

# MIT App Inventor Codi Bot: Complete

90  
mins

## Level: advanced

This tutorial combines all the previous tutorials together. Here, you can interact with all Codi Bot functions, including LEDs, wings and sounds.

- [source .ino](#) / [source .aia](#)



## Function description

This project will show you how to control all Codi Bot functions with App Inventor through a BLE connection.

## Hardware

Please follow this [building guide](#) to assemble your Codi Bot.

## App Inventor

Now log in to your App Inventor account and create a new project or directly import [this aia file](#).

Since this app is the combination of the previous three, this tutorial will not go into very much detail. But you are certainly can follow this tutorial to build the app step by step.

This app is composed of **four** different sections:

1. Connection ([Designer/Blocks](#))
2. Wing ([Designer/Blocks](#))
3. LED ([Designer/Blocks](#))
4. Buzzer ([Designer/Blocks](#))

## Designer

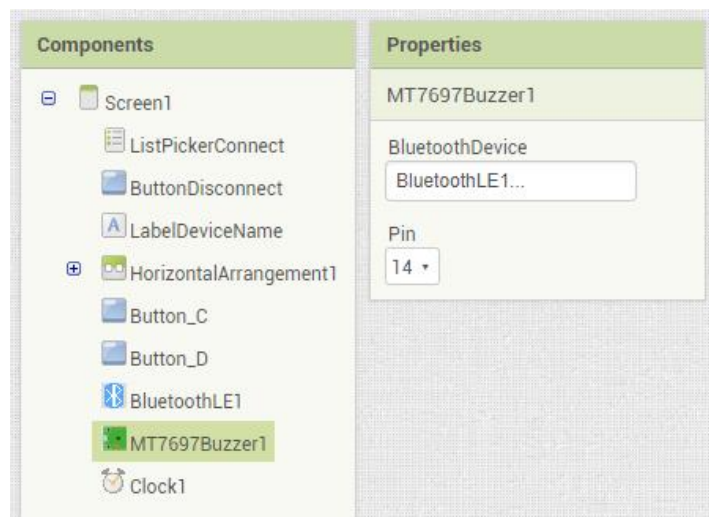
1. We need to import two extensions from this URL:
  - **Bluetooth low energy:**  
<http://iot.appinventor.mit.edu/assets/resources/edu.mit.appinventor.ble.aix>
  - **MT7697pin:**  
<http://iot.appinventor.mit.edu/assets/resources/edu.mit.appinventor.iot.mt7697.aix>
2. Add a **BluetoothLE** component to your project, we will use it to send commands to Codi Bot through Bluetooth connection.

3. Add seven **MT7697Pin** components to your project. Set their BluetoothDevice properties to **BluetoothLE1** and rename them as table below:

Rename as	Mode	Pin
MT7697_LeftWingServo	servo	2
MT7697_RightWingServo	servo	7
MT7697_LeftWingLED	analog output	3
MT7697_RightWingLED	analog output	9
MT7697_LED_R	analog output	15
MT7697_LED_G	analog output	16
MT7697_LED_B	analog output	11

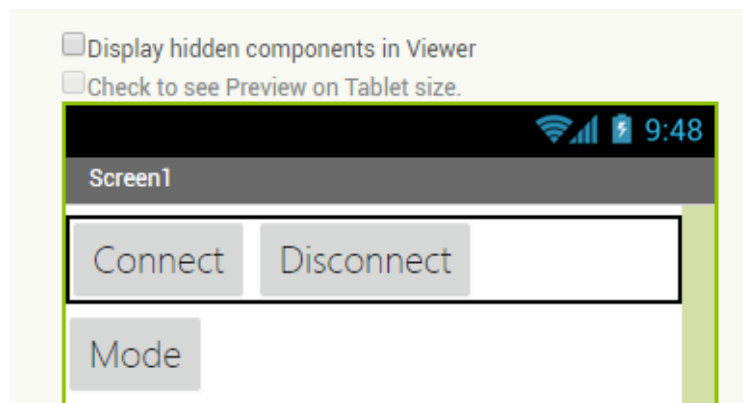
4. Add a **MT7697Buzzer** component to your project, we use this to control the #14 pin of LinkIt 7697, which is connected with Robot Shield onboard buzzer.

- Set its **BluetoothDevice** property to BluetoothLE1 (Step 2.) and set **Pin** to 14.



## Connection

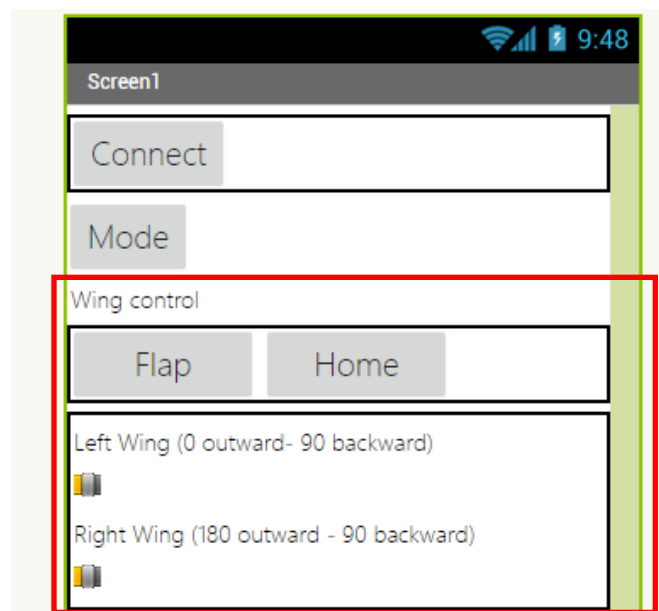
5. Add a ListPicker to select available Bluetooth devices nearby. Rename it as "**ListPicker\_Connect**", set Text to "**Connect**" and FontSize to **20**.
6. Add a button to close Bluetooth connection between your Android phone and LinkIt 7697. Rename it as "**Button\_Disconnect**" and set Text to "**Disconnect**".
7. Add a Label to show messages of connection. Rename it to "**Label\_Device**" and clear Text to "".
8. Add a HorizontalArrangement component, set Width to **Fill parent**, then add components from Step 4 to 6 into it.
9. Add another ListPicker to select one of the three control mode: Wing, LED and Sound. Rename it as "**ListPicker\_Connect**", Text to "**Mode**" and FontSize to **20**.



