MIT App Inventor Codi Bot

User Manual

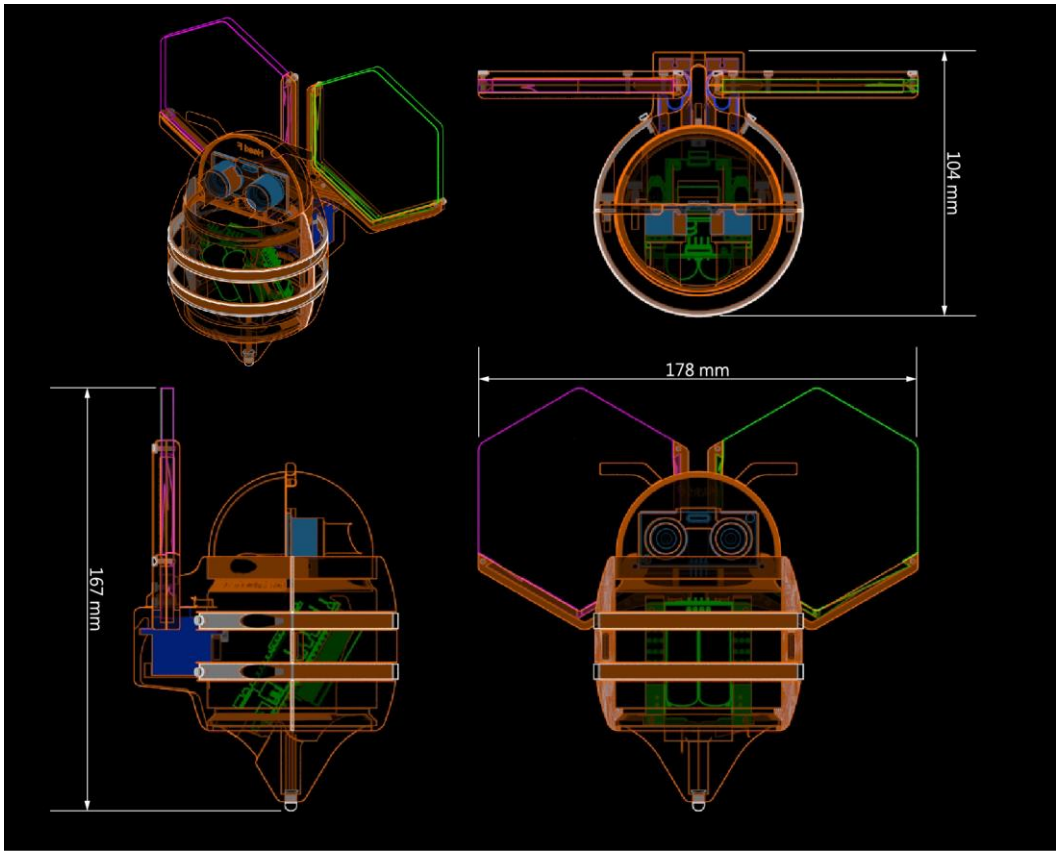
Introduction

MIT App Inventor Codi Bot is an educational kit demonstrating the Internet of Things (IoT). It has adorable appearance and children and adults alike can control it with App Inventor through Bluetooth communication. We have provided tutorials to show you how to interact with Codi Bot various functions, including:

- **Standalone demo**
- **LED**
- **Wing (servo)**
- **Sound**
- **Complete Codi Bot app**

Specification

- Dimension: **178** x **104** x **167** (W, L,H in mm)
- LinkIt 7697 power supply: 5V adaptor or powrbank with USB connector. PC USB port.
- Robot shield power supply: 5V adaptor or powerbank with USB connector. PC USB port. All components can function normally only when the shield is powered on (switch left).



Hardware

Parts list (purchase link)

Each set shall include the parts listed below:

1. LinkIt 7697 MCU board, 1
2. RobotShield extension board, 1 (with an onboard buzzer)
3. RGB LED (common cathode), 1
4. **LED stripe green** (left wing), 1
5. **LED stripe purple** (right wing), 1
6. Ultrasonic sensor(HC-SR04), 1
7. female-female jump wires, 10
8. mini servo (SG90), 2
9. screw
    a. M3x8, 7pcs

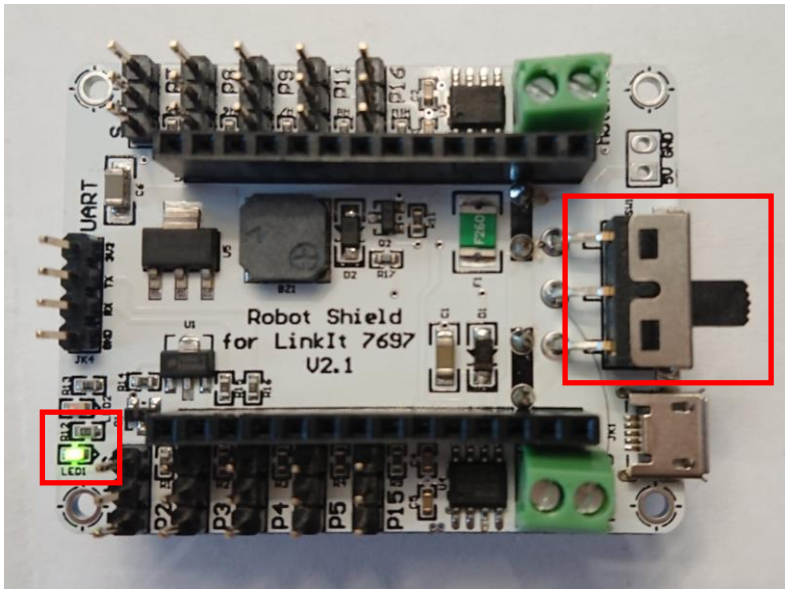
b. M2x12, 2pcs

c. M2x6, 12pcs

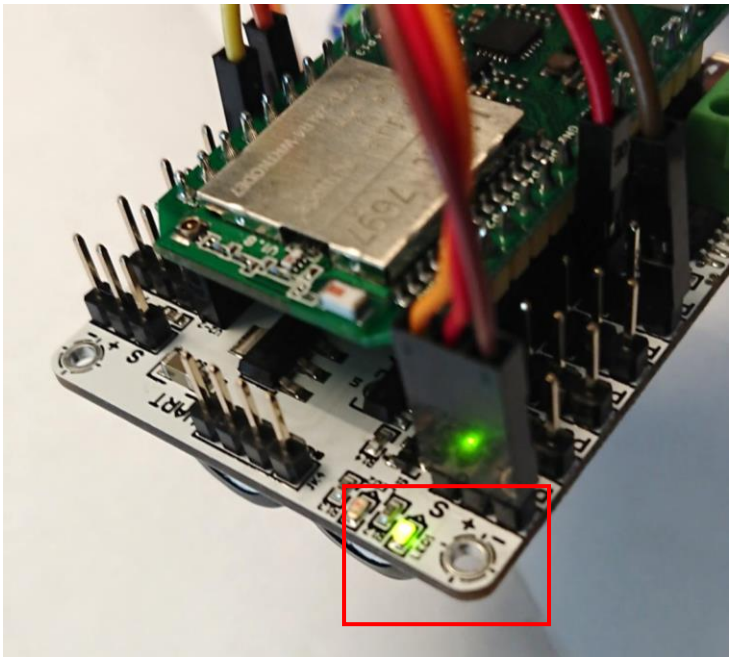
10. Acrylic (base, wings), 2 pieces.

