion des moteurs

Figure 6- 2 :

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

Left Motor



Right Motor

Figure 6- 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

Step 7: Connection between motors control module and shield module

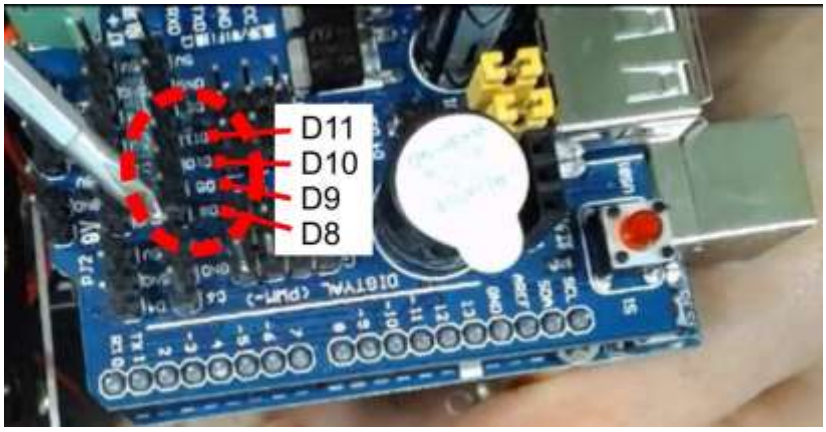


Figure 7 – 1 : Locations of contacts on the shield module

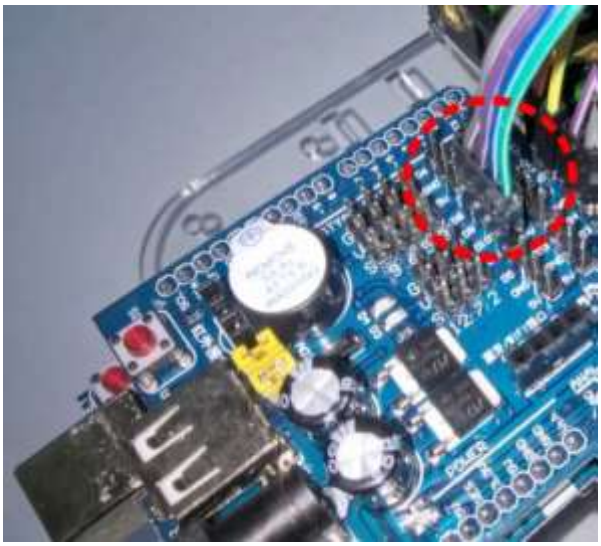


Figure 7 - 2 : Connector once connected on the Shield module

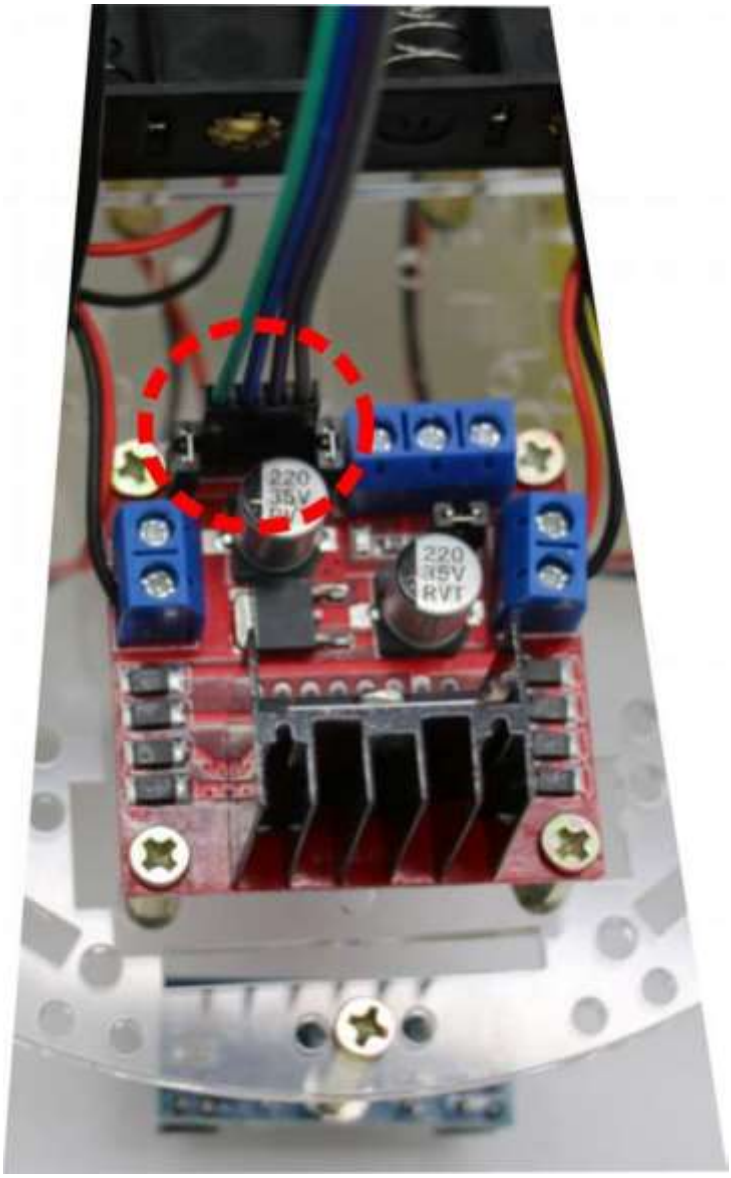


Figure 7 – 3 : View of the other extremity of the connector connected to the motor control module.

Pay attention to the polarity.

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

Connection of the power supply to the motors control module

Figure 7 – 4 : To supply the motors control module it is necessary to use a special cable. At a first extremity there are two connectors with two male lug pins which are connected to the terminal block of the motors control module.

