MIT App Inventor Codi Bot: Sound

60 mins

Level: advanced

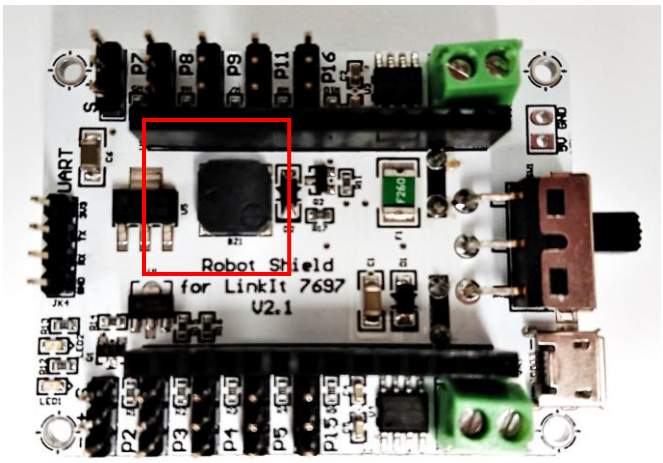
This tutorial will help you get started with App Inventor + IoT, telling Codi Bot to make different kinds of sounds by buttons. We also provide a complete app for you.

Note that the frequency range for the onboard buzzer of **Robot Shield** is 30 ~ 6500 (Hz).

- **source .ino** / **source .aia**
- **complete .aia**

Function description

This project will show you how to control Codi Bot buzzer with App Inventor through BLE communication. This buzzer is the onboard buzzer of **Robot Shield**, which is connected to the #14 pin of LinkIt 7697 dev board. The components used in this tutorial are mostly buttons.



Hardware

Please follow this **building guide** to assemble your Codi Bot.

App Inventor

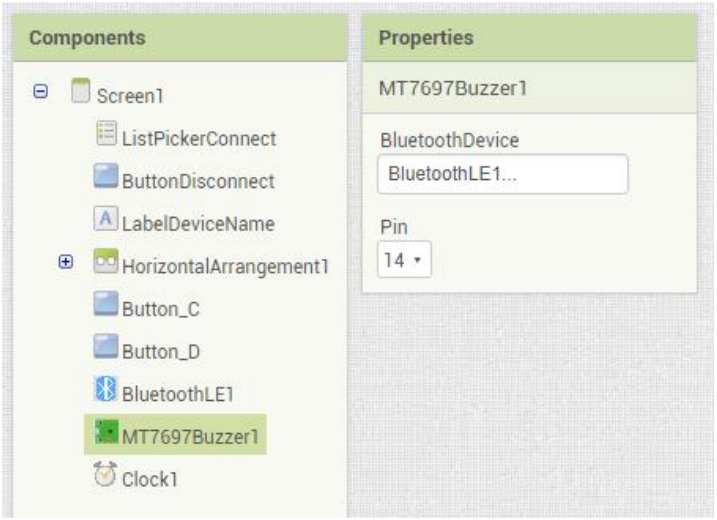
Now log in to your App Inventor account and create a new project or directly import **this aia file**.

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 use it to send commands to Codi Bot through Bluetooth communication.
3. Add a **MT7697Buzzer** component to your project, we use them to control the Robot Shield onboard buzzer, which is connected with #14 pin of LinkIt 7697.
    - Set its BluetoothDevice property to **BluetoothLE1** (Step 2.) and set Pin to **14**.