11. Cow leather (stripes and body cusions), 4 pieces.

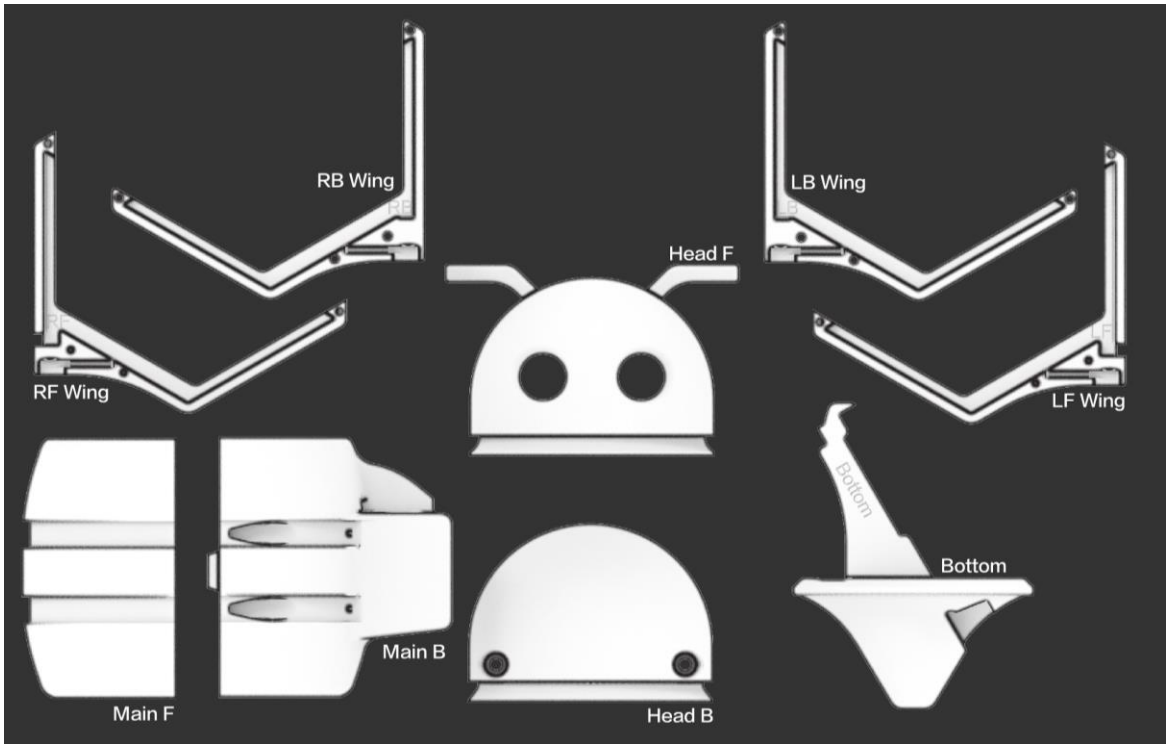
12. 3D printed parts(Main F, Main B, Head F, Head B, Bottom, Wing RF, Wing RB, Wing LF, Wing LB), 9 pieces.



Note: each 3-pin port of Robot Shield has labeled with **S** (signal), **+** (Positive) and **-** (Negative/GND). For each component's power supply, connect component's +/- terminals to corresponding +/- pins, which is within the same port of the signal pin.