## Wing (Designer)

10. Add a Label to show message, rename it as "**Label\_Wing**" and set Text to "**Wing control**".
11. Add two Buttons for wing actions. Rename them as "**Button\_WingFlap**" and "**Button\_Home**". Set FontSize to **20** and Text to "**Flap**" and "**Home**".
12. Add a HorizontalArrangement component, set Width to **Fill parent**, then put components of Step 11 into it.

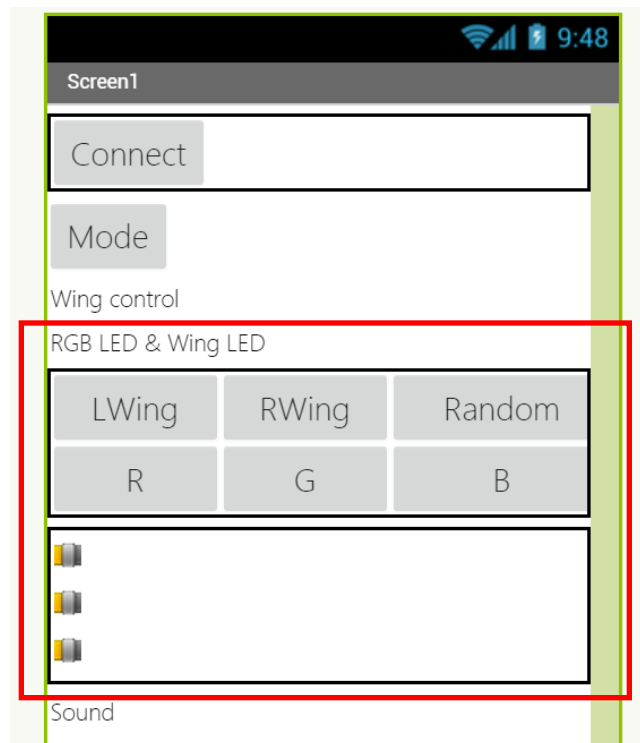
13. Add two labels to show messages. Rename them as **"Label\_LeftWing"** and **"Label\_RightWing"**. Set their Text to **"Left Wing (0 outward- 90 backward) "** and **"Right Wing (180 outward - 90 backward) "**.
14. Add a slider to control left wing position. Rename it as **"Label\_LeftWing"**. Set MinValue to **0**, MaxValue to **90**, Width to **Fill parent** and ColorLeft to **Green**.
15. Add a slider to control right wing position. Rename it as **"Label\_RightWing"**. Set MinValue to **90**, MaxValue to **180**, Width to **Fill parent** and ColorLeft to **Purple**.
16. Add a VerticalArrangement component, set Width to **Fill parent**, then add components from Step 13 to 15 into it.
17. Wing section finishes as below:



## LED (Designer)

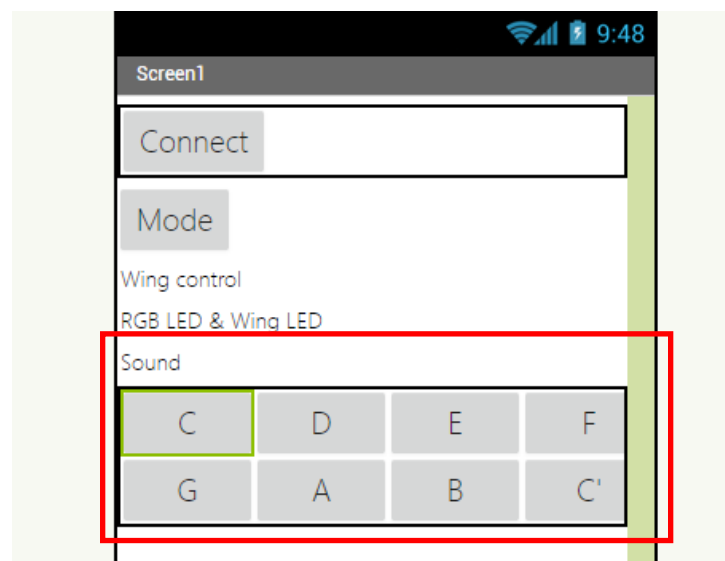
18. Add a Label to show message, rename it as **"Label\_LED"** and set Text to **"RGB LED & Wing LED"**.
19. Add four buttons for RGB LED actions. Rename them as **"Button\_LED\_R"**, **"Button\_LED\_G"**, **"Button\_LED\_B"** and **"Button\_RGB\_Random"**. Set Text to **"R"**, **"G"**, **"B"**, and **"Random"**; Width to **30 percent**; and FontSize to **20**.

20. Add two more buttons for wing LEDs actions. Rename them as "**Button\_LED\_LeftWin**" and "**Button\_LED\_RightWing**". Set Text to "**L**" and "**R**", Width to **30 percent** and FontSize to **20**.
21. Add a TableArrangement component, set Width to **Fill parent**, Columns to **3** and Rows to **2**. Then add the components from Step 19 to 20 into it.
22. Add three sliders to control red/green/blue light intensity of RGB LED. Rename them as "**Slider\_LED\_R**", "**Slider\_LED\_G**" and "**Slider\_LED\_B**". Set ColorLeft to **Red**, **Green** and **Blue**; Set MinValue to **0**, MaxValue to **255** and Width to **Fill parent**.
23. Add a VerticalArrangement component, set Width to **Fill parent**, then add components of Step 22 into it.
24. LED section finishes as below:



## Sound (Designer)

25. Add a Label to show message, rename it as **"Label\_Sound"** and set Text to **"Sound"**.
26. Add eight buttons to make sounds. Rename them as **"Button\_C"**, **"Button\_D"**, **"Button\_E"**, **"Button\_F"**, **"Button\_G"**, **"Button\_A"**, **"Button\_B"** and **"Button\_C2"**. Text to **"C"**, **"D"**, **"E"**, **"F"**, **"G"**, **"A"**, **"B"** and **"C'**". Set Width to **25 percent** and FontSize to **20**.
27. Add a TableArrangement component, set Width to **Fill parent**, Columns to **4** and Rows to **2**. Then add the components of Step 26 into it.
28. Sound section finishes as below:



Not all the functions of previous tutorials are included here, for instance specifying sound frequency and time duration. However, you can always tinker with this app and add as many App Inventor components as you like.

