

Controlling your UKMARSBOT from your Android phone

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With a bit of help from Neil at Fortronics

All you need to do !!

- Install MIT AI2 Companion on your phone from the Play Store
- Write an app for your phone that can send and receive Bluetooth messages to UKMARSBOT
- Load the app you have written onto your phone and install it there using the MIT App Inventor 2 companion
- Write some code on UKMARSBOT that receives the Bluetooth messages and turns them into motor control actions
- Put the 3 Bluetooth components (2 resistors & a diode) on the UKMARSBOT main board and plug in the HC05 module
- Configure the Bluetooth connection
- Fire up the app and control your robot

So how do we do all that?

- Start by going to Google Play Store and searching for MIT App Inventor
- Select MIT AI2 Companion and install it on your phone. It will put an icon on your phone that looks like this:



MIT AI2
Companion

- Don't open it yet

Writing the App on your PC

Use MIT App Inventor 2 on the internet. Get to it at <https://appinventor.mit.edu/> and click on Create apps, then sign in with a google account

You will see a developers screen something like this



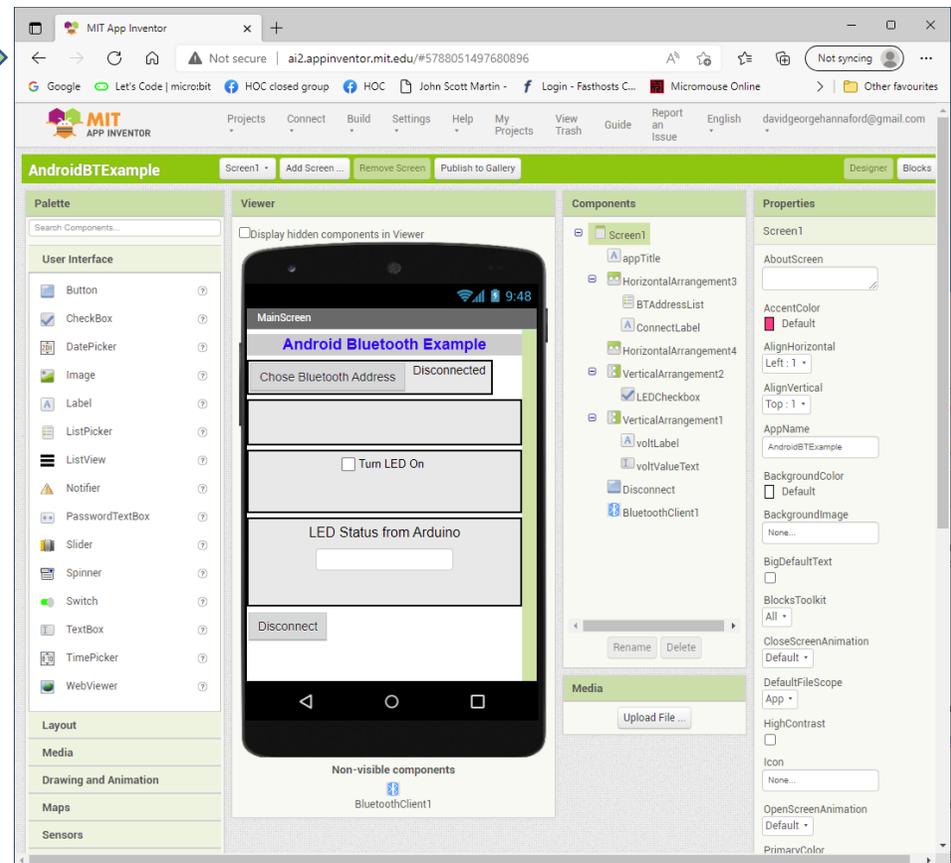
In Designer mode:

The Viewer section in the middle shows your phone screen layout as you put elements into it.