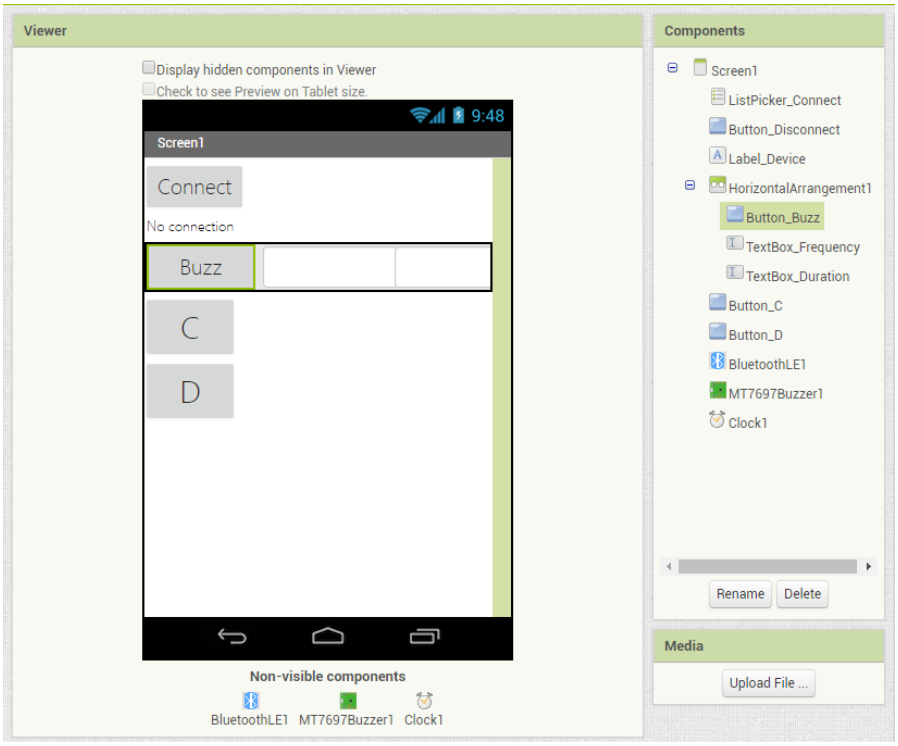


4. Add a LiskPicker to select available Bluetooth devices nearby, set Text to "**Connect**" and FontSize to **20**.
5. Add a button to close Bluetooth connection between your Android phone and LinkIt 7697. Rename it as "**Button_Disconnect**" and set Text to "**Disconnect**".
6. Add a Label to show messages of connection. Rename it as "**Label_Device**" and set Text to "**No connection**".
7. Add a button to make sounds. Rename it as "**Button_Buzz**", Text to "**Buzz**", Width to "**30 percent**" and FontSize to **20**.
8. Add two TextBox components to specify sound frequency and time duration. Rename them as "**TextBox_Frequency**" and "**TextBox_Duration**". And set their Hint to "**frequency**" and

"**time(ms)**" accordingly, clear their Text to "", Width to **35 percent**, FontSize to **20** and check the numbersOnly property.

9. Add a HorizontalArrangement component, set Width to "**Fill parent...** " and uncheck Visible property (It will show up after it is connected to the Codi Bot). And put components of Step 7~8 into it.
10. Add another two buttons to make note C and D by specifying the frequency. Rename them as "**Button_C**" and "**Button_D**". And set their Text to "**C**" and "**D**" accordingly. Finally set their FontSize to **30**.

After some adjusting, your designer should look similar as image below. It doesn't have to be exactly the same. Feel free to modify the component's background color, position and text size.



Blocks

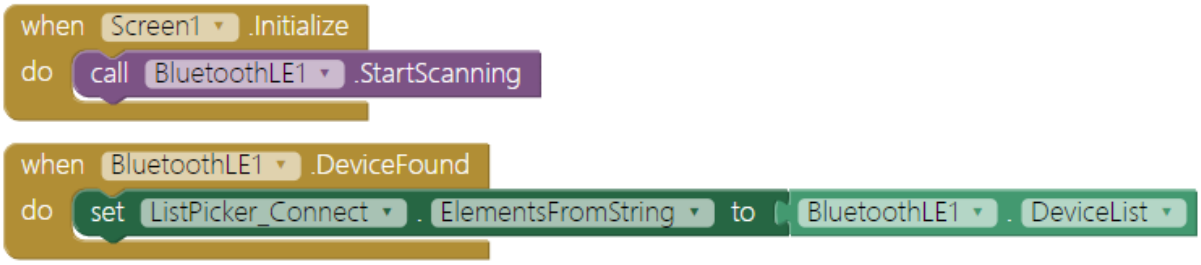
Let's take a look at our blocks step by step. Notice this time we have a different connect approach with previous projects. We use a

Listpicker to select one of available BluetoothLE devices nearby instead of a specified device.