## Blocks

Let's take a look at our blocks step by step. Notice this time we have

a different connection approach than with previous projects. We use ListPicker to select available BluetoothLE device instead of a specified device.

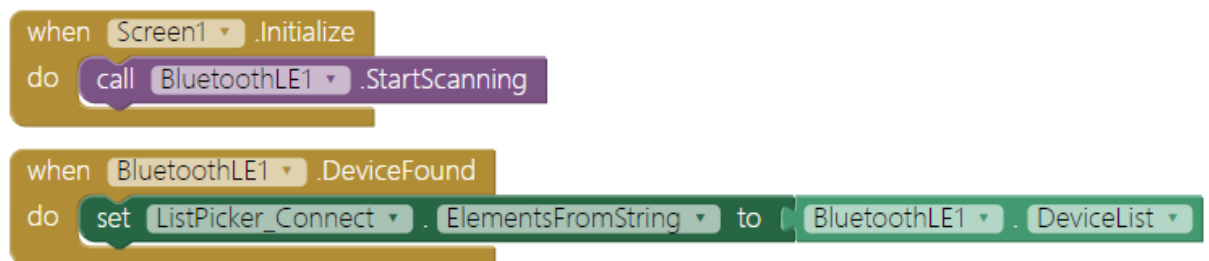
Similar to Designer, we use the same structure to guide you to finish the blocks needed for this project.

## Connection (Blocks)

### 1. Initialize app and scan for nearby Bluetooth devices

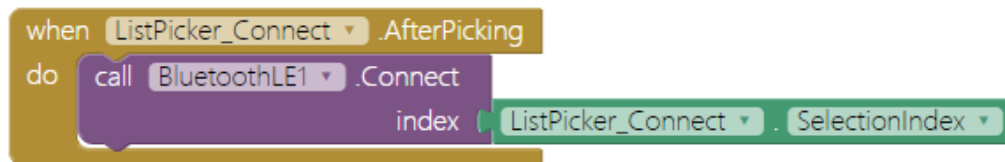
In **Screen1.Initialize** event, we ask **BluetoothLE** component to scan for BLE devices nearby (**BluetoothLE1.StartScanning**).

If any devices are found (**BluetoothLE1.DeviceFound** event), we put these devices into ListPicker.



### 2. Choose device with ListPicker

We choose device to connect in a ListPicker. In the **ListPicker.AfterPicking** event, we use the **BluetoothLE.Connect** method to connect with the device selected.

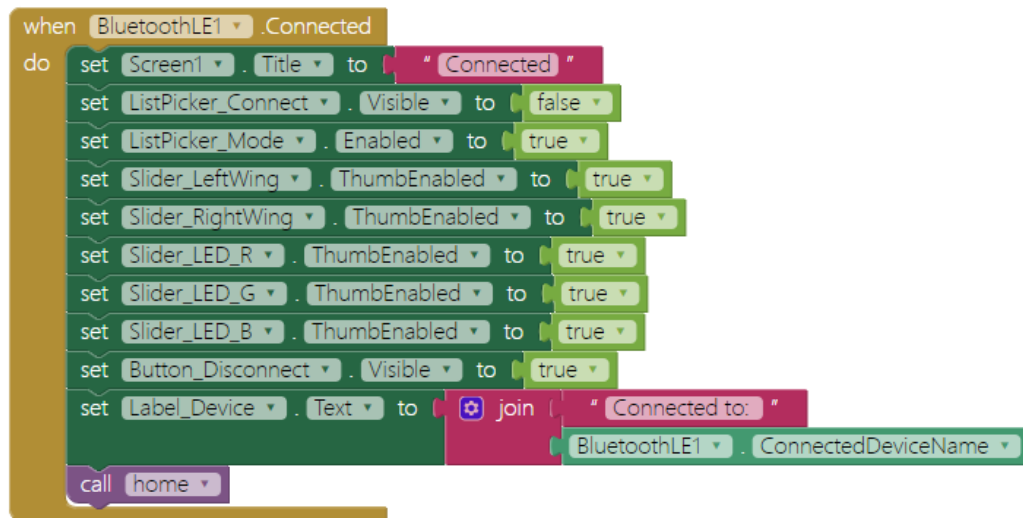


### 3. BLE Connected

When connected successfully (**BluetoothLE.Connected** event), we will see related messages on several components, hide the ListPicker and show other components. This is because if we



send Bluetooth commands without connecting to something first, it may cause error.