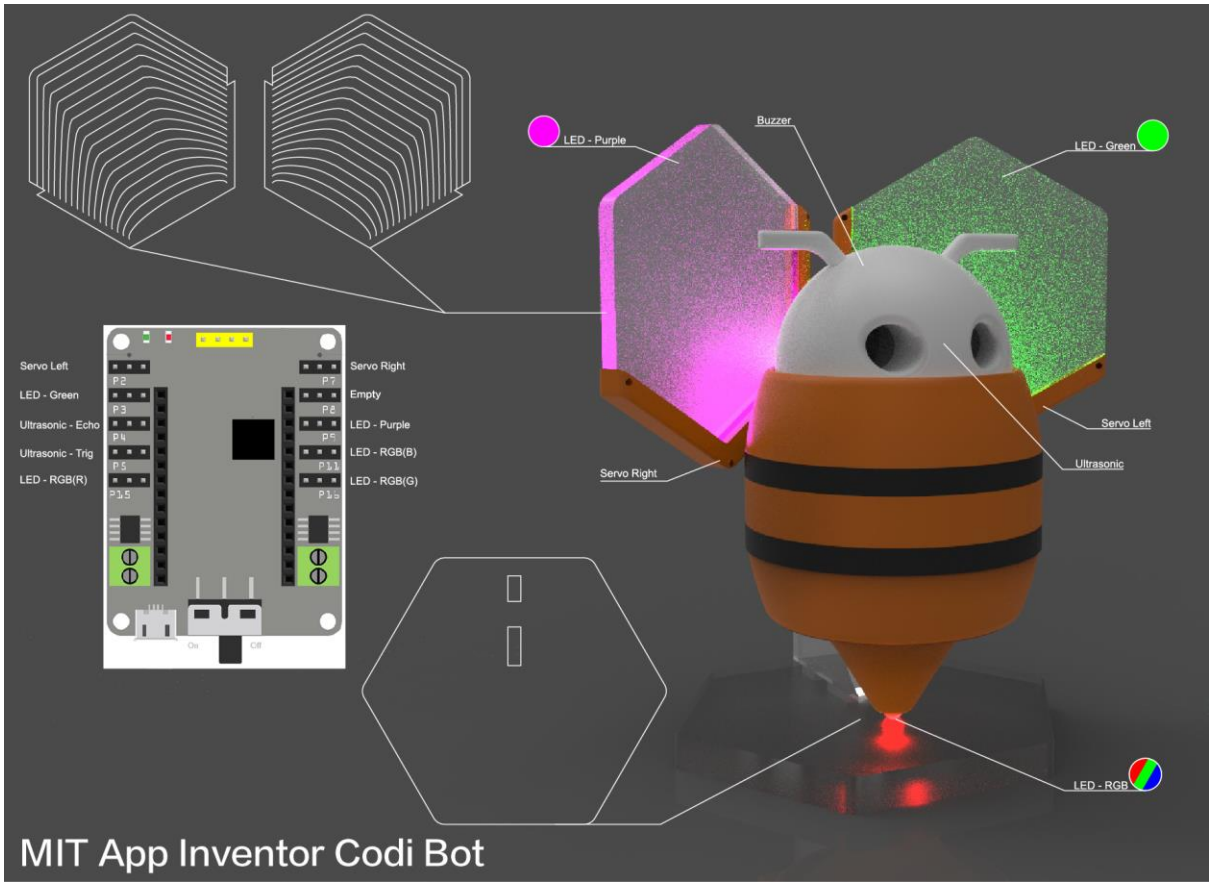


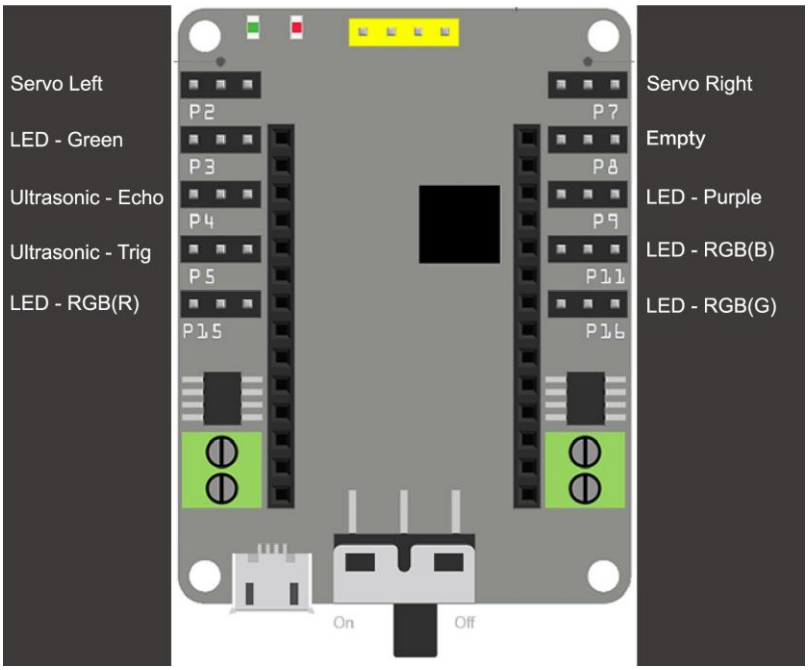
3D parts



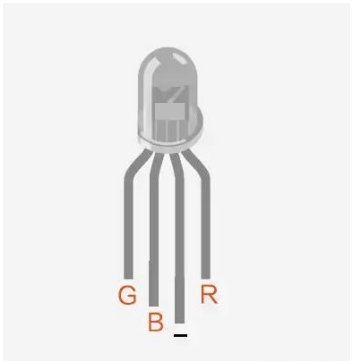
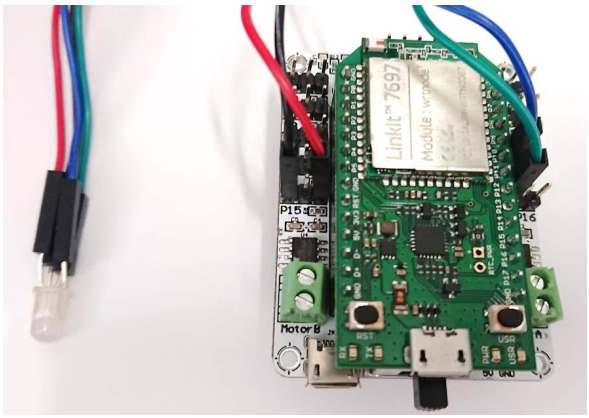
Pin mapping

This section will guide you through connecting each component pin to the corresponding Robot Shield pin. Please ensure you connect all of them accordingly or your Codi bot may not function normally.

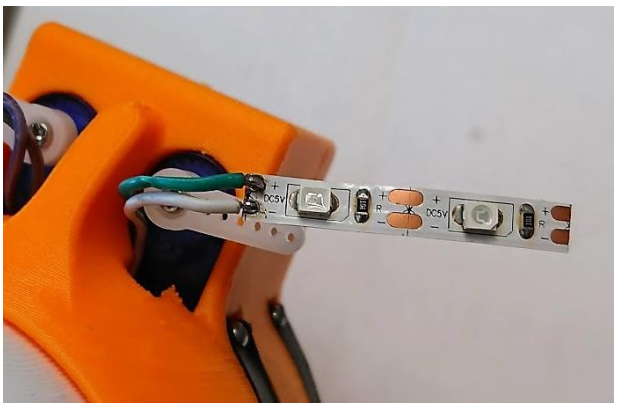

LED - Purple
Buzzer
LED - Green
Servo Left
Ultrasonic
Servo Right
LED - RGB
Servo Left
LED - Green
Ultrasonic - Echo
Ultrasonic - Trig
LED - RGB(R)
Servo Right
Empty
LED - Purple
LED - RGB(B)
LED - RGB(G)
MIT App Inventor Codi Bot


Servo Left
LED - Green
Ultrasonic - Echo
Ultrasonic - Trig
LED - RGB(R)
P2
P3
P4
P5
P15
P7
P8
P9
P11
P16
Servo Right
Empty
LED - Purple
LED - RGB(B)
LED - RGB(G)
On
Off

RGB LED (base)

RGB LED	Robot shield	
R	P15	
G	P16	
B	P11	
GND (longest pin)	- of P11/P15/P16 port (any one)	

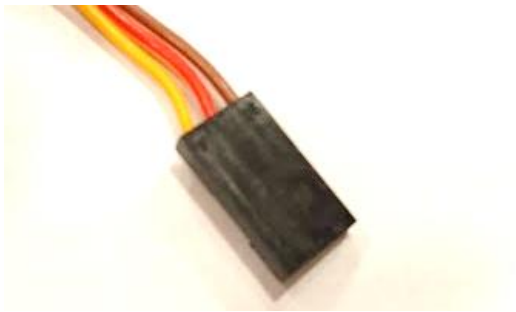
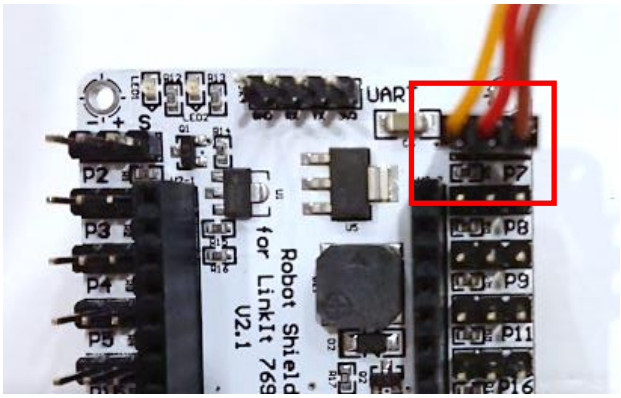
LED green (left wing)

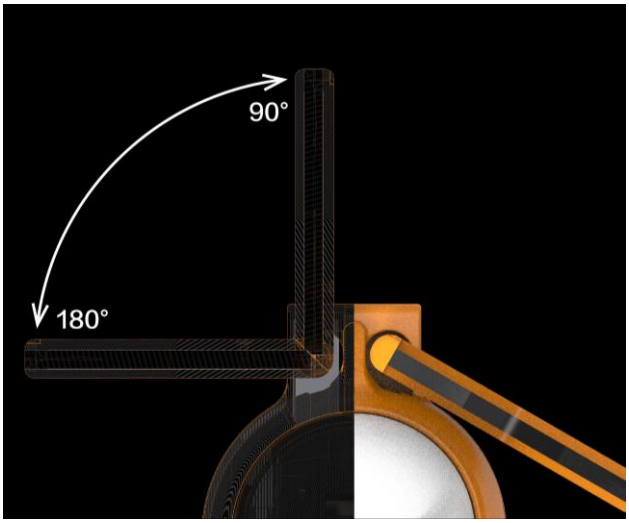
LED green (right wing)	Robot shield	
+	P3	
-	- of P3 port	

LED purple (right wing)

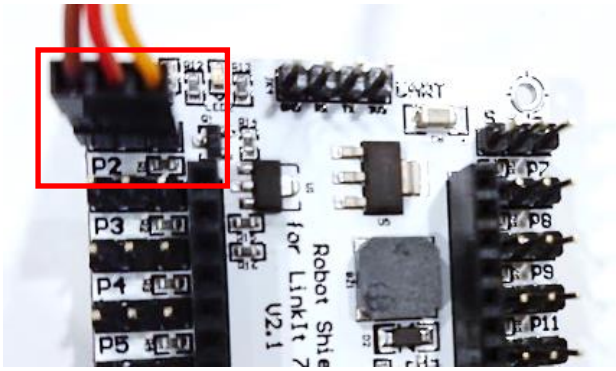
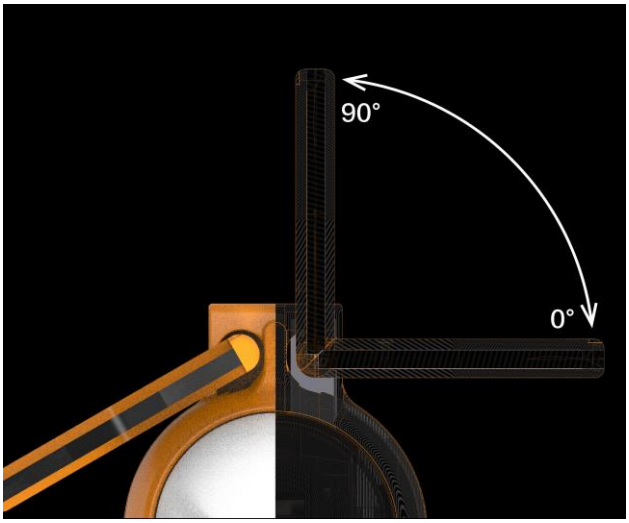
LED purple (left wing)	**Robot shield**	
+	+ of P9 port	
-	P9	