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

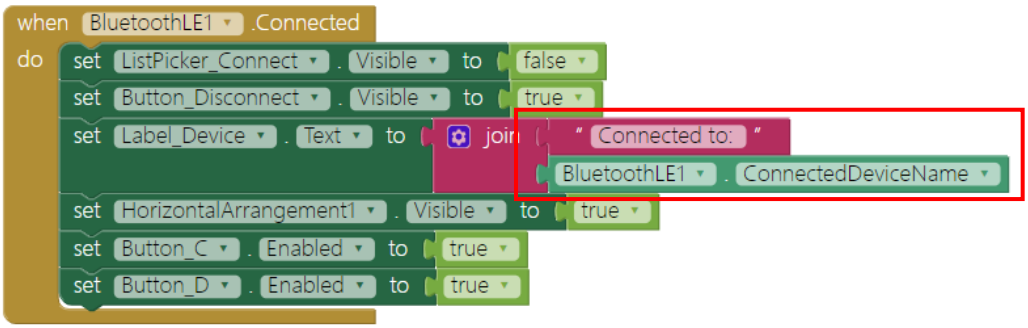
   In **Screen1.Initialize** event, we ask **BluetoothLE** component to scan for BLE devices nearby (**BluetoothLE1.StartScanning**).

   If any device is founded (**BluetoothLE1.DeviceFound** event), we put these devices into ListPicker.



2. **BLE Connected**

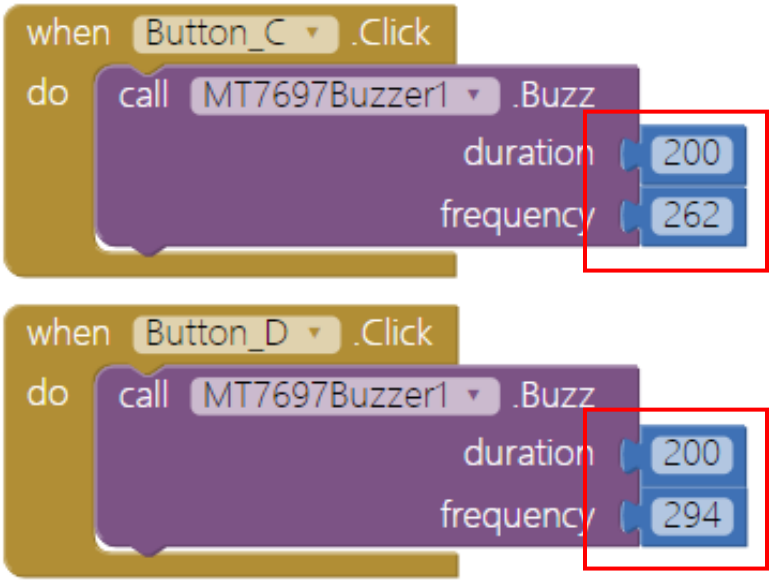
   When connected successfully (**BluetoothLE.Connected** event), we will see related messages on several components and hide the ListPicker and show other components. This is because if send Bluetooth commands without connecting to something first, it may cause error.



3. **Buttons to make sounds of different notes**

   When **Button_C** is pressed (**Button_C.Click** event), we put a **MT7697Buzzer.Buzz** method to make a sound of Note C by

specifying frequency as **262** and duration as **200** (milliseconds). For **Button_D** to make a sound of Note D, just modify the frequency to 294.
Different frequency makes different pitch; therefore, we can make as many kinds of notes by modifying the frequencies. For the rest of note frequency please refer to table below.

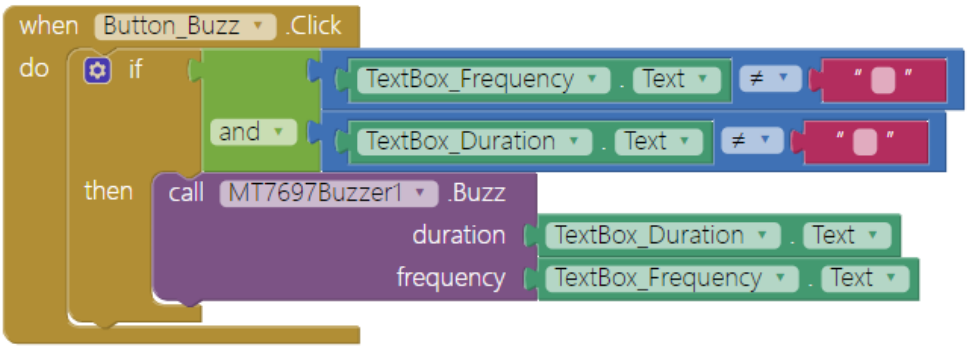


Note	Great	Small	One-lined	Two-lined	Three-lined	Four-lined
A	55.00	110.00	220.00	440.00	880.00	1760.00
A♯/B♭	58.27	116.54	233.08	466.16	932.33	1864.66
B/C♭	61.74	123.47	246.94	493.88	987.77	1975.53
B♯/C	65.41	130.81	261.63	523.25	1046.50	2093.00