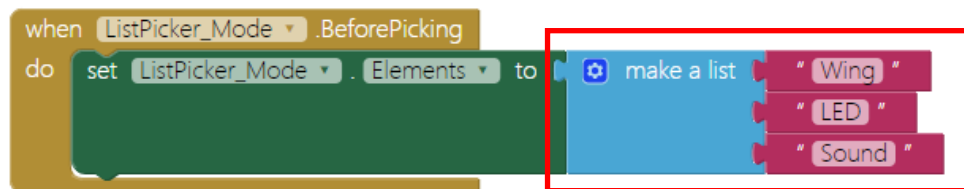


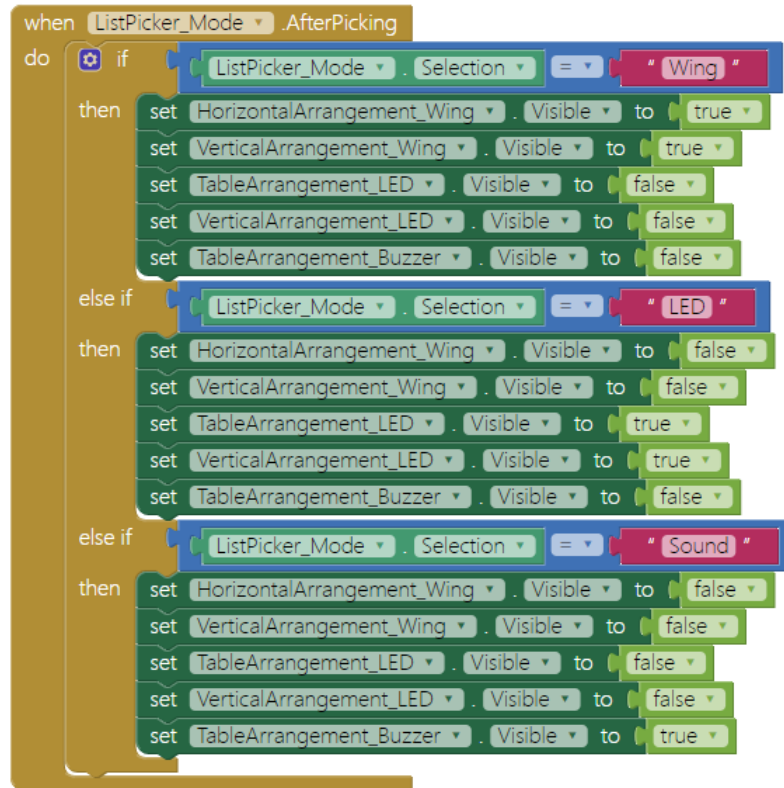
#### 4. Another ListPicker to choose one of the modes

To simplify the interface, we separate related components into three groups: Wing, LED and Sound. In

**ListPicker.BeforePicking** event, we set the ListPicker elements to a list (Wing, LED, Sound).

Next, in **ListPicker.AfterPicking** event, we set related components to be visible or not according to the selection result.



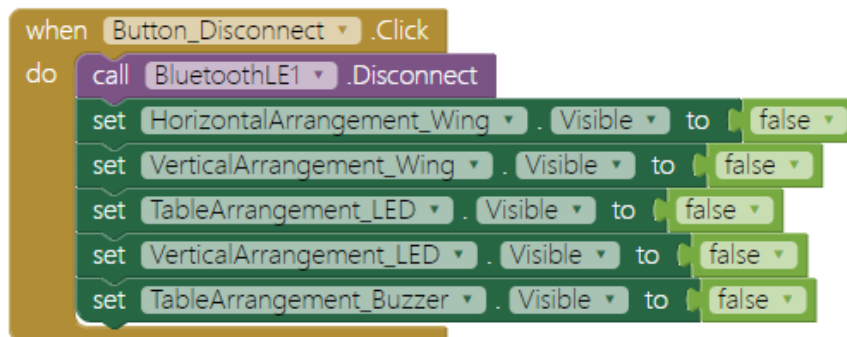


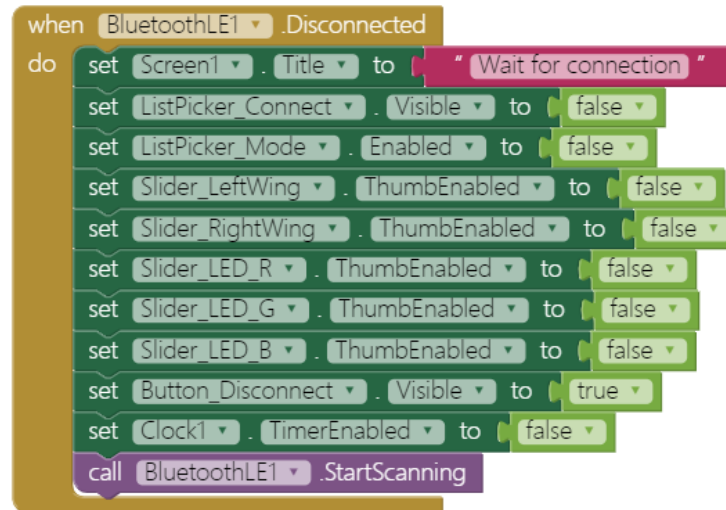
## 5. Button to disconnect

When **Button\_Disconnect** is pressed, we close the Bluetooth connection and hide all Layout components.

And when we disconnect successfully

(**BluetoothLE.Disconnected** event), we reset all components to their initial status and wait for the next connection.



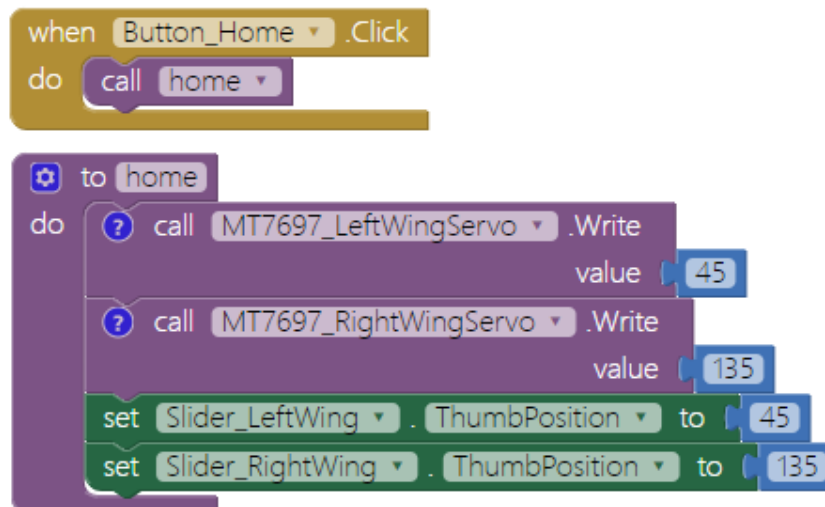


## Wings (Blocks)

Here we will control the wings by buttons and sliders, which are exactly the same with [Codi Bot wing tutorial](#).

### 6. Button to move wings to home position

We create a procedure (**home**) to move the wings and sliders back to their home positions, which is **45** for left wing and **135** for right wing.