Right Servo

Right Servo	**Robot shield**	**Outward**: servo position 180 degree **Backward**: servo position 90 degree Servo pins: **orange**: signal / **red**: 5V / **brown**: GND  Connect to RobotShield port 7 
Signal	P7	
Power	+ of P7 port	
GND	- of P7 port	

		 90° 180°

Left Wing Servo motor

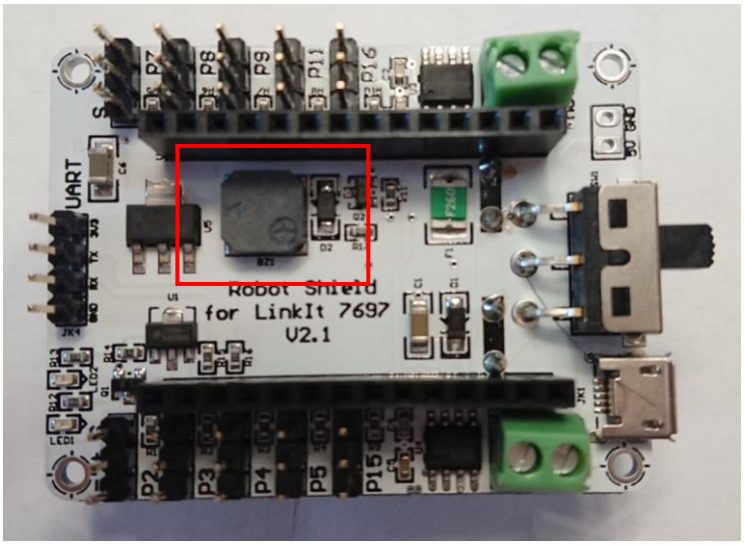
Left Servo	**Robot shield**	**Outward**: servo position 0 degree **Backward**: servo position 90 degree Connect to RobotShield port 7  
Signal	P2	
Power	+ of P2 port	
GND	- of P2 port	

Ultrasonic sensor

Ultrasonic sensor	Robot shield	
Echo	P4	
Trig	P5	
Vcc	+ of P4/P5 port	
GND	- of P4/P5 port	

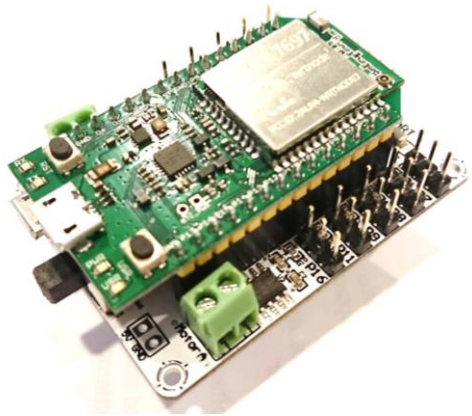
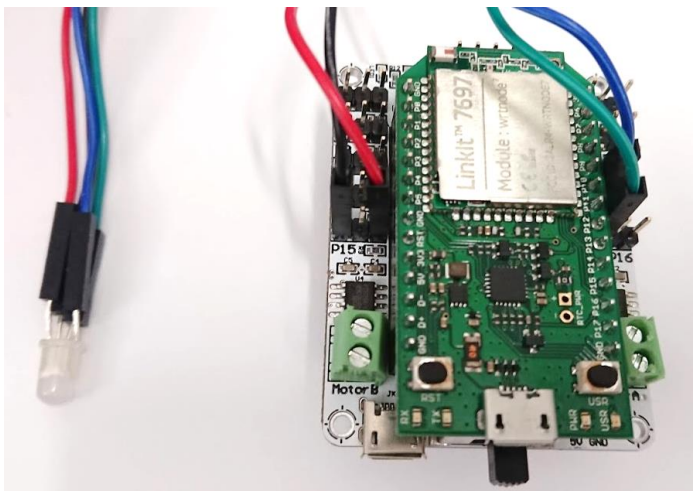
Buzzer

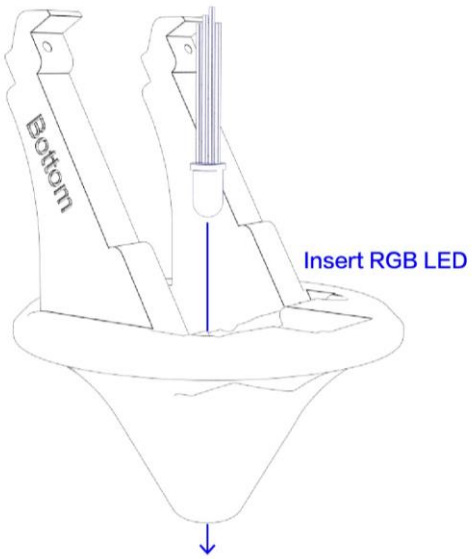
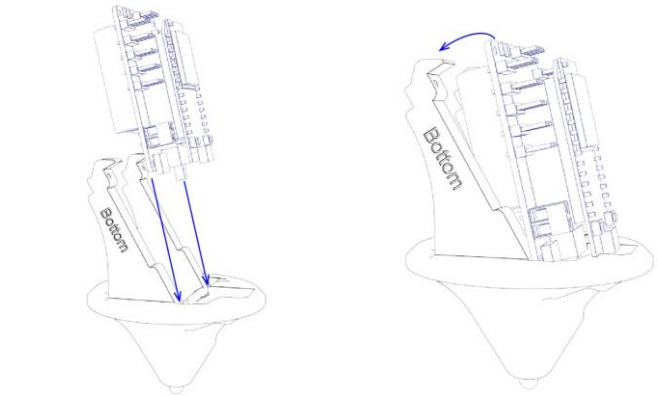
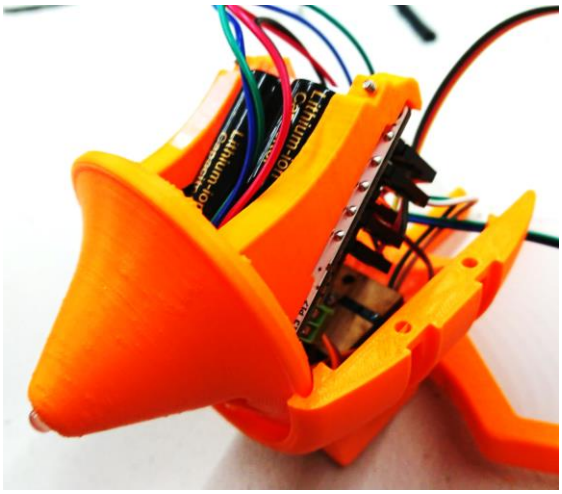
Robot Shield has an onboard buzzer connected to P14, we can use this pin to make sounds.