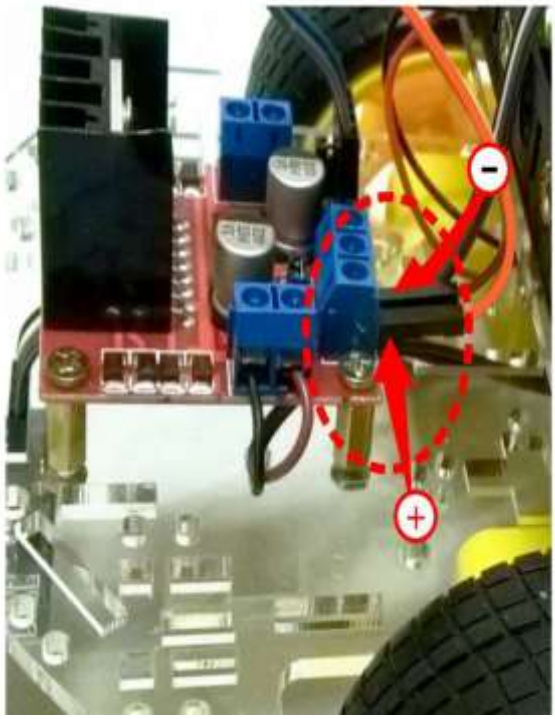


Figure 7 – 5 :

Connection of the power supply to the motors control module.

Attention, polarity.

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

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

Figure 7 – 6 :

The other extremity of the cable has two female connectors that will connect to the pins of the Shield module.

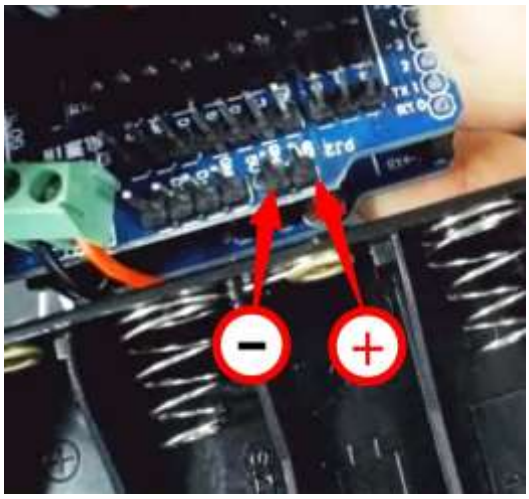


Figure 7 – 7 :

View of the location of the terminals on the Shield module

They are indicated on the module as:
9V (positive) and GND (negative)

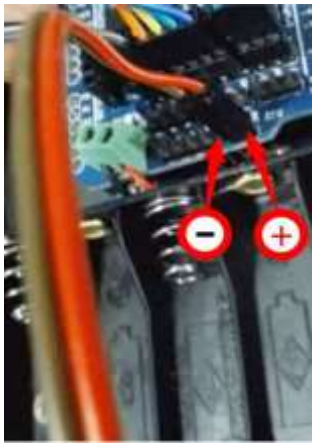


Figure 7 – 8 :

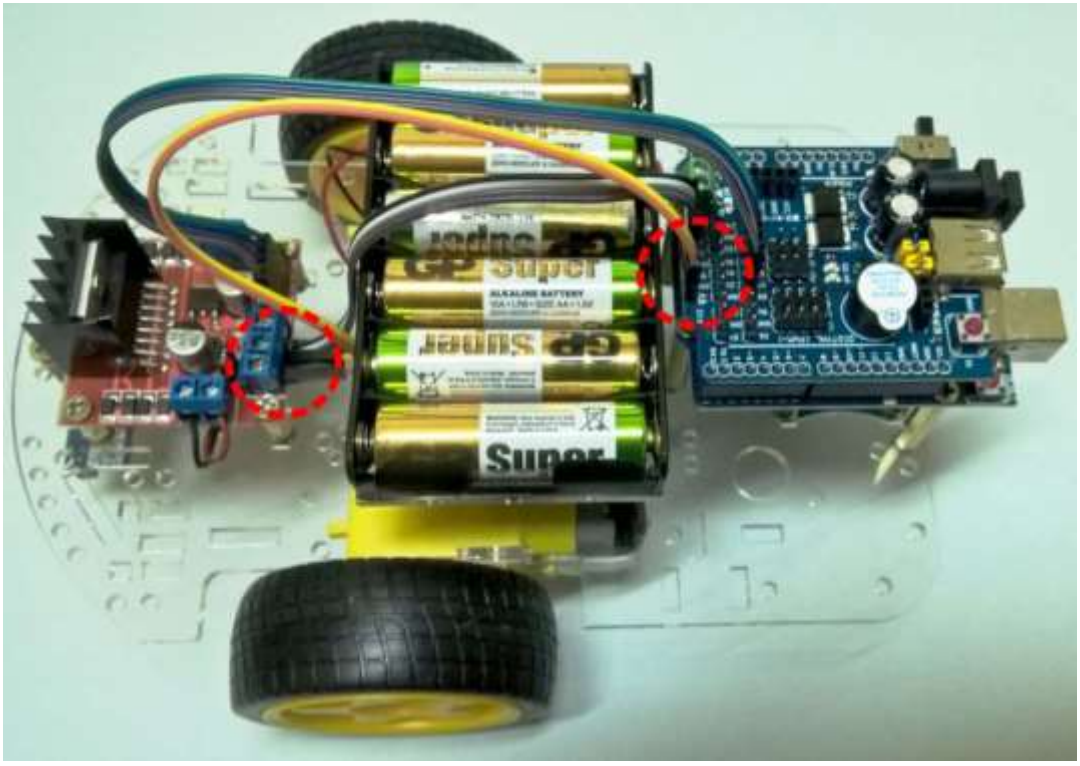
Cable connection on the Shield module.

Pay attention to the polarity.

Figure 7 –9 :

View of the robot, completely finished, where it is possible to appreciate the power supply connection of the motors control module.

The colors of the cables may vary depending on the photographed model.