C♯/D♭	69.30	138.59	277.18	554.37	1108.73	2217.46
D	73.42	146.83	293.66	587.33	1174.66	2349.32
D♯/E♭	77.78	155.56	311.13	622.25	1244.51	2489.02
E/F♭	82.41	164.81	329.63	659.26	1318.51	2637.02
E♯/F	87.31	174.61	349.23	698.46	1396.91	2793.83
F♯/G♭	92.50	185.00	369.99	739.99	1479.98	2959.96
G	98.00	196.00	392.00	783.99	1567.99	3135.96
G♯/A♭	103.83	207.65	415.30	830.61	1661.22	3322.44

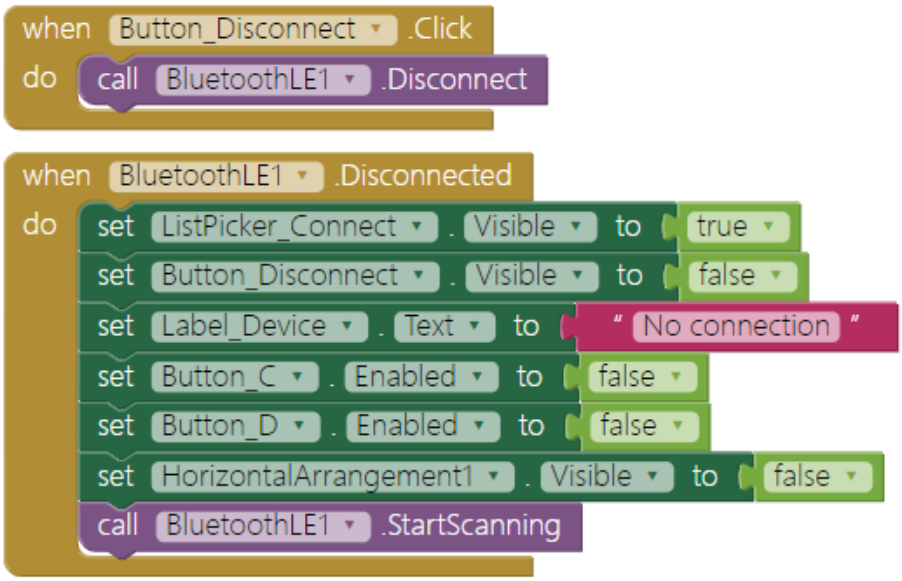
Source: https://en.wikipedia.org/wiki/Pitch_(music)

4. **Button to make customized sound**
   When **Button_Buzz** is pressed, we first check whether the two TextBoxes is empty, then make a sound of Note C by specifying **frequency** and **duration** as the numbers in these two Textboxes.



5. **Disconnect**

   We press **Button_Disconnect** to close the Bluetooth communication. After Bluetooth communication is closed successfully (**BluetoothLE1.disconnected** event), we reset the app to its initial state to wait for next connect request in.



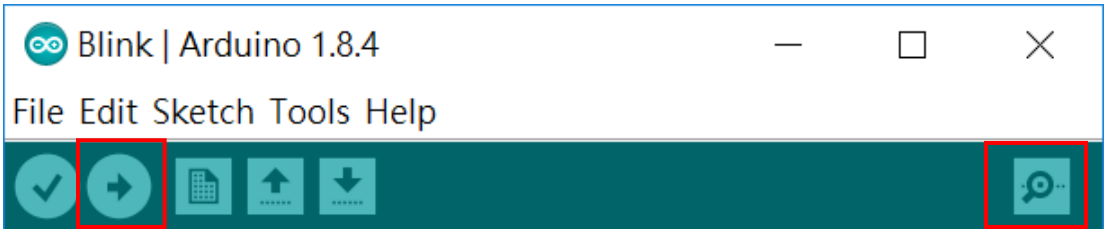
Arduino IDE and sketch

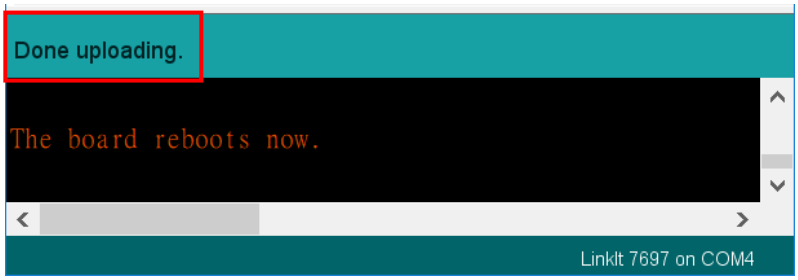
Make sure your computer has Arduino IDE installed and LinkIt 7697 SDK/driver are ready. If not, please check [Codi Bot Standalone tutorial].