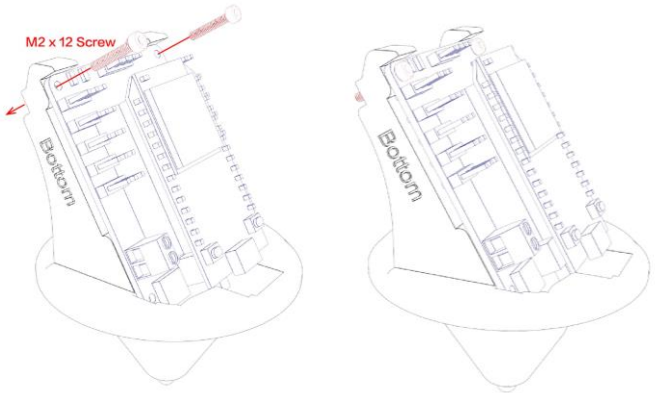
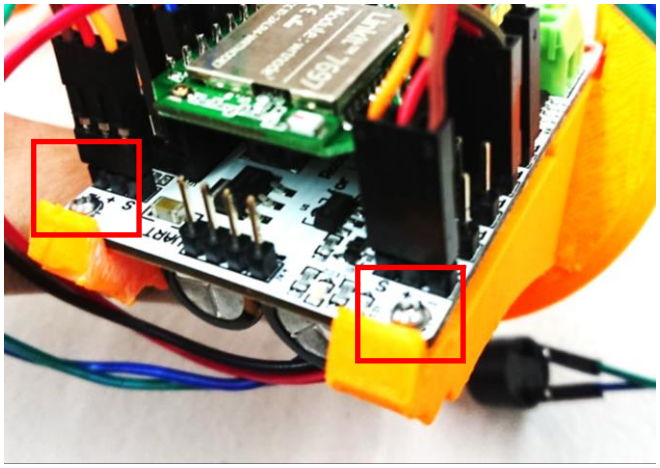
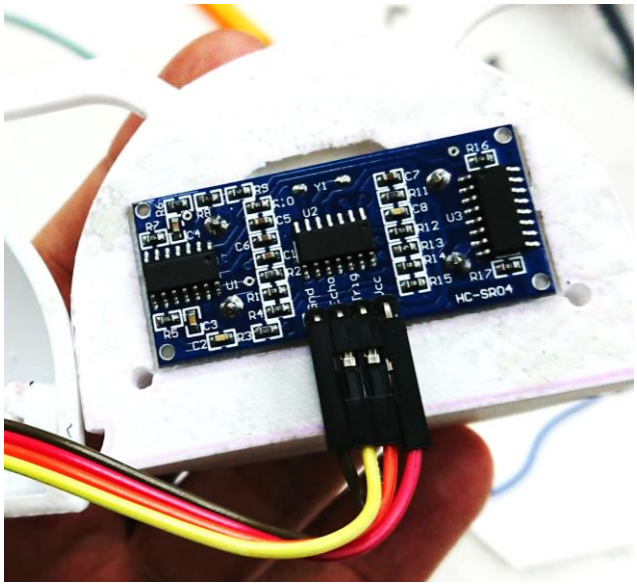


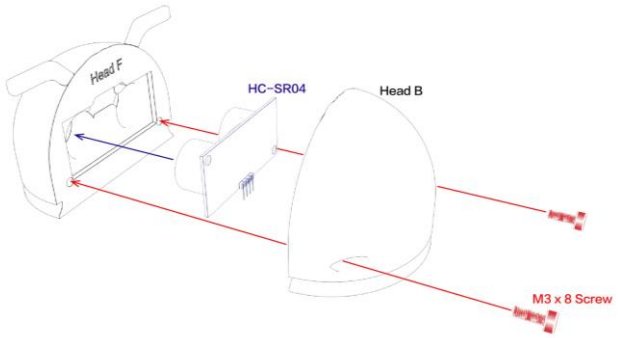
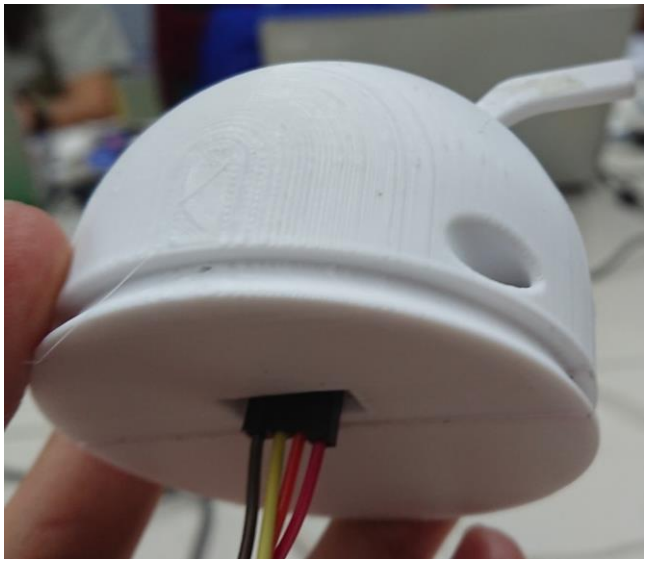
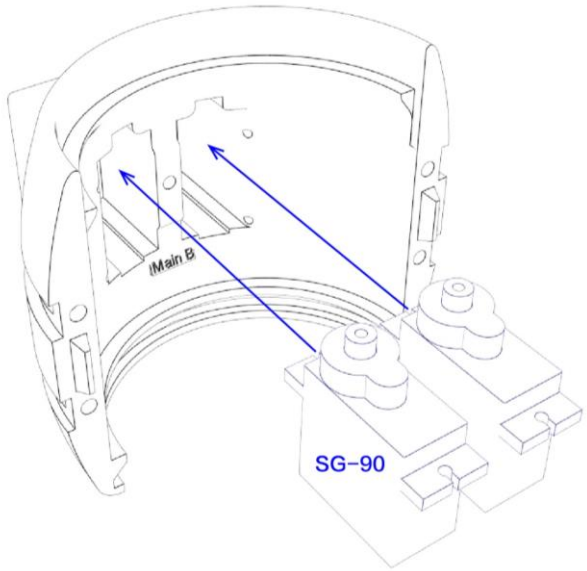
How to assemble

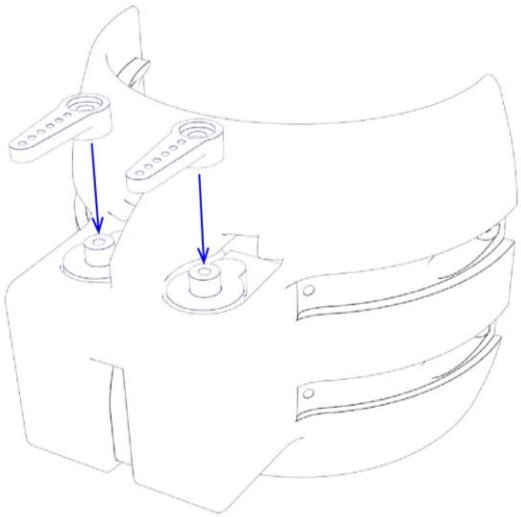
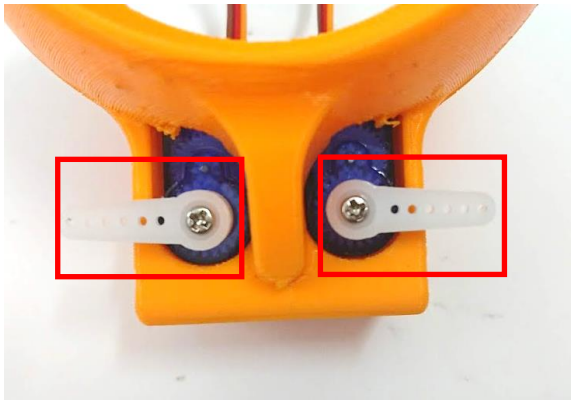
Please follow below Steps to assemble your Codi Bot. Note that the part name in Bold is the 3D-printed parts (**Head B**, **Bottom**, **RF Wing**, etc.)