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

Step 8: Remote control

We will use :

(1) Base robot previously assembled 1
(2) Remote control infrared transmitter 1
(3) Infrared receiver 1

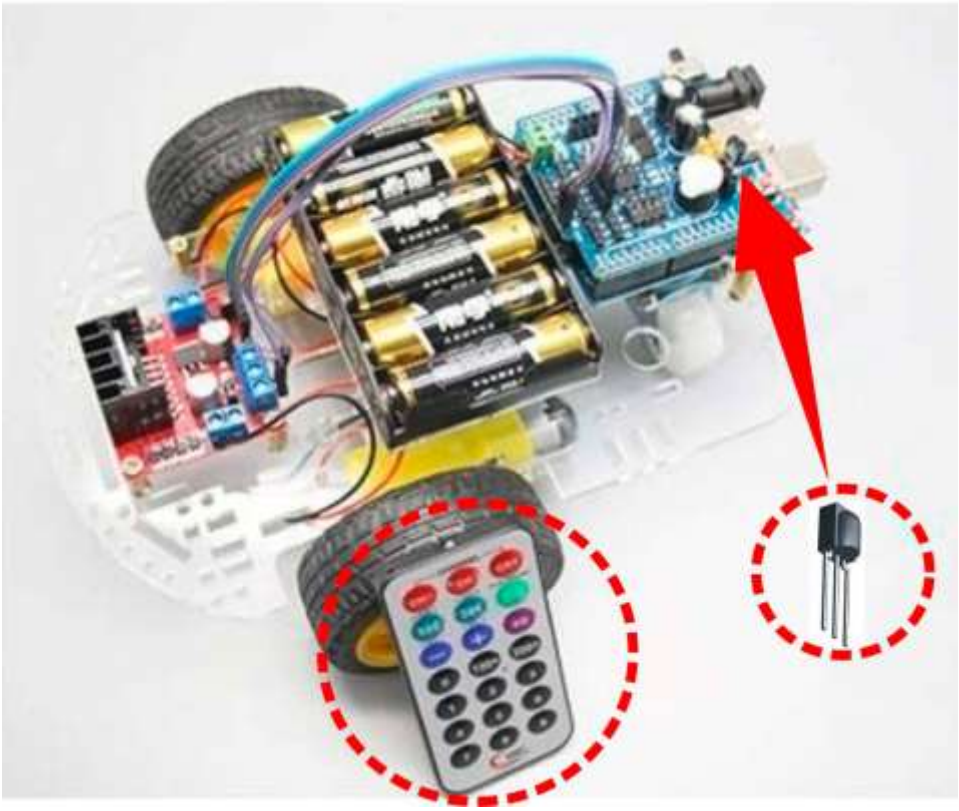


Figure 8 – 1 : Remote Control (LEFT) and infrared receiver (RIGHT)

Note :

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

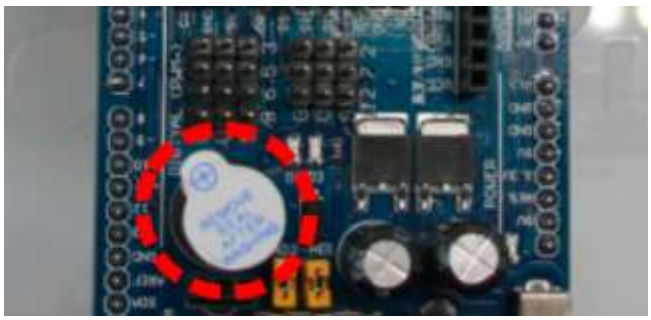


Figure 8 – 2
Loudspeaker with protection label.

We will now connect the infrared receiver, which is simply connected.

Figure 8 – 3 : Location of the base where the infrared receiver must be connected.

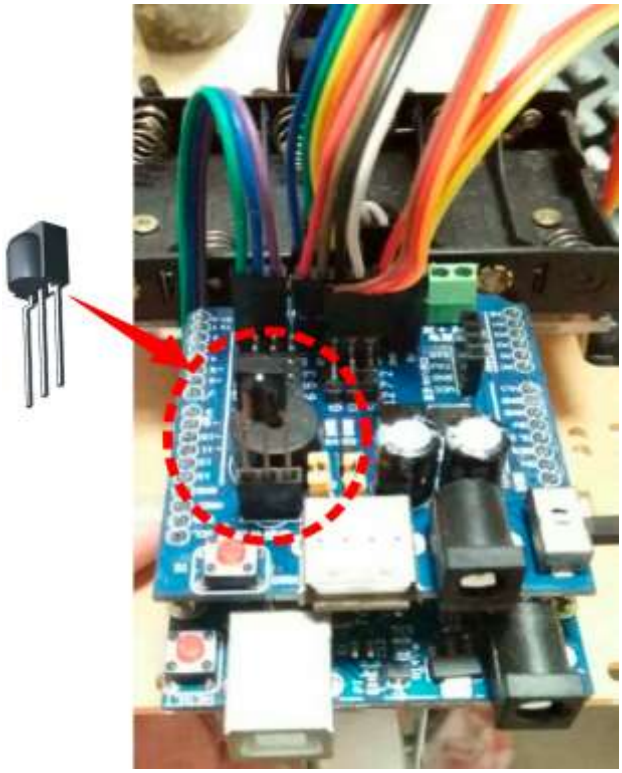


Figure 8 – 4 : View of the correct position of the receiver.

Caution: Do not confuse the correct polarity of the infrared receiver.

Step 9 . Infrared remote control

To prevent battery wear during transport and storage, they are protected with special insulation that you can see on the bottom of the remote control

It is necessary to remove this insulation in order to connect the remote control

Figure 9 – 1 : Pull the insulation outward until it is off the remote control.

Keep this insulation.