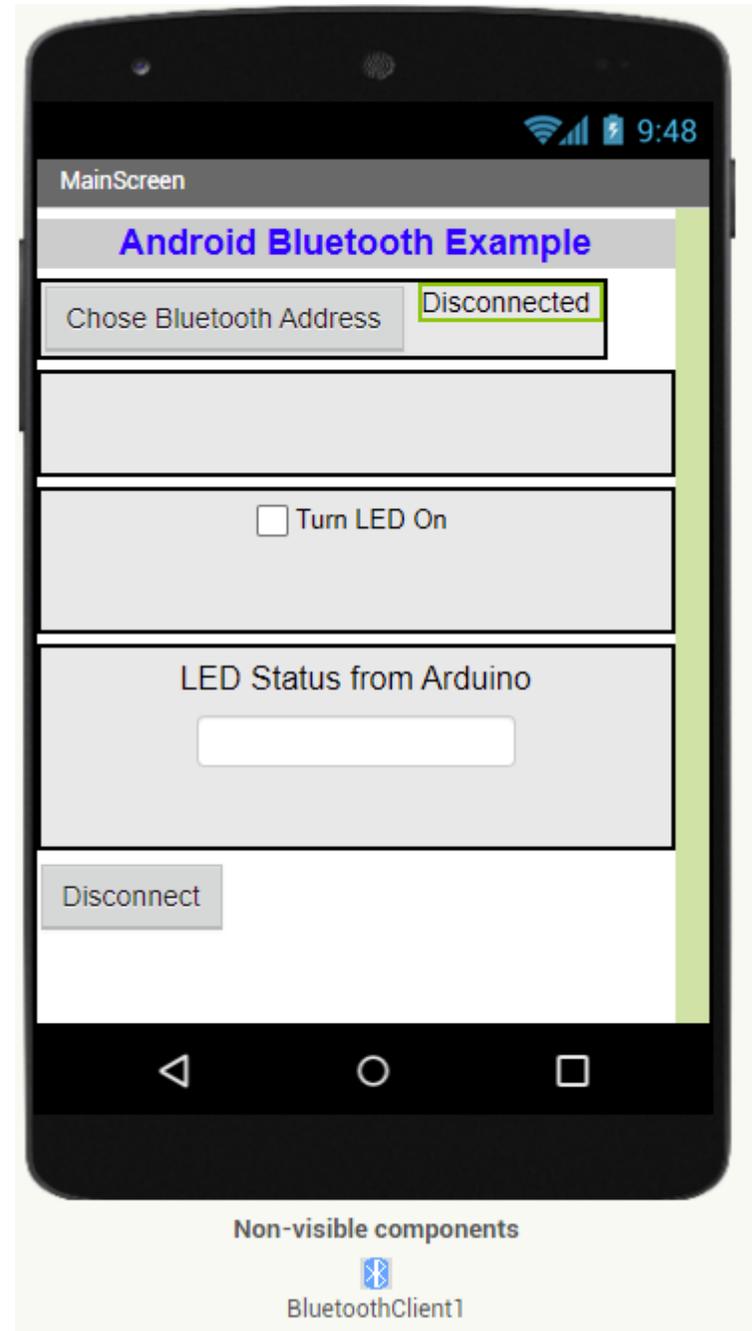
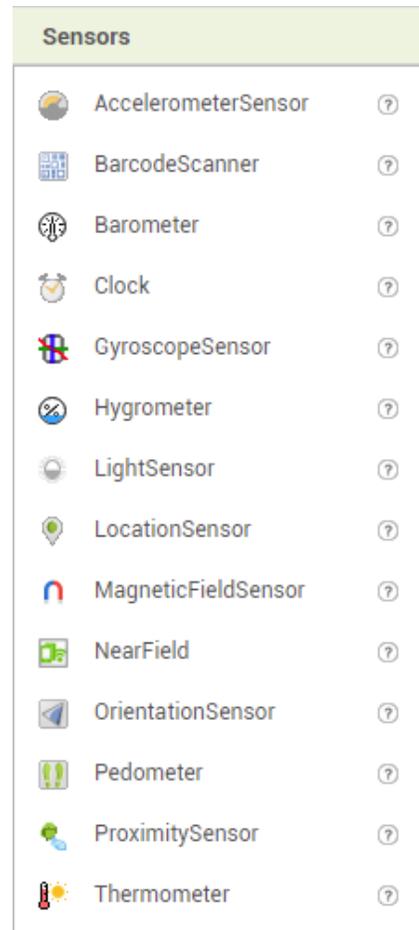
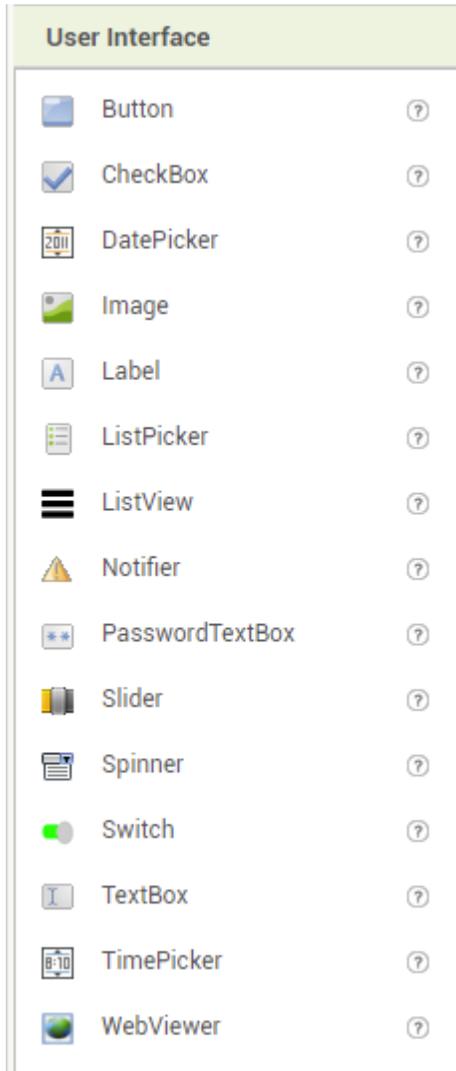
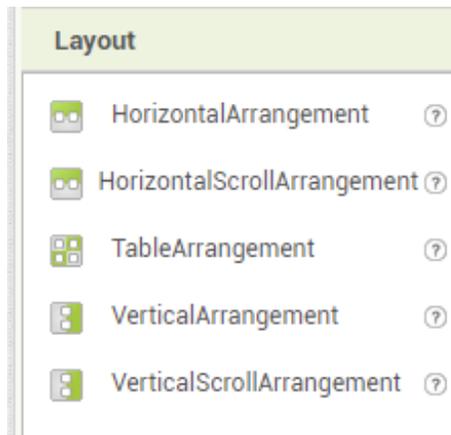
The Palette on the left shows components available