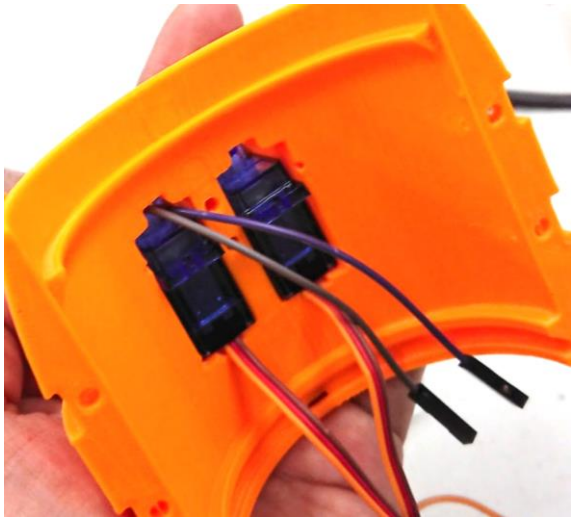
Step 1: Connect RGB LED pins with wires Parts: • RGB LED, 1 • wire, 4 • 3DP-Bottom	
Step 2: Assemble LinkIt 7697 with Robot Shield Parts: • LinkIt 7697 board, 1 • Robot Shield, 1	
Step 3: Connect RGB LED pins to correpsponding pins of Robot Shield. (refer to **Pin Mapping** section). Parts: • Step 1 • Step 2	

Step 4: Secure RGB LED in the hole of **Bottom**. Parts: • Step3 • **Bottom** Tips: Glue for better secure Tips: Cut LED pins shorter if necessary	
Step 5: Secure Link7697 and Robot Shield on **Bottom**. Parts: • Step 1-4 *Tips: Remove 3DP supporting structure if necessary.*	 

Step 6: Secure with M2x12 screws. Parts: • M2x12 screw, 2 *Tips: 3DP part may be broken if you screw too hard*	 
Step 7: Connect wires on SR-04 pins and insert ultrasonic sensor into **Head F**. Parts: • HC-SR04 ultrasonic sensor, 1 • **HeadF**, 1	

Step8: Secure Step7 and **Head B** with M3x8 screws. parts: • Step 7 • **Head B** • M3x8 screw, 2 *Tips: Remove 3DP supporting structure inside if necessary.*	 
Step 9: Insert 2 SG-90 servos into holes of **Main B**. Make sure servo wires is at the bottom of the servos. parts: • SG-90 servo, 2 • **Main B** *Tips: Remove 3DP supporting structure inside if necessary.*	

	
Step 10: Rotate the left servo to the leftmost position. Rotate the right servo to the rightmost position. Then secure servo and servo horn with its screw. Parts: • Step 9 • servo horn, 2 • servo screw, 2	 

Step 11: Pass wires of two LED stripes through corresponding holes we've just put in servos in Step 10. Make sure the LED **green** stripe is in the left hole and LED **purple** stripe is in the left hole. Parts: • Step10 • LED stripe **green**, 1 • LED stripe **purple**, 1	
Step 12: Put two LED stripes into grooves of **LF Wing** and **RF Wing**. Then assemble two acrylic wings pieces. Parts: • Step 11 • **LF Wing** • **RF Wing** • Acrylic wing, 2 • M2 x 6 screw, 8	

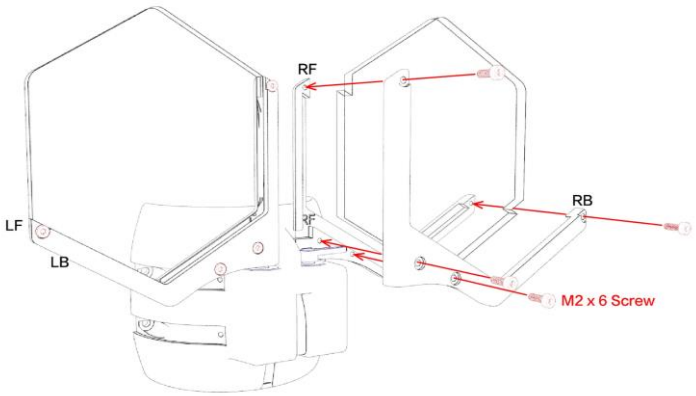
Step 13:

Secure the right wing (Step 12) and **RB Wing** with 4 M2 x 6 screws. Do the same thing for the left wing.

Parts:

- Step 12
- **LB Wing**
- **RB Wing**
- M2 x 6 screw, 8

Tips: 3DP part may be broken if you screw too hard.



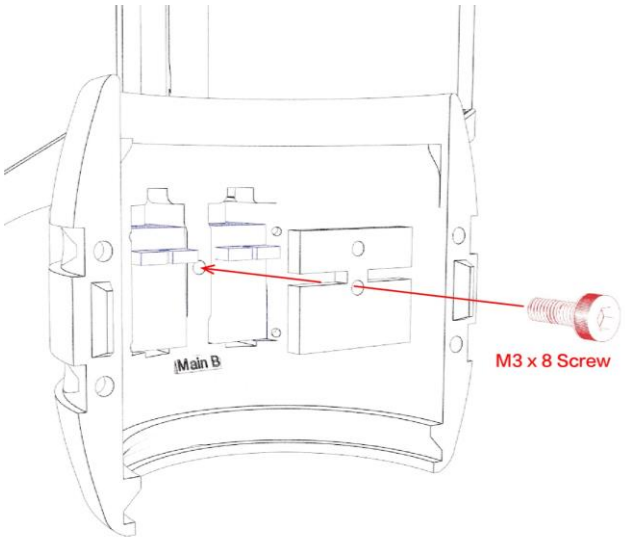
Step 14

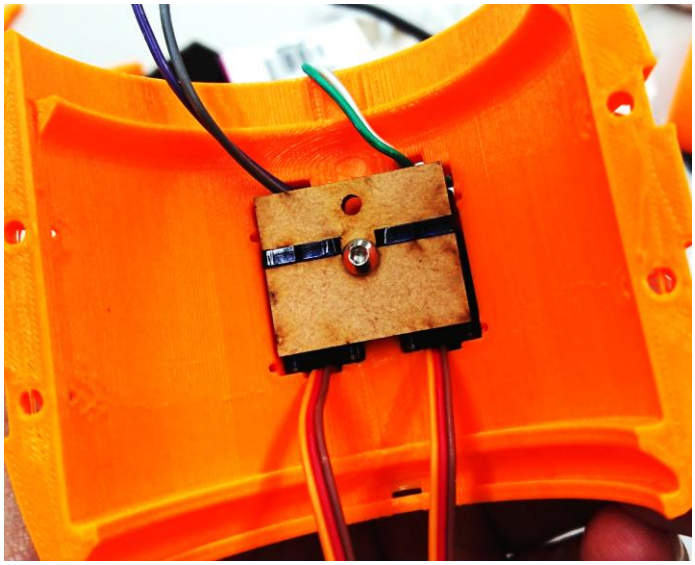
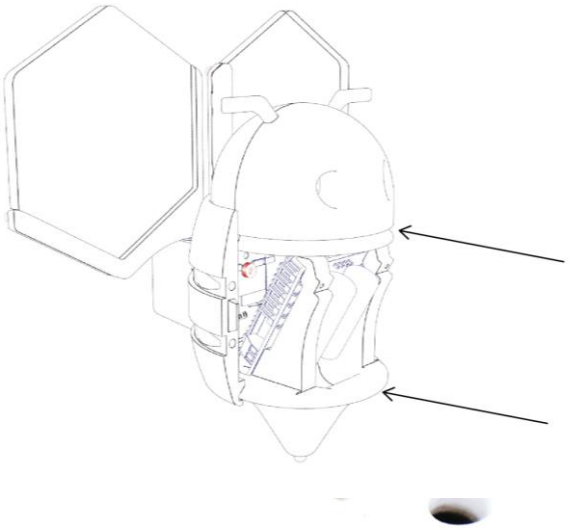
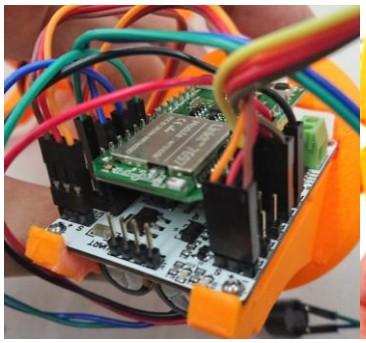
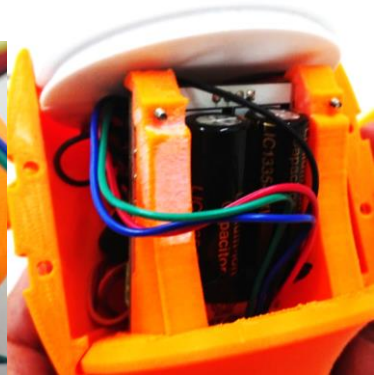
Secure the spacer on **Main B** with a M3x8 screw.