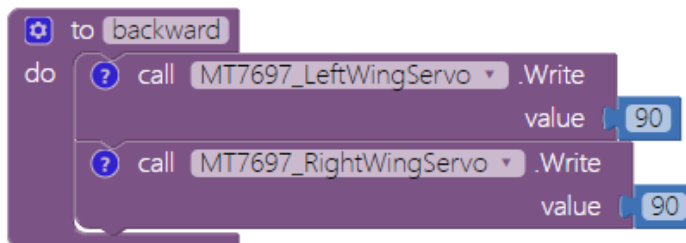
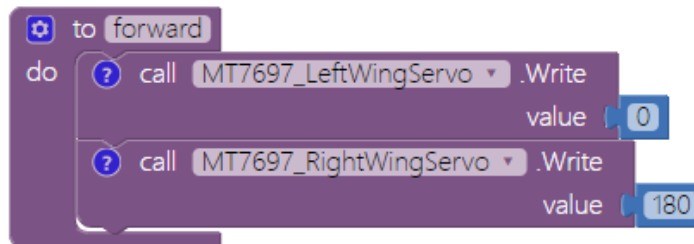
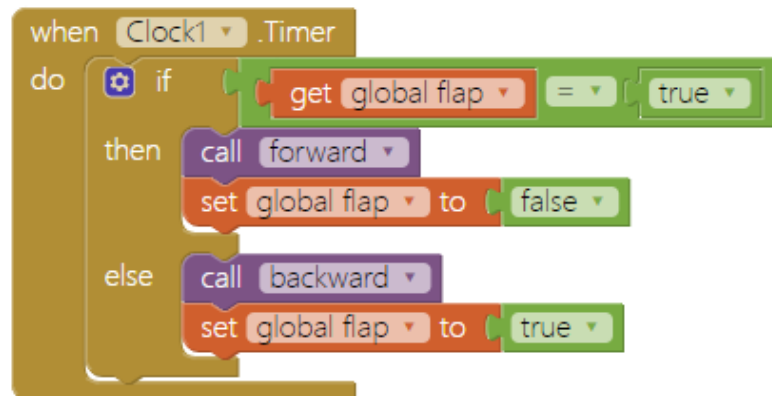
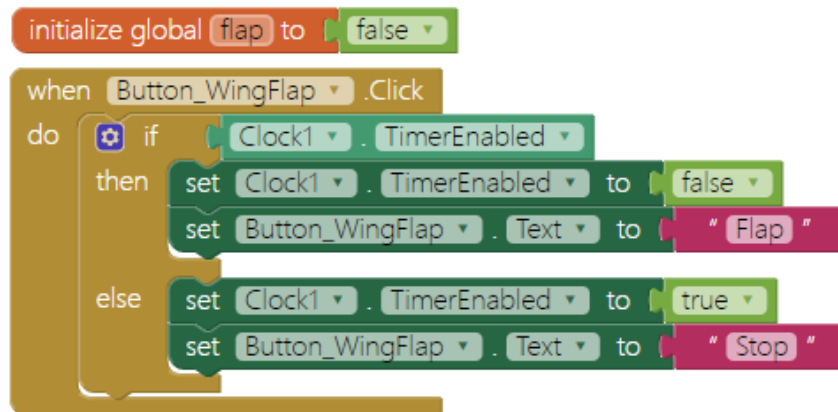


## 7. Button to flap wings

This section is exactly the same with [Codi Bot wing tutorial](#).

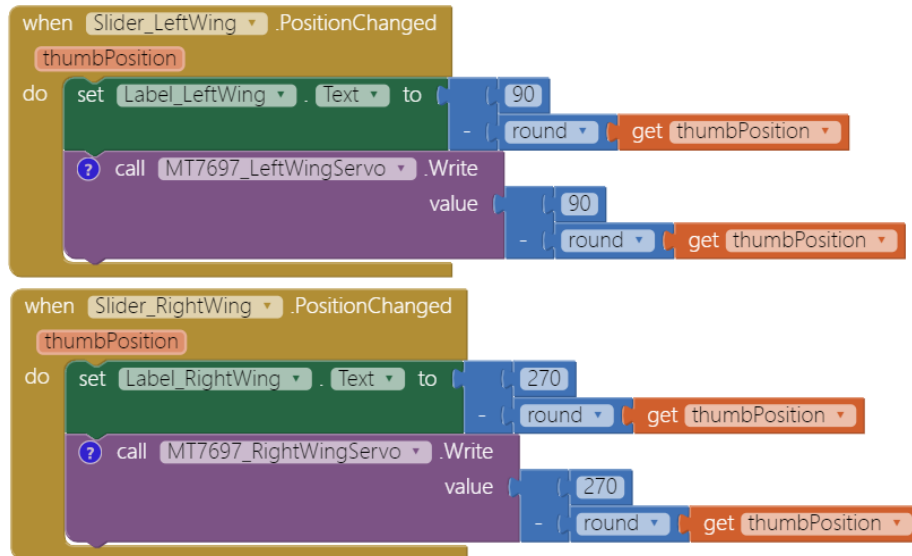
We use **Button\_WingFlap** to control the clock timer, which in turn makes the wings flapping.

For simplicity, we create two procedures (**forward**, **backward**) to control the servo motor positions.



## 8. Sliders to move each wing

When you drag a slider, the corresponding servo motor will move to the selected position.