Connect your computer and LinkIt 7697 with a microUSB cable.

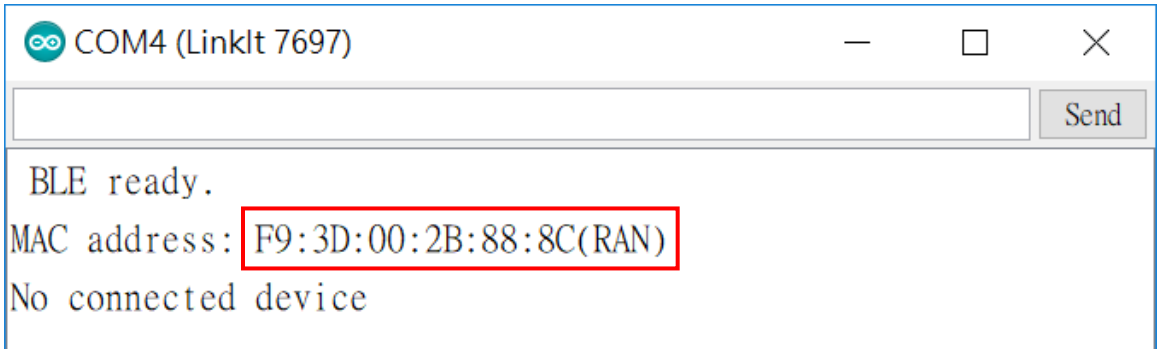
Please download the Arduino sketch from **here** and open in your Arduino IDE. This sketch can be used for all following Codi Bot projects, let you focus on building App Inventor projects.

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 see the "**done uploading**" message in the console.



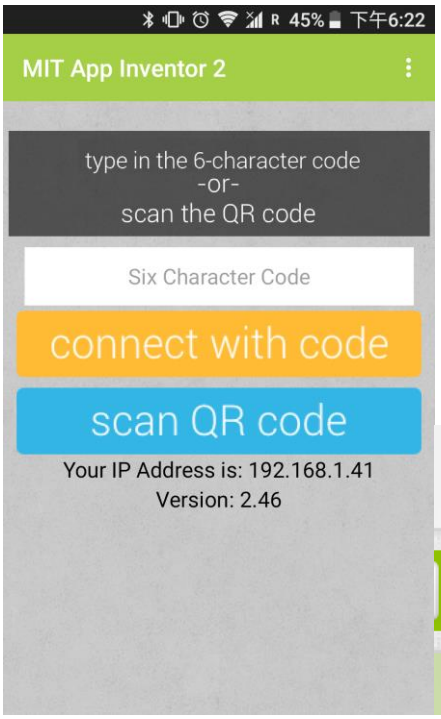


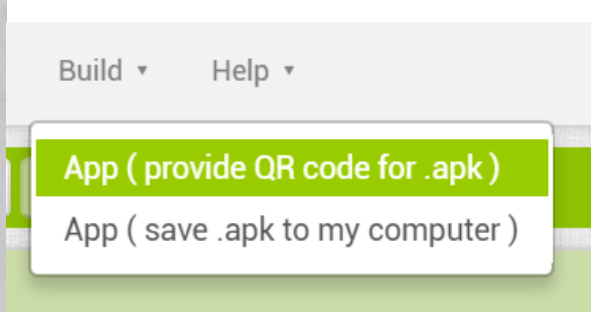
Click the magnifier icon at the up-right corner of Arduino IDE, you should see a message in the pop-up window. The [**XX:XX:XX:XX:XX:XX**] 12-digit string is the Bluetooth address of your LinkIt 7697. We will choose the device of this address in our app.



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 qrcode for .apk file. Use MIT AI2 Companion to scan this qrcode, download and install.





Open your 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 Codi Bot.