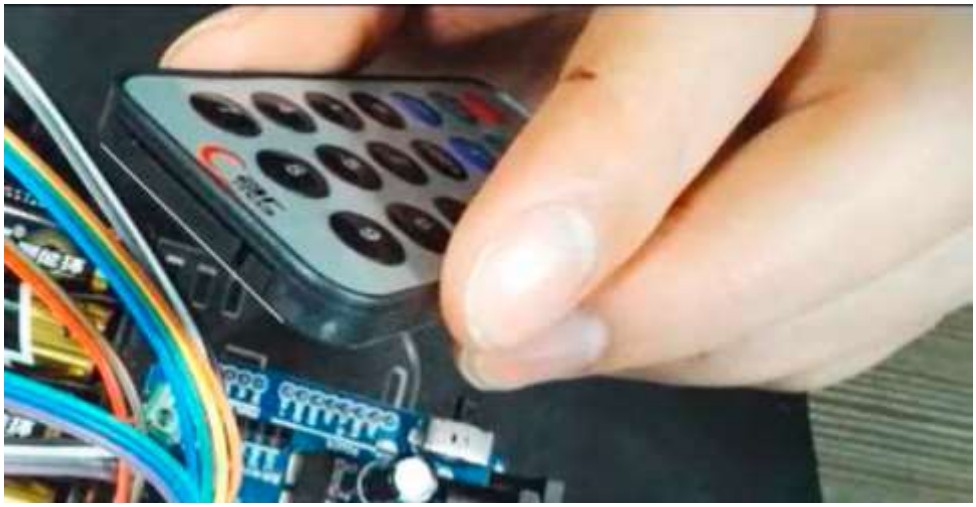


Figure 9 – 2 : Remote control prepared for use

Key functions of the infrared remote control

FFA25D	FF629D	FFE21D
FF22DD	FF02FD	FFC23D
FFE01F	FFA857	FF906F
FF6897	FF9867	FFB04F
FF30CF	FF18E7	FF7A85
FF10EF	FF38C7	FF5AA5
FF42BD	FF4AB5	FF52AD

Note:
The infrared software only accepts 5functions keys.
Please adjust the software to the values indicated in this instructions manual /page

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:

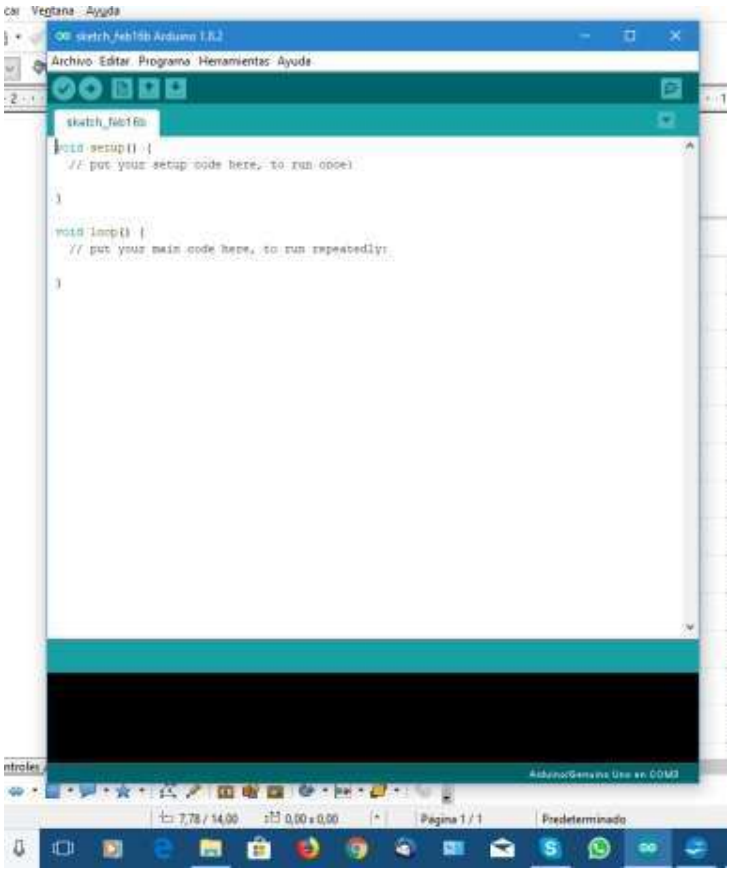
2) Connect the batteries to the robot

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

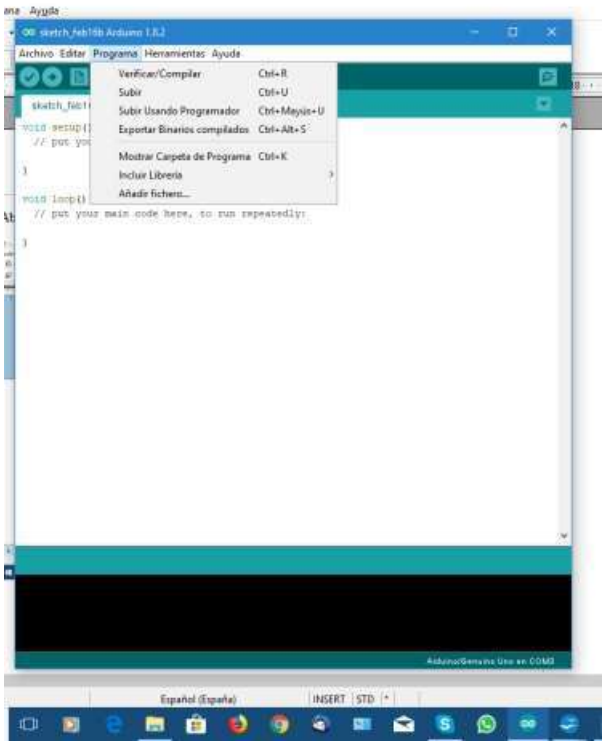
4) Install the Arduino Software in the robot

5) Install the software included in this CDROM **: IRemote** , proceeding as follows:

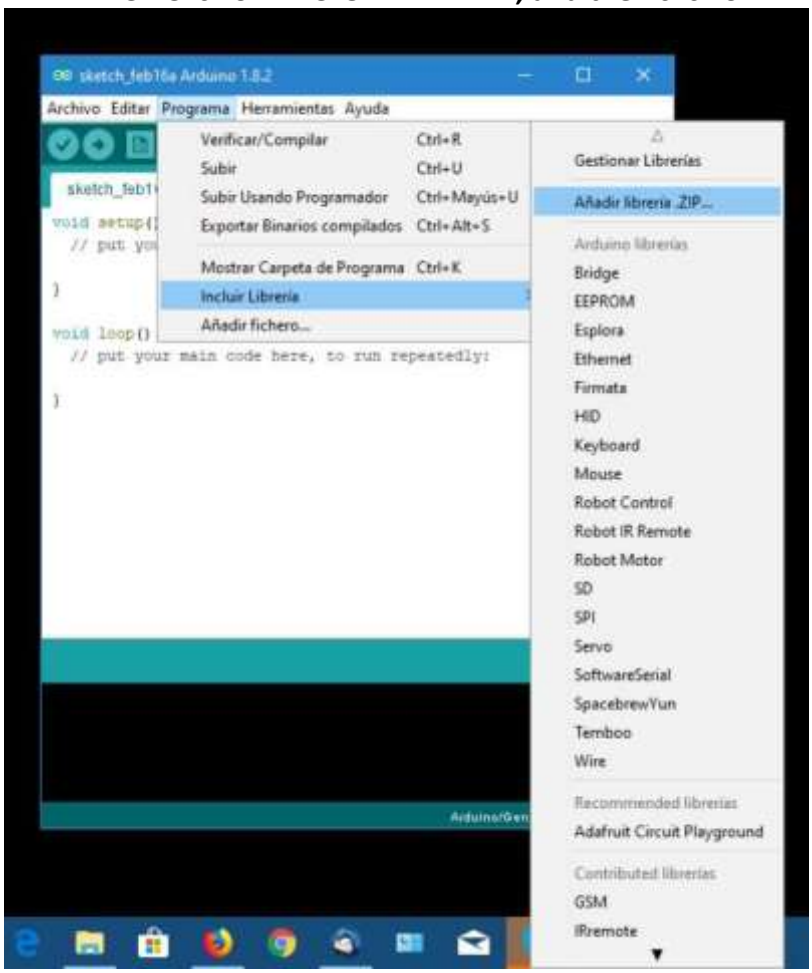
A.- Open the ARDUINO sofware



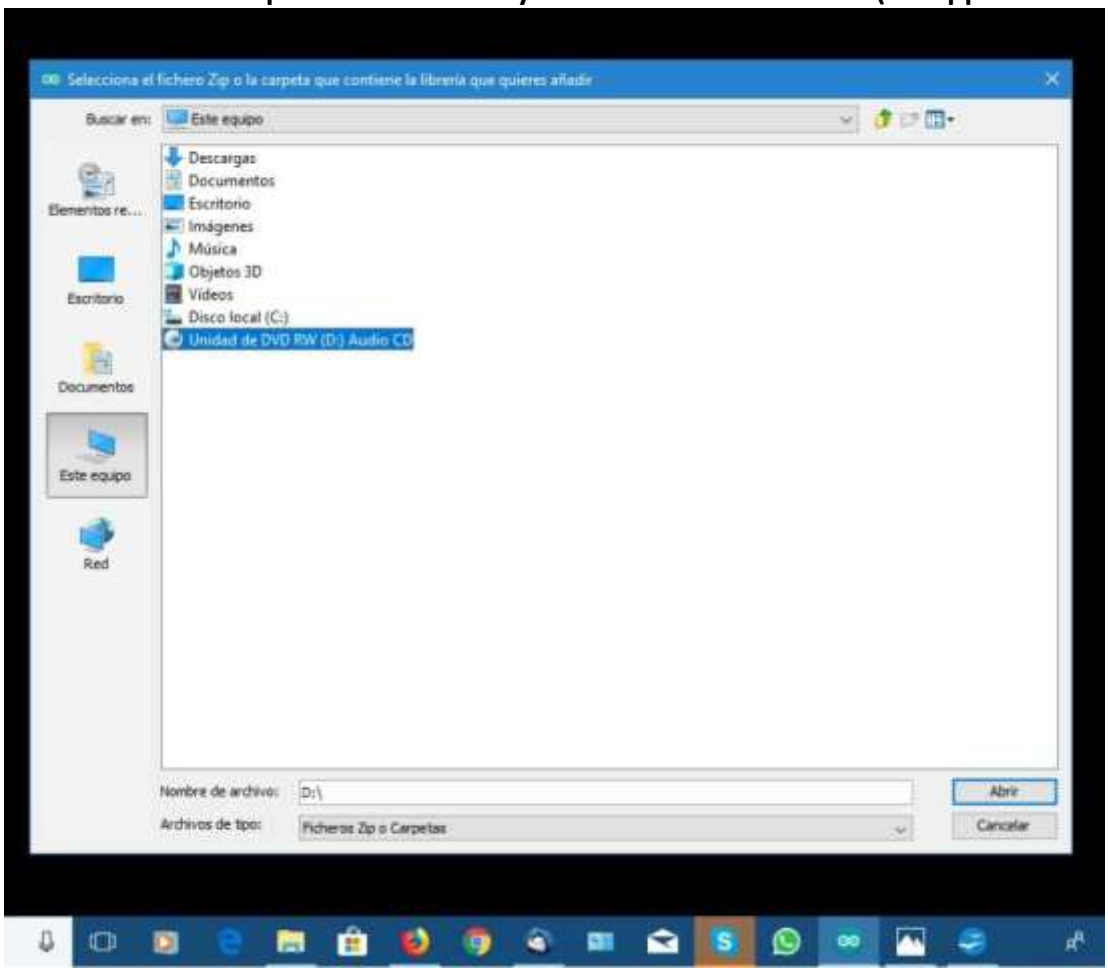
B.- Go to PROGRAMA and click



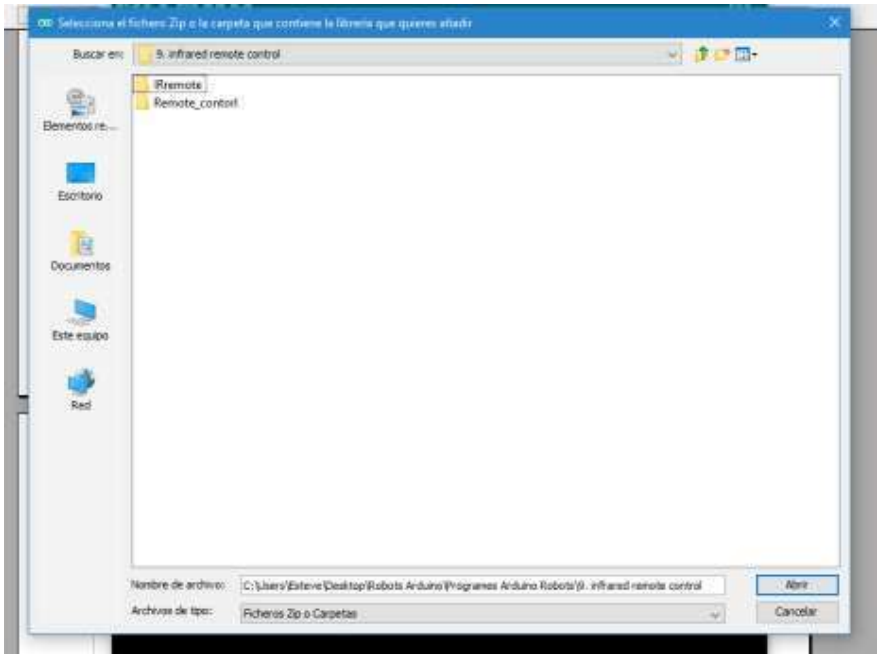
C.- Click on INCLUIR LIBRERIA, and then click on AÑADIR LLIBRERIA ZIP



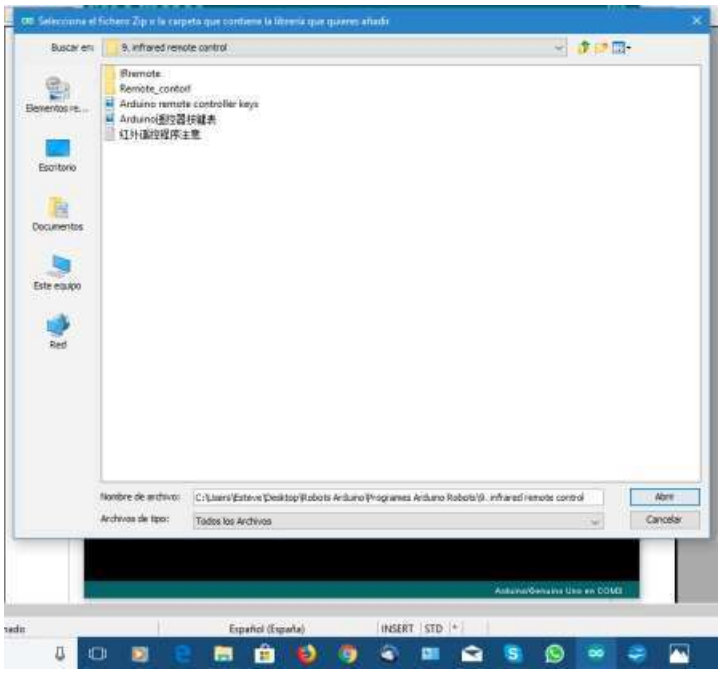
D.- It will open to the directory where the robot files are (in supplied CDROM).



E.- Select the directory where we are the robot software

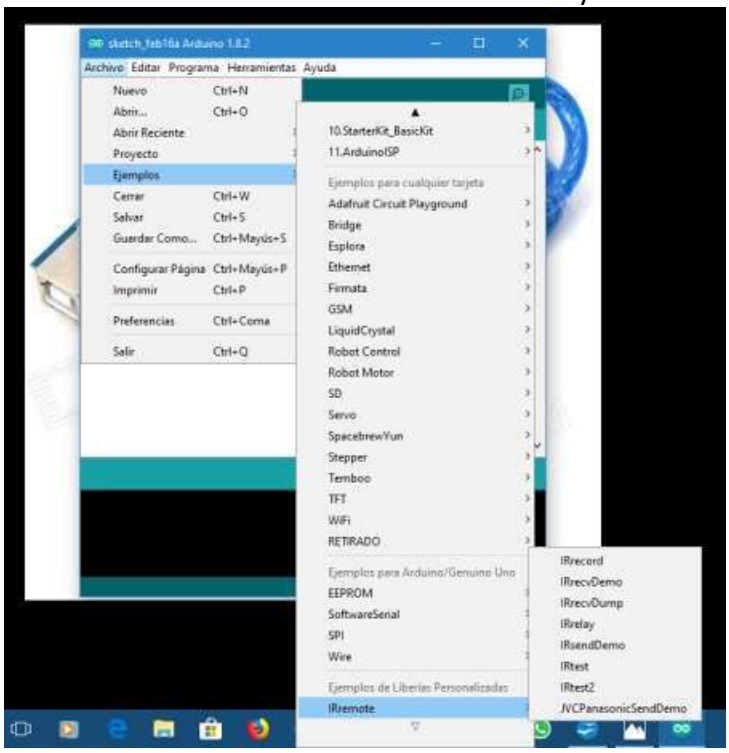


F.- Click on IRemote. You will see all the files contained



G.- Click and open. The library will be installed in the ARDUINO software.
Close the ARDUINO software to save the library.
Open the Arduino software again and verify that the library is properly installed.

H.- Click File and then click EXEMPLES.
Check in the submenu that the library is well installed.



6) Once installed the IRemote library, install the other software that is included in the CD-ROM: **remote_control.ino**

7) Unplug the USB cable from the robot

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

9) Press the S1 button on the Shield module. The robot buzzer will sound and it will be ready to be used with infrared remote control.