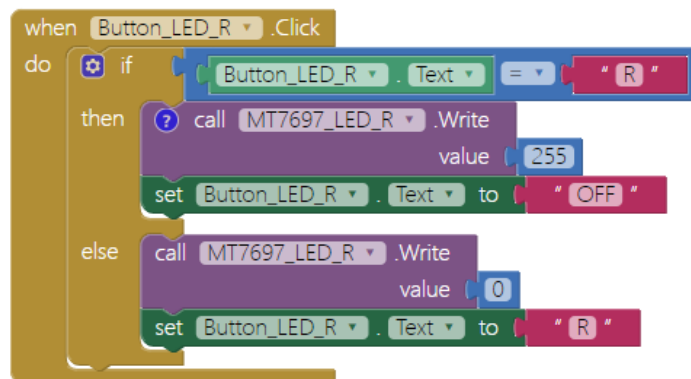


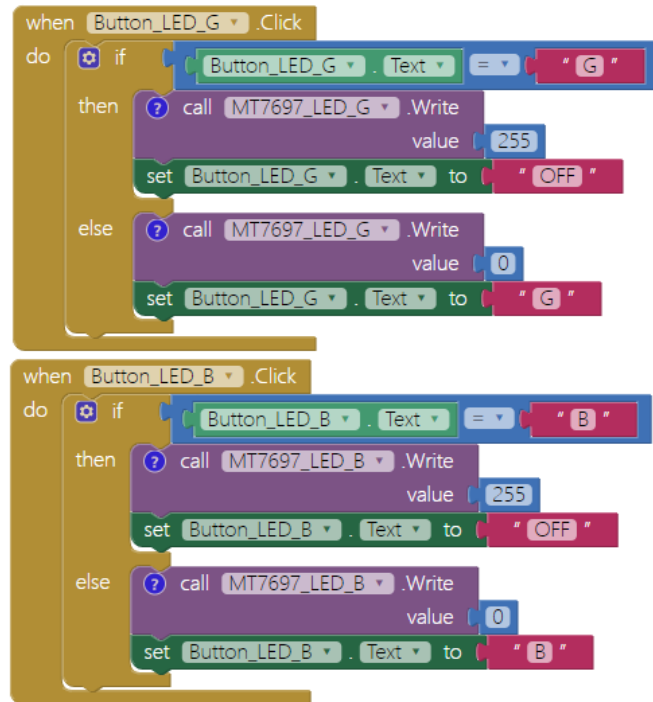
## LED (Blocks)

Here we are going to control the LEDs with buttons and sliders, as we did in the [Codi Bot LED tutorial](#).

## 9. Button to control RGB LED

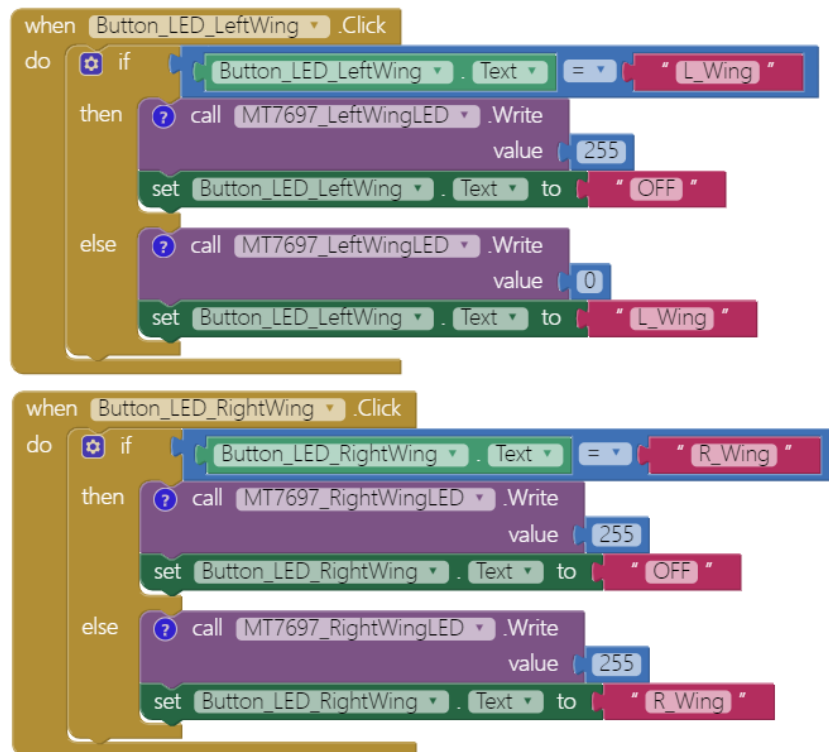
These three buttons are used to control the red, green and blue colors of the RGB LED. For the red light, we use **MT697\_LED\_R.Write** method. Value **255** turns on the red light; and value **0** turns it off. Please finish the other two button events in a same manner.





## 10. Button to control the green and purple wing LEDs

These two buttons are used to control the LED of both wings.  
The idea is same as in the previous step.



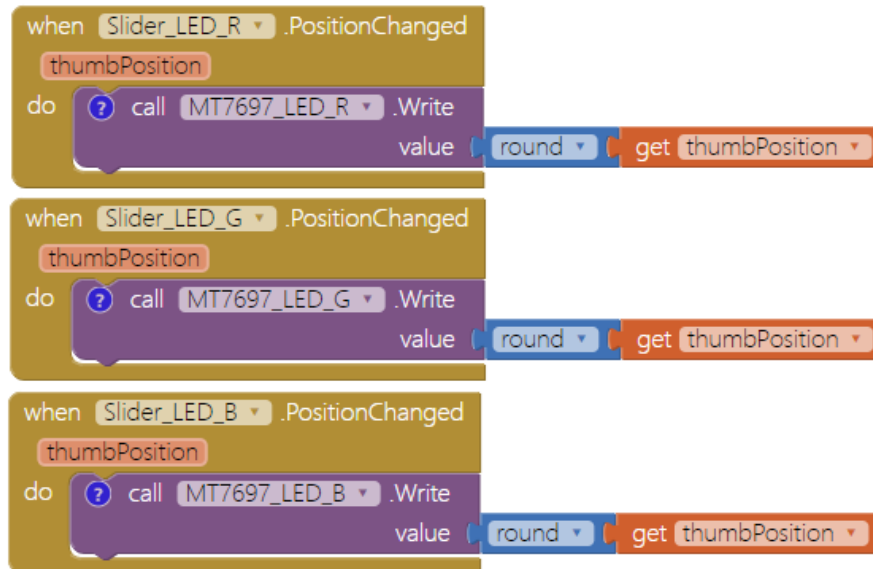
## 11. Button to randomize the RGB LED color

We can also randomize the RGB LED color. When **Button\_RGB\_Random** is pressed, we use a loop (for each) to replace the **RGBLEDColor\_list** variable content with a random number from **0** to **250**. Then we control the corresponding color and slider thumb position with this variable.



## 12. Sliders to fine tune the RGB LED color

When the slider is dragged, we control the corresponding color by slider thumb position.