Click it and your phone will try to connect with the Codi Bot, if connect successfully, you will see your app should look like Fig 3. Press **Button_C** and **Button_D** to play Note C and D. Or you can input different numbers to specify frequency and time duration, press Btutton_Buzz to make sound.

Remember to click **Disconnect** button when you finish with this project. According to our test, the buzzer frequency range is 30 ~ 6000 Hz, while frequency higher than 2000 Hz is really annoying).

Fig 1. Initial screen	Fig 2. Select available Bluetooth device

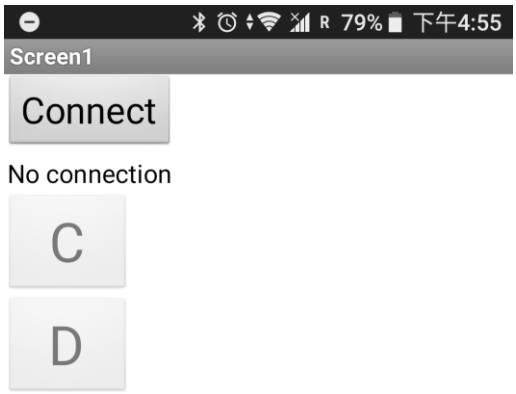
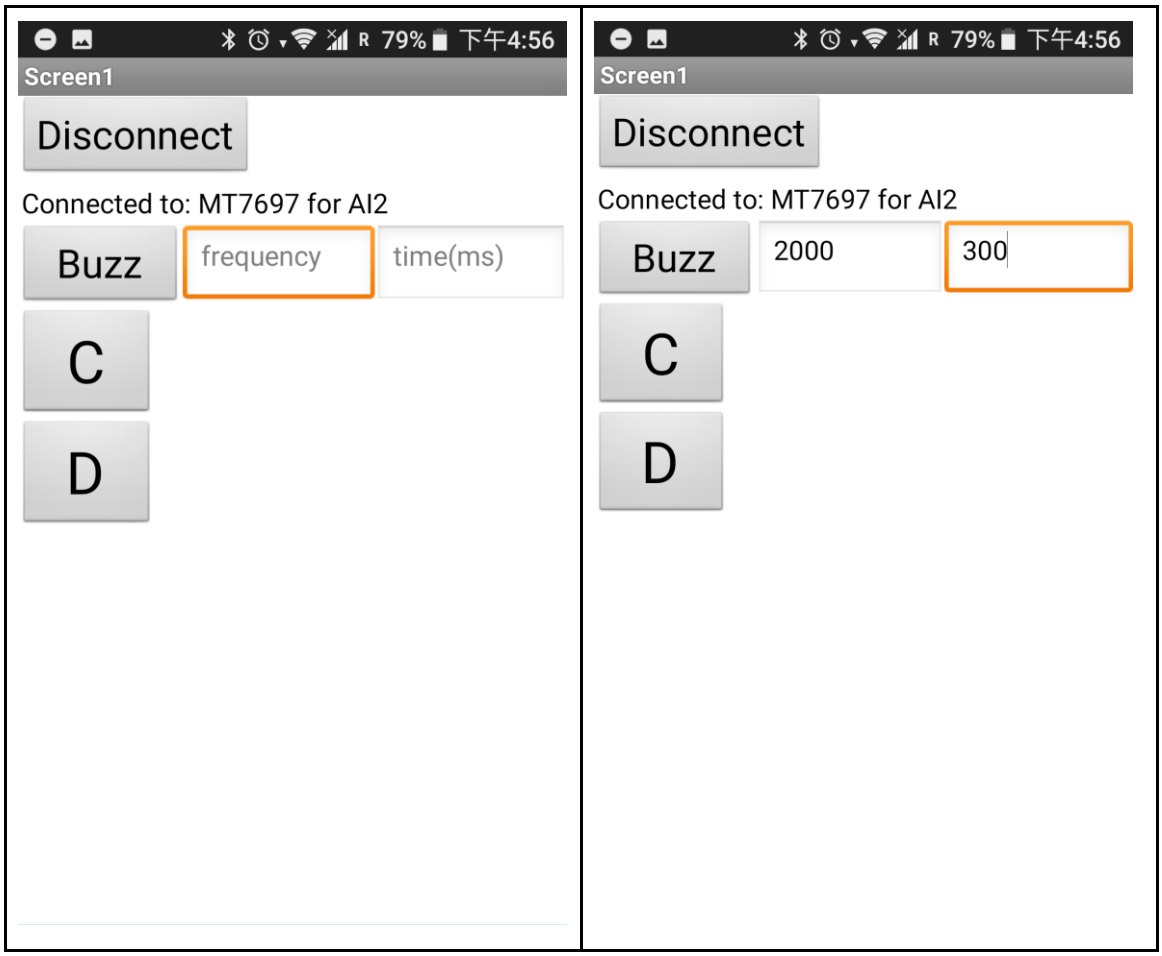