parts:

- Step 13
- spacer, 1
- M3x8 screw, 1

Tips: 3DP part may be broken if you screw too hard



	
Step 15: Connect all components' wires to corresponding pins on Robot Shield. Then assemble head (Step 8), core (Step 6) and body-back (Step 14) together. Parts: • all above Tips: Make sure all wires are **connected correctly** and neither squeezed nor interfered by mechanisms (servos). *Tips: You may execute the **standalone sketch** to check everything works correctly.*	  

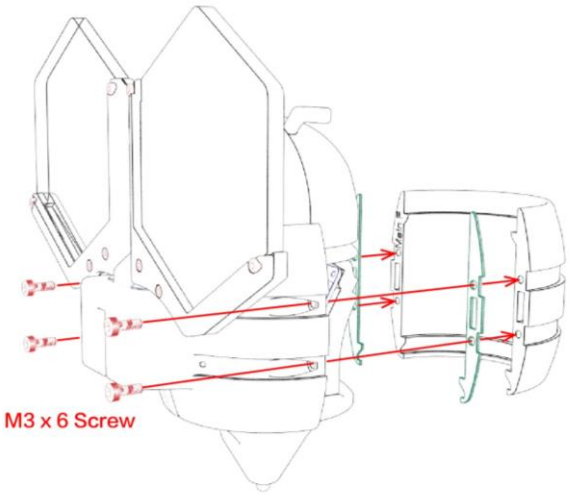
Step 16:

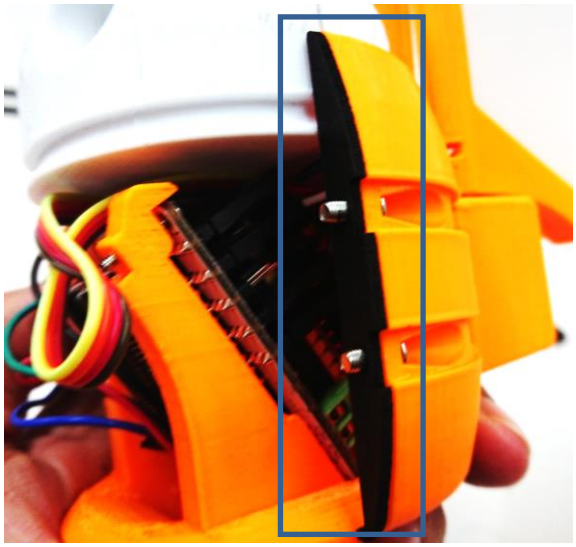
Secure back-body, cushions and **Main F** with four M3 x 6 screws.

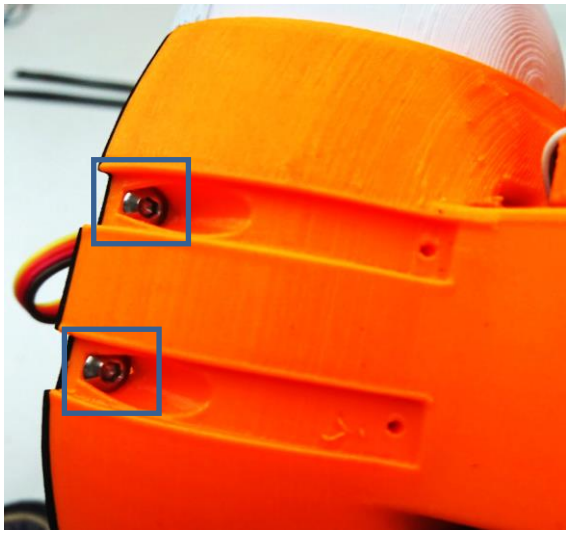
parts:

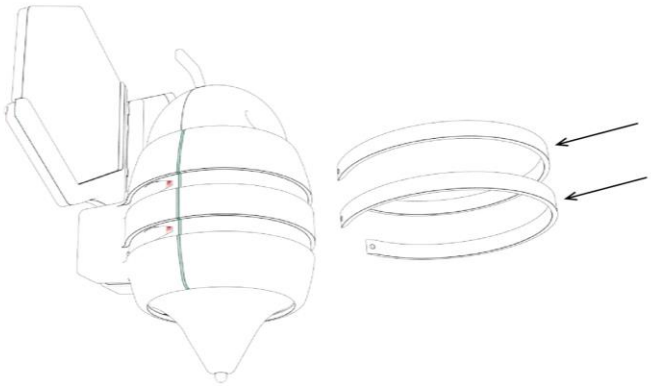
- **Main F**
- cushion, 2

Tips: 3DP part may be broken if you screw too hard







	 
Step 17: Assemble two stripes. parts: ● Step 16 ● stripes, 2	

Step 18:

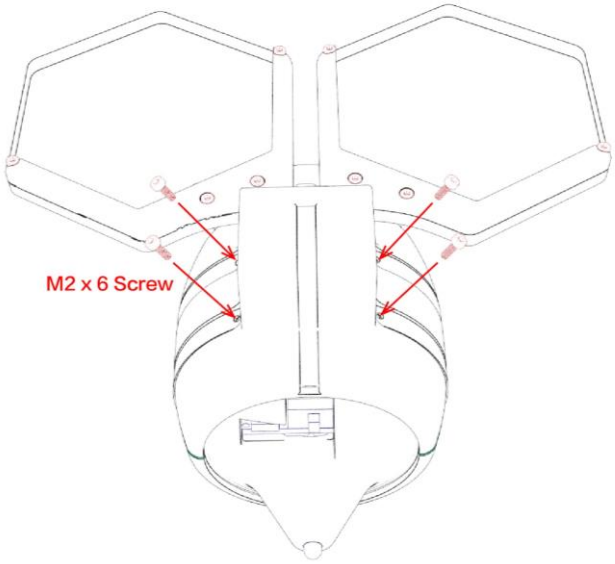
Secure stripes and Codi Bot with four M2 x 6 screws.