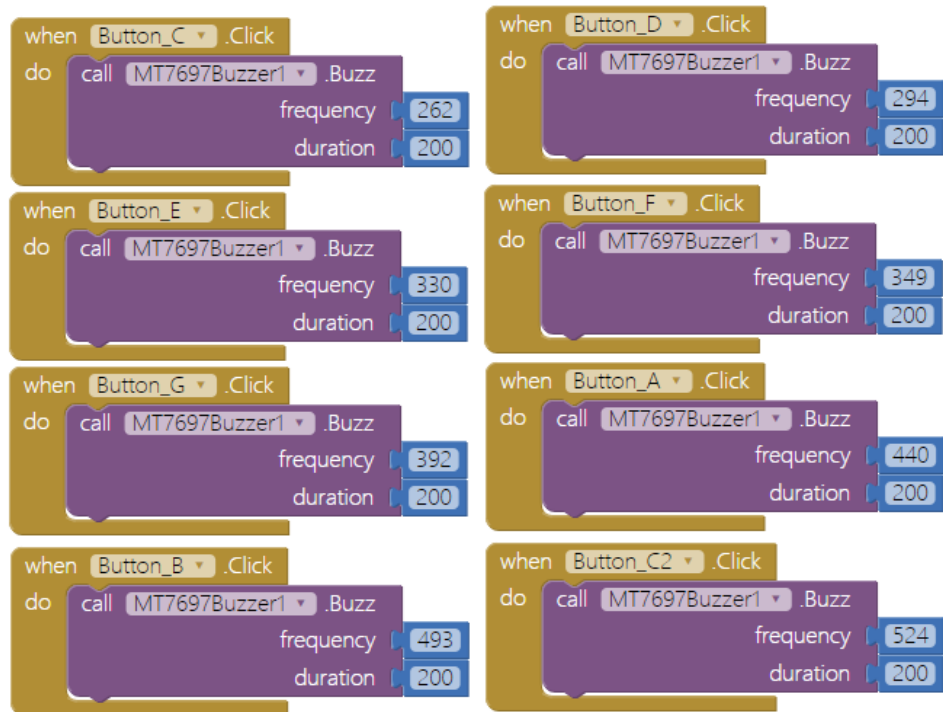
## Sound (Blocks)

Here we can play different notes with buttons, which are exactly the same with the [Codi Bot Sound tutorial](#).

## 13. Buttons to make sounds of different notes

We have eight buttons here. Each of them will tell the buzzer inside the Codi Bot to make a different note. For example, when **Button\_C** is pressed (**Button\_C.Click** event), we use a **MT7697Buzzer.Buzz** method to make a sound of Note C by specifying the **frequency** as 262 and the **duration** as 200 (milliseconds). Please finish the other seven button events in a same manner.





## Arduino IDE and sketch

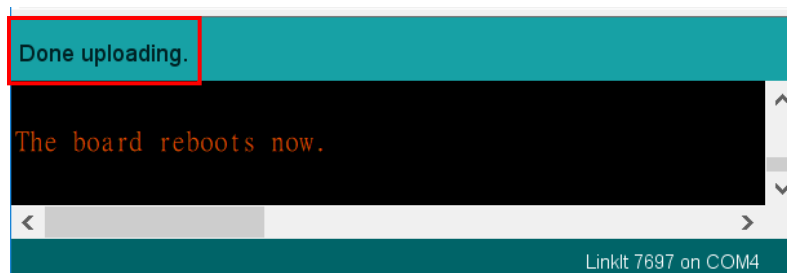
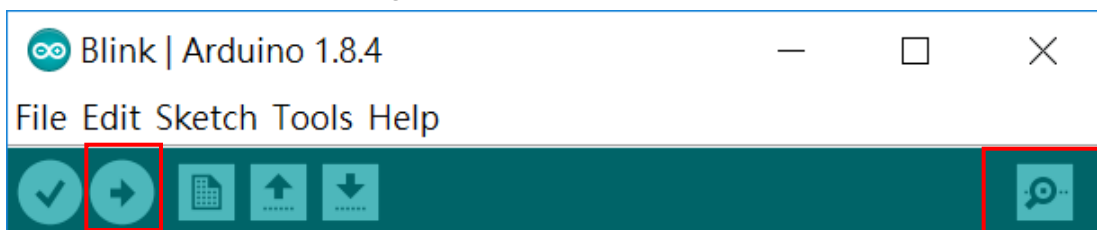
Make sure your computer has Arduino IDE installed and LinkIt 7697 SDK and driver are ready. If not, please check out this [Codi Bot Standalone tutorial](#).

Connect your computer and LinkIt 7697 with a microUSB cable.

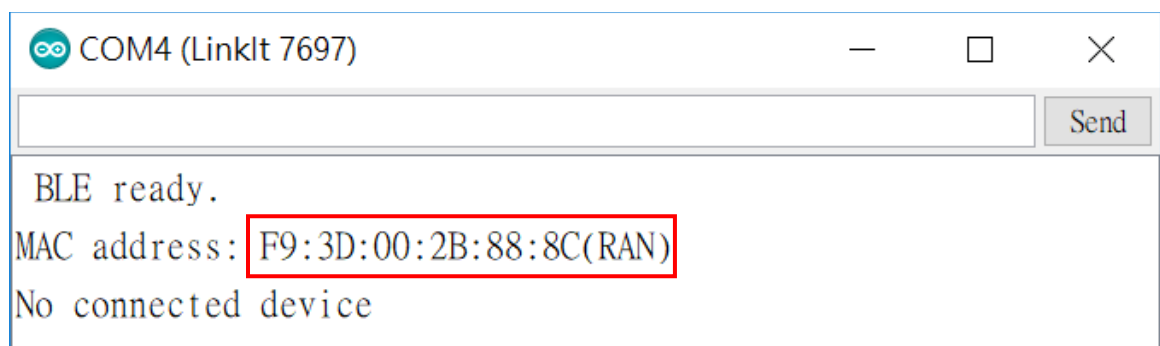


Please download the Arduino sketch from [here](#) and open it in your Arduino IDE. This sketch can be used for all following Codi Bot projects, to allow you to focus on building App Inventor projects you will enjoy.