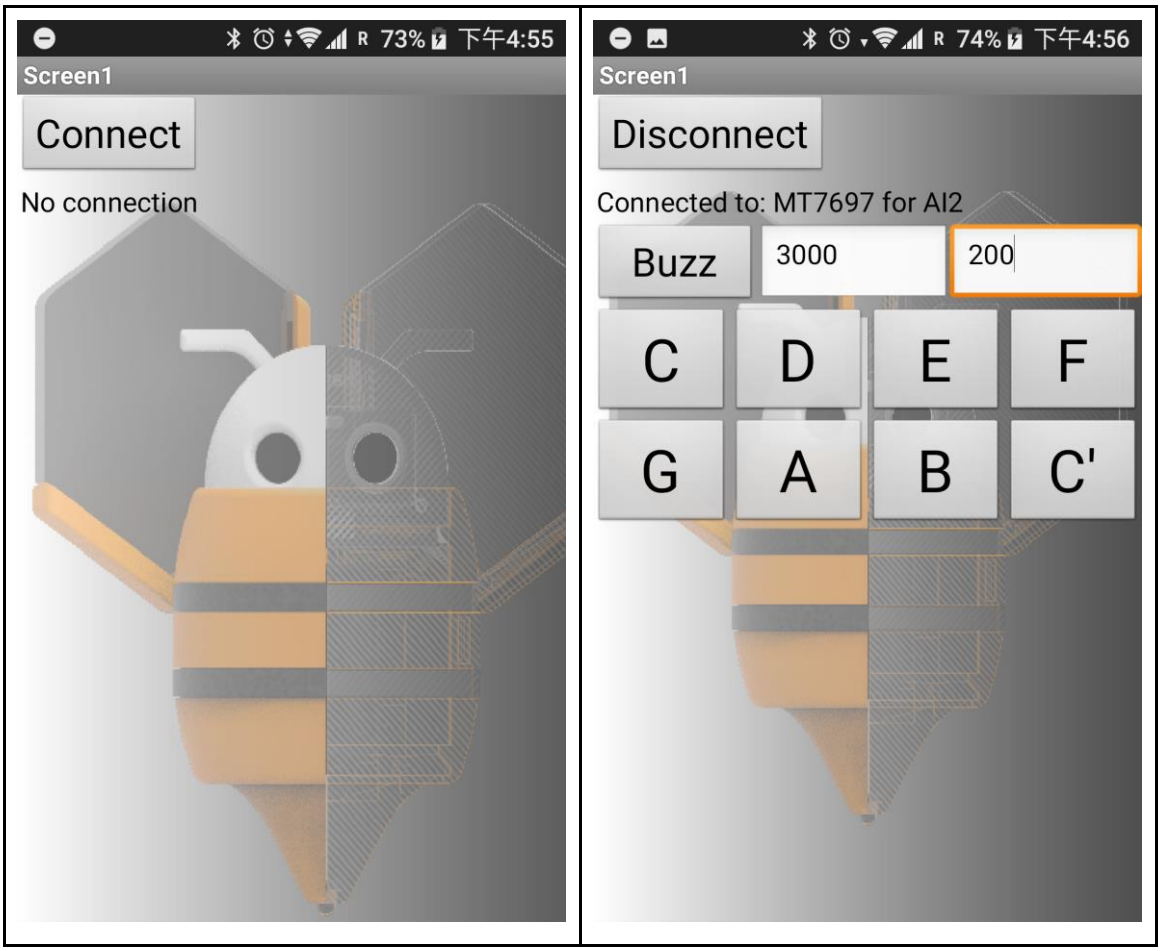
Fig 3. Connected to Codi Bot (MT7697 for AI2)

Fig 4. Set frequency and duration



Complete Buzzer app

We have provided a complete app to control all Codi Bot LEDs, please import this **complete .aia** to your App Inventor.



Brainstorming

1. Add more buttons to play more notes.