10) 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 **remote_control.ino**

Annex:
- **remote_control.ino**
- **librairies arduino**

Diagram of the control board:

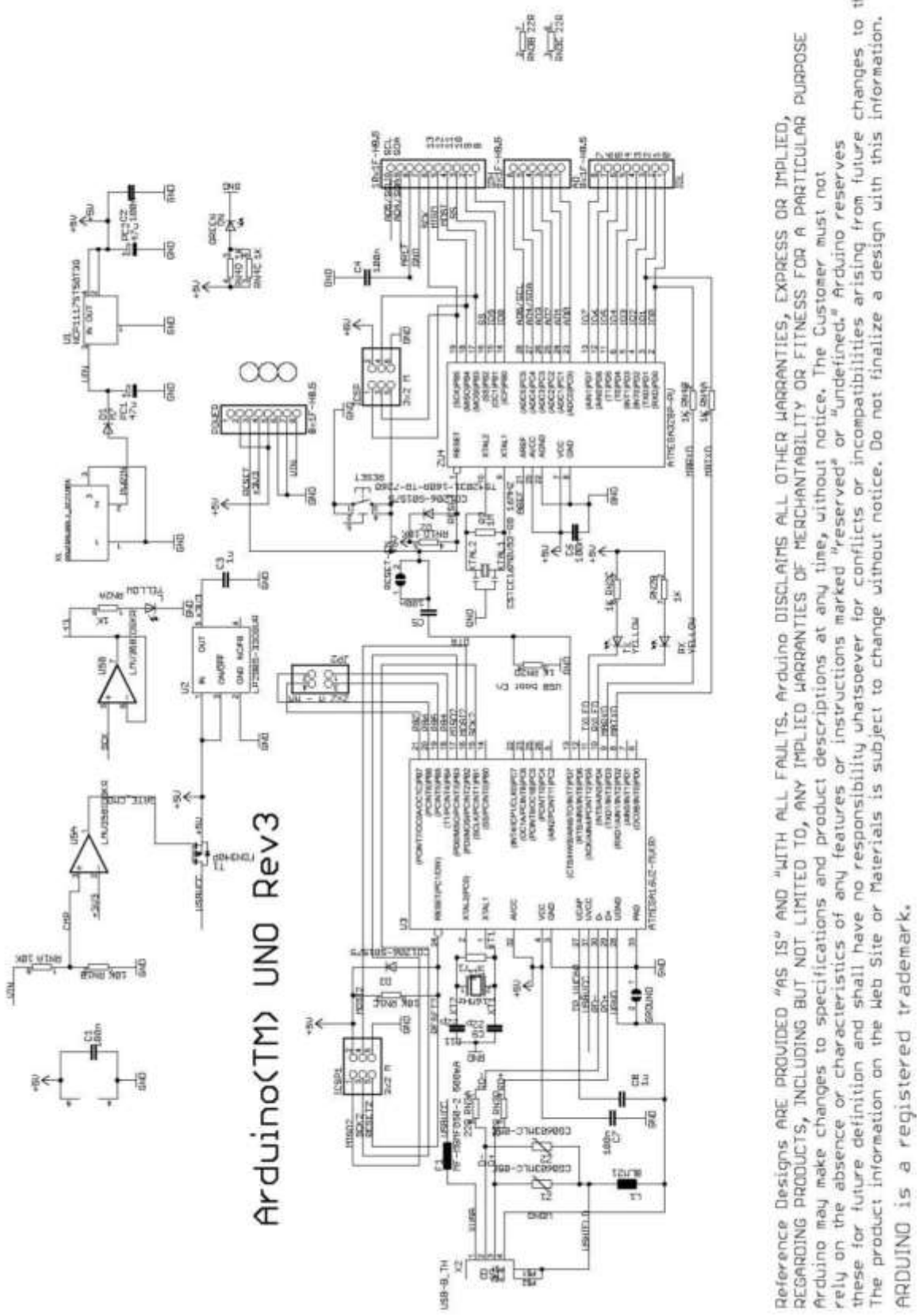
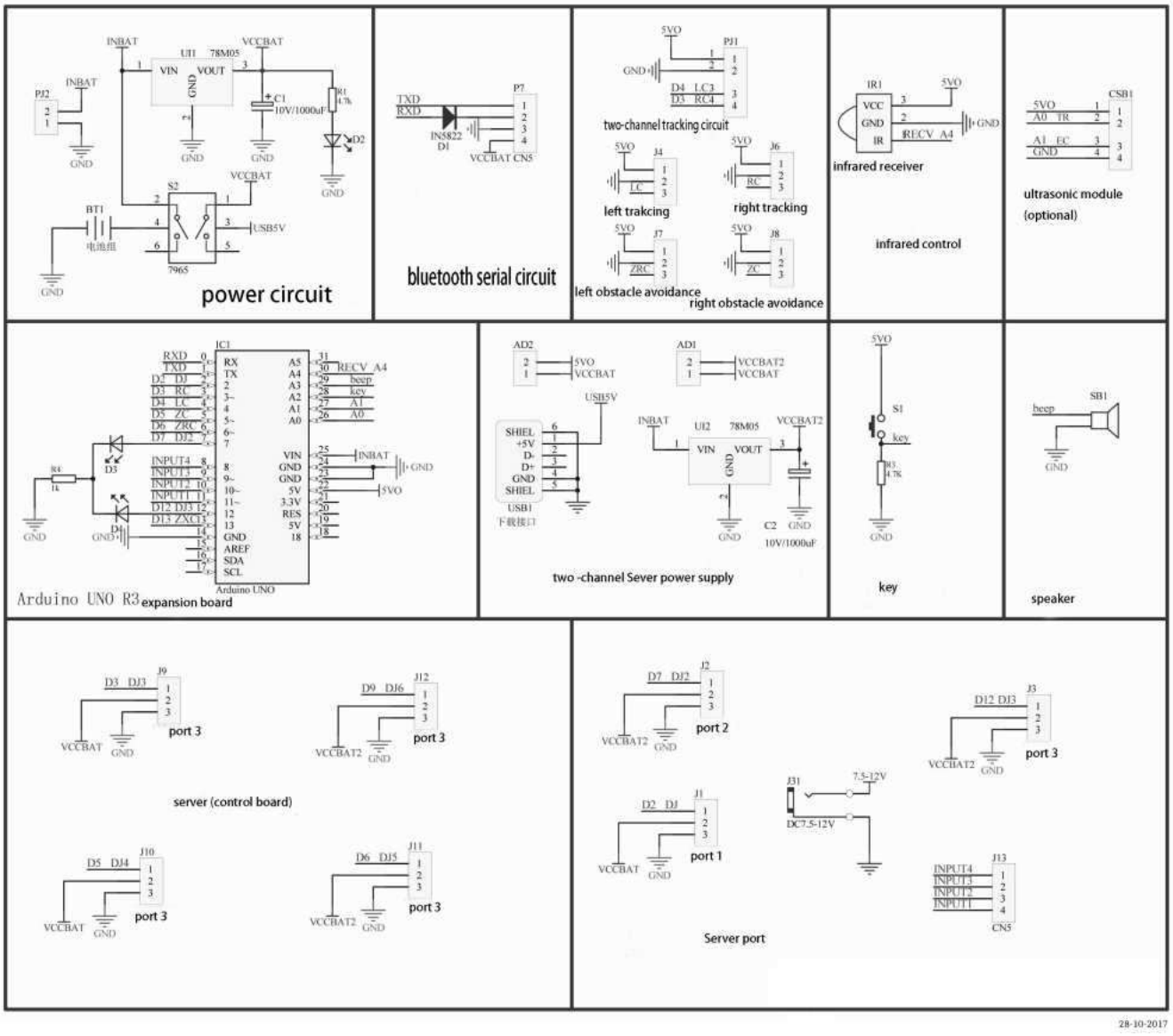