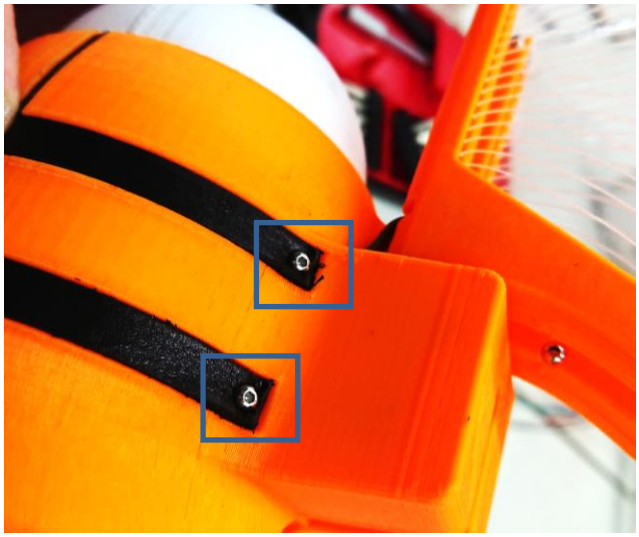
Parts:

- Step 17
- M2 x 6 screw, 4

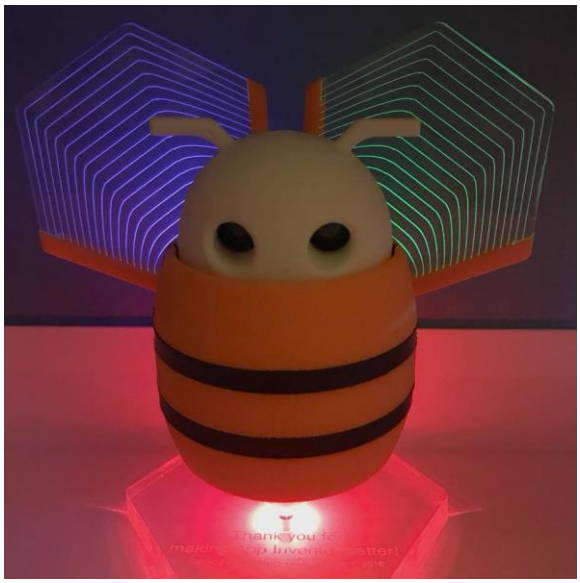
Tips: You may need to stretch leather a bit to screw

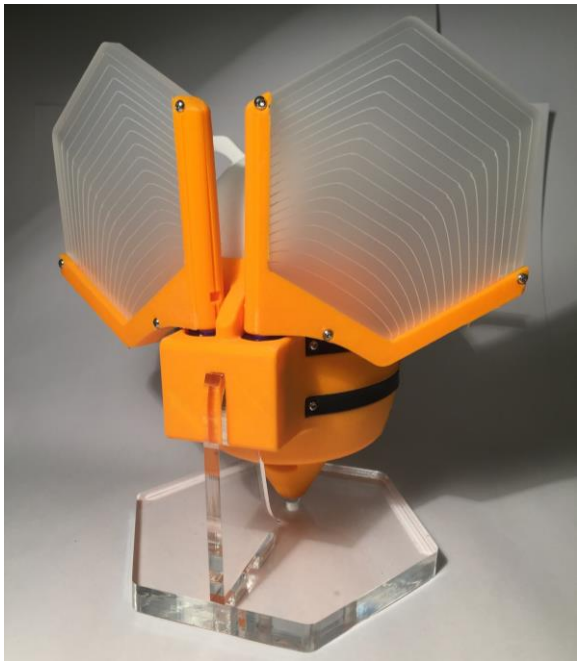
Tips: 3DP part may be broken if you screw too hard





Finish!





Software

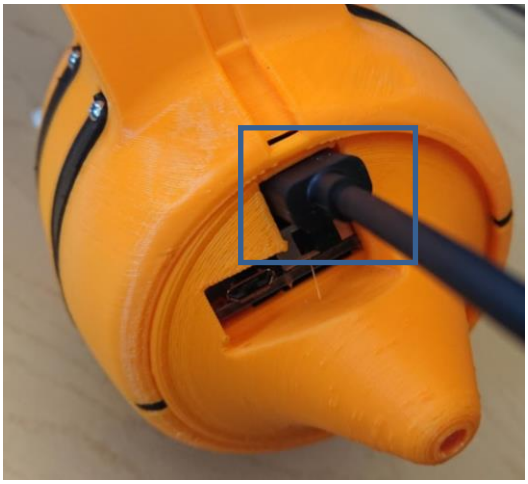
Function list

1. **Standalone demo**: Use **this sketch** to check hardware functions correctly. Notice this demo has no interaction with App Inventor (**Video**).
    a. LED (base, wings)
    b. servo (wings)
    c. buzzer
    d. Ultrasonic sensor
2. **Codi Bot LEDs**: Control LEDs by buttons and sliders (**Video**).
3. **Codi Bot Wings:** Control wing flapping or move to certain position (**Video**).
4. **Codi Bot Sound:** Control Codi Bot to make different kinds of sound (**Video**).
5. **Codi Bot**: Combination all previous functions into one app (**Video**).

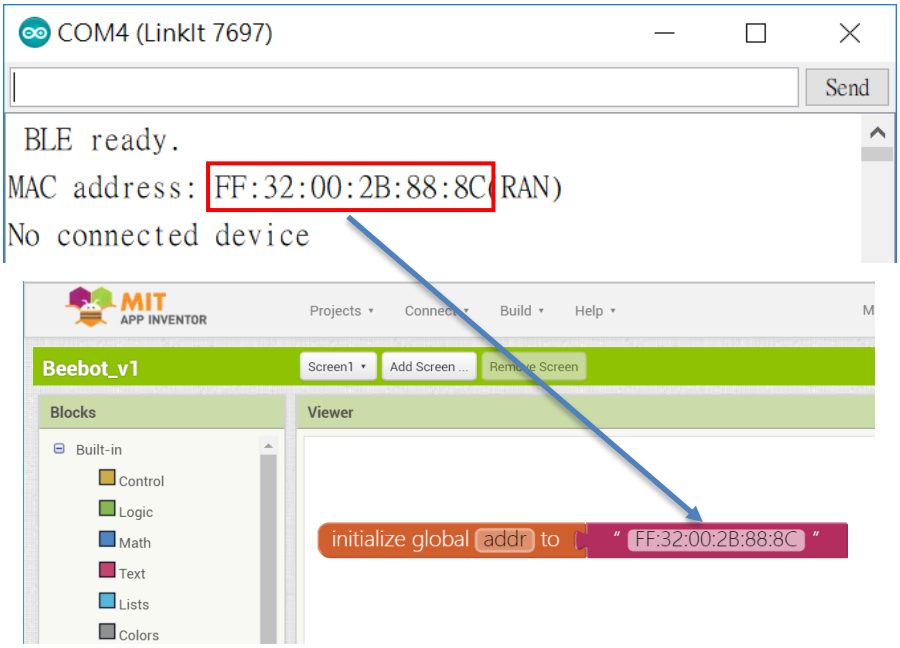
Arduino IDE setup

Check this document for Arduino IDE and MCU board driver setup

After the environment is ready, connect the MCU board and your PC with a micro-USB cable. Open your Arduino IDE and load the sketch of each corresponding project (see below) and click the **Upload** button in Arduino IDE to upload to the MCU board.



- **Project 1 - Standalone demo**: upload **this sketch** and the Codi Bot will flap wings and change LED color randomly. And if you put something in front of Codi Bot, LEDs of both wings will light up and it make sounds by buzzer.
- **Project 2. to 4**: upload **this sketch** and open Arduino IDE's serial monitor, you will see messages like below, the **FF:32:00:2B:88:8C** is the Bluetooth address of my LinkIt 7697 MCU board, which is different from yours. You have to either replace the **addr** variable of your aia or select the correct address in the app. Otherwise your app cannot connect with the Codi Bot.



FAQ

1. Wings, LEDs are not functioning?
    a. Check your Robot shield is switched on.
    b. Robot Shield may run out of power, connect it to your PC/laptop USB port by an USB cable.
    c. Most problems came from wiring, please always check you've connect all the components correctly. (refer to **pin mapping section of user manual**).
2. Can not connect to Codi Bot?
    a. Check Arduino IDE setup section, make sure you've modify the **addr** variable (.aia) with the Bluetooth address of your LinkIt 7697.