And the right side shows the Components in use and their Properties

You also need to go to your play store and find and install MIT AI2 Companion on your phone



Designer – Palette items



Designer screen

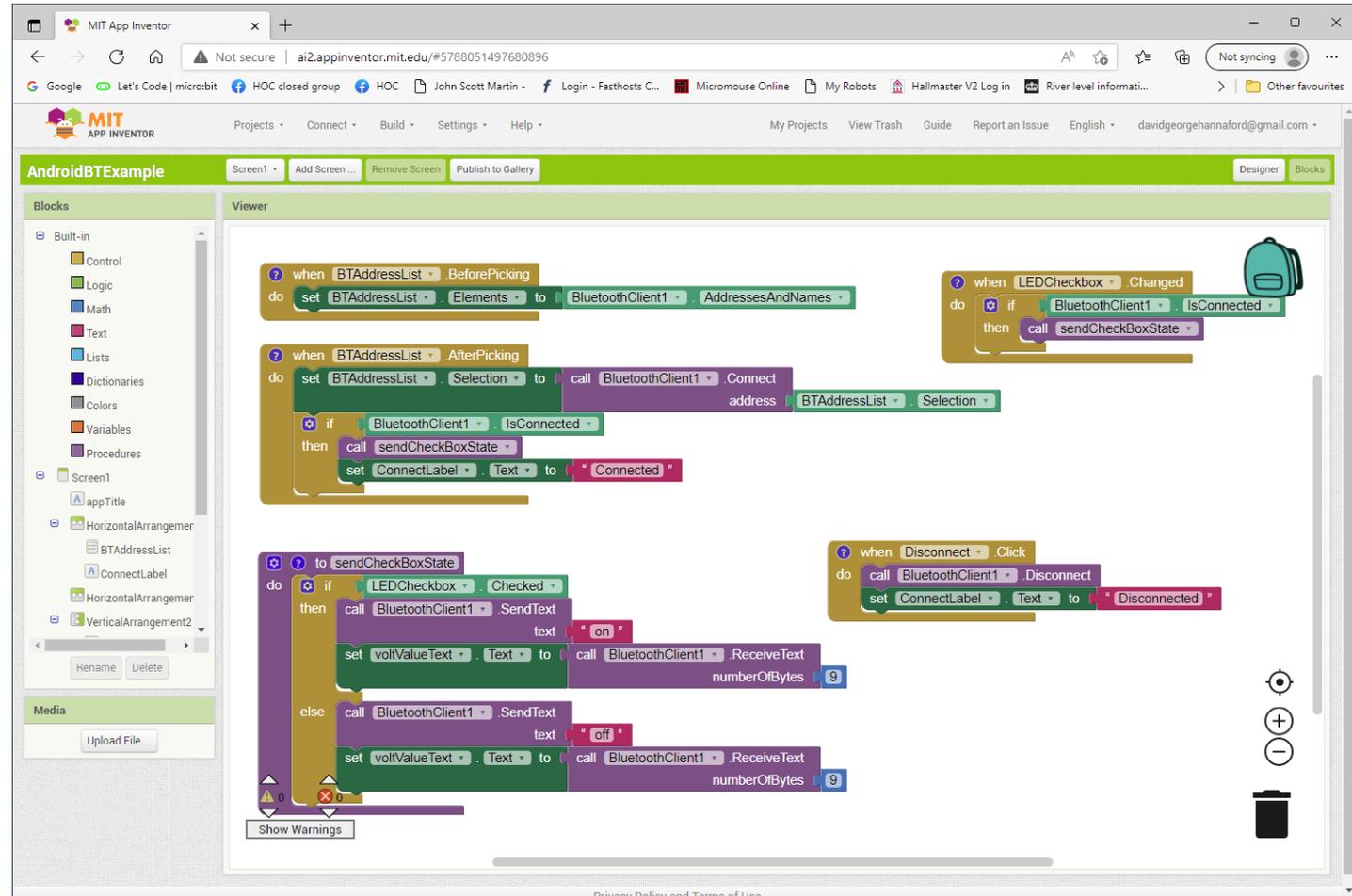
This sets up and shows the components that have been added to the screen design.