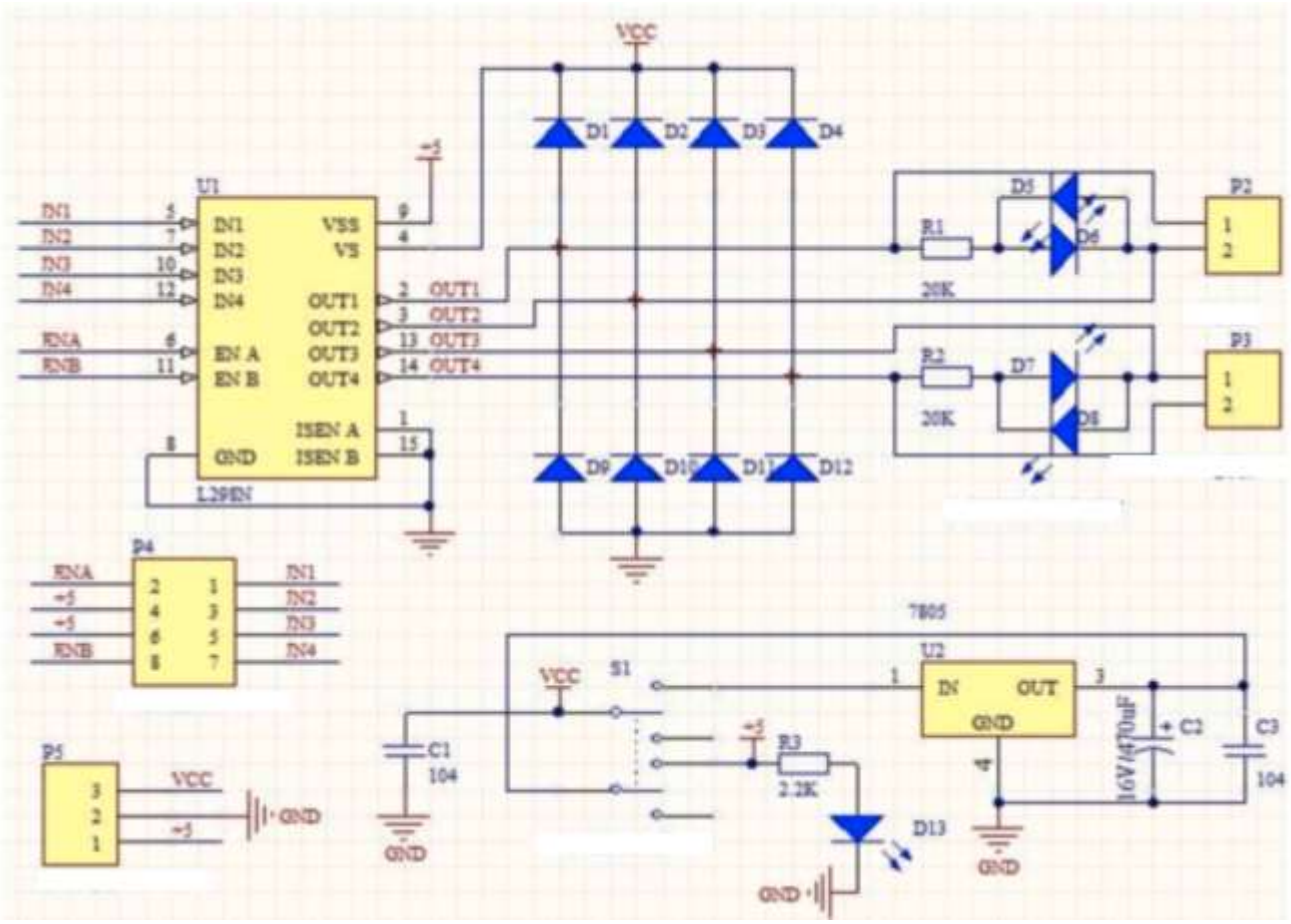
Diagram of the Shield module



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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