Press the "**Upload**" right-arrow button of Arduino IDE. This will compile and upload the Arduino sketch to your LinkIt 7697. Please make sure you can see the "**done uploading**" message in the console before continuing.

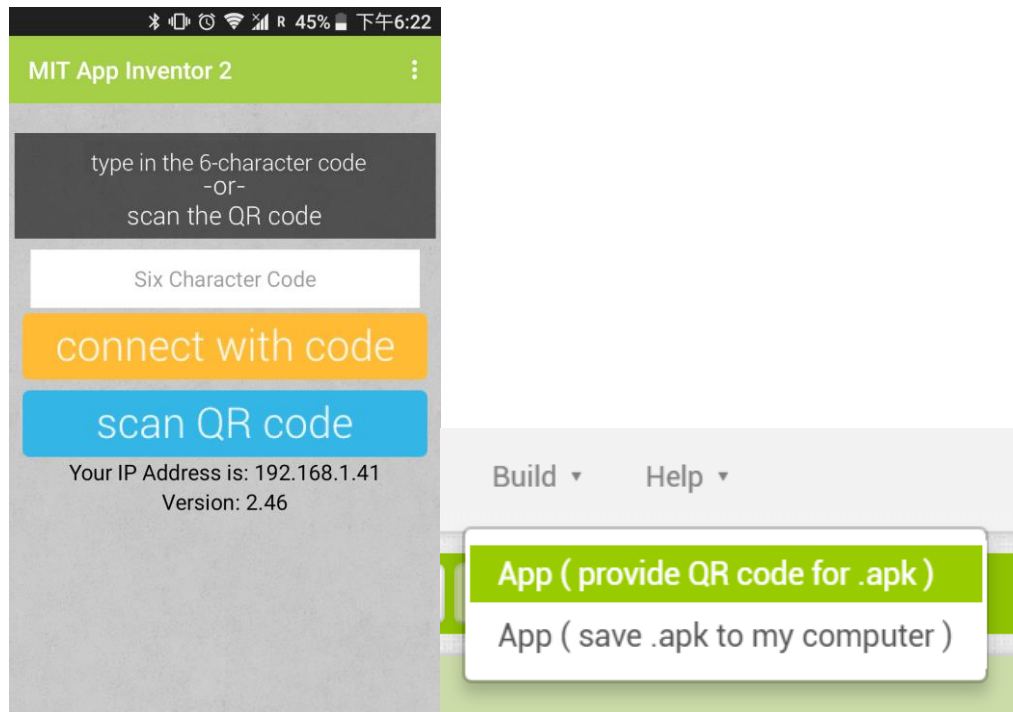


Click the magnifier icon at the up-right corner of Arduino IDE. You should see a message in the pop-up window. The [XX:XX:XX:XX:XX:XX] 12-digit string is the Bluetooth address of your LinkIt 7697. We will choose the device of this address in our app.



## Tips

Make sure your LinkIt 7697 is running correctly. And install App Inventor project on your Android phone by clicking Build / App (provide QR code for .apk), this will show a QR code for the .apk file of this project. Use MIT AI2 Companion to scan this QR code, download the app, and install it.



Open Codi Bot app (Fig 1.) and click **Connect** ListPicker. You'll see a list of available Bluetooth devices (Fig 2). In general, the first item is the Codi Bot where "**F9:3D:00:2B:88:8C**" is the Bluetooth address of my Codi Bot. Click it and your phone will try to connect with the Codi Bot, If connects successfully, you will see your app like in Fig 3.

Click **Mode** ListPicker to choose which mode you want to play with: **Wing**, **LED** or **Sound** (Fig. 4). Choose one to interact with your Codi Bot (Fig 5 to Fig 7). Remember to click the **Disconnect** button when you finish with this project.

Fig 1. Initial screen



Fig 2. Select available Bluetooth device



Fig 3. Connected to Codi Bot (MT7697 for AI2)



Fig 4. Select mode

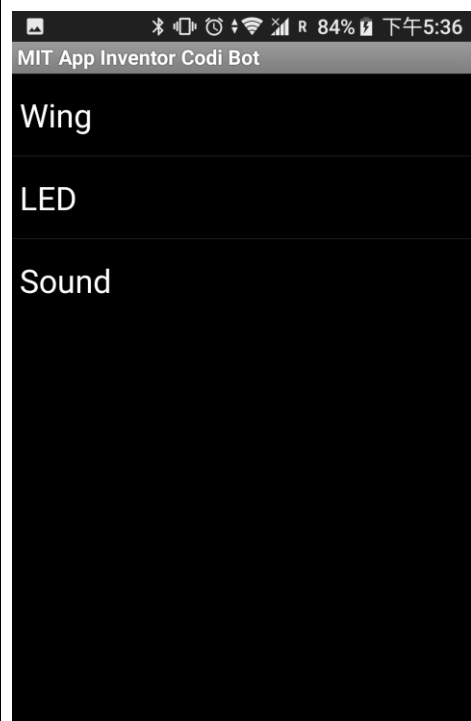


Fig 5. Wing mode



Fig 6. LED mode

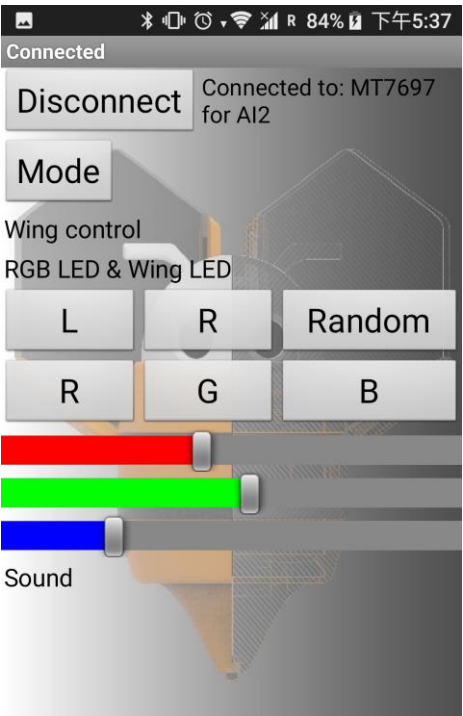


Fig 7. Sound mode