These components are referenced by the blocks code that follows



Writing the code behind the components

- In Blocks mode: you build the code behind the elements that you have put on the screen using the drag and drop style as used with most Blocks programs



Blocks - Bluetooth components

- Bluetooth address selection, connection & disconnection

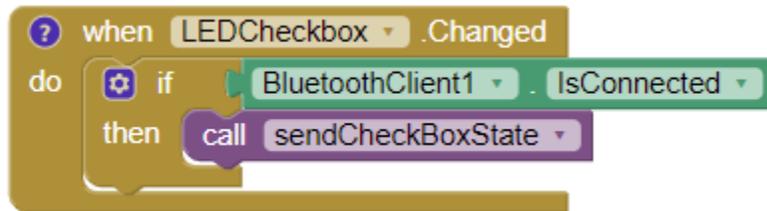
```
? when BTAddressList .BeforePicking
do
  set BTAddressList . Elements to BluetoothClient1 . AddressesAndNames

? when BTAddressList .AfterPicking
do
  set BTAddressList . Selection to call BluetoothClient1 .Connect
  address BTAddressList . Selection
  if BluetoothClient1 . IsConnected
  then
    call sendCheckBoxState
    set ConnectLabel . Text to " Connected "

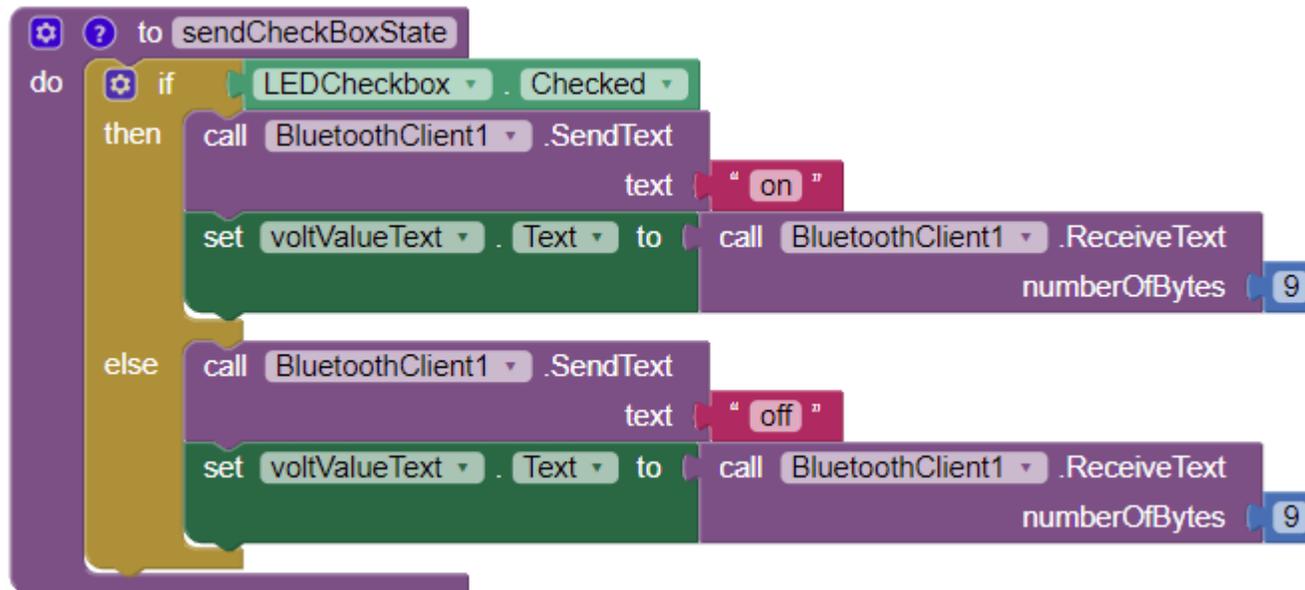
? when Disconnect .Click
do
  call BluetoothClient1 .Disconnect
  set ConnectLabel . Text to " Disconnected "
```

Blocks - Send commands components

- These blocks process the checkbox on the screen, send text “on” or “off” to the robot via Bluetooth and update the returned value on the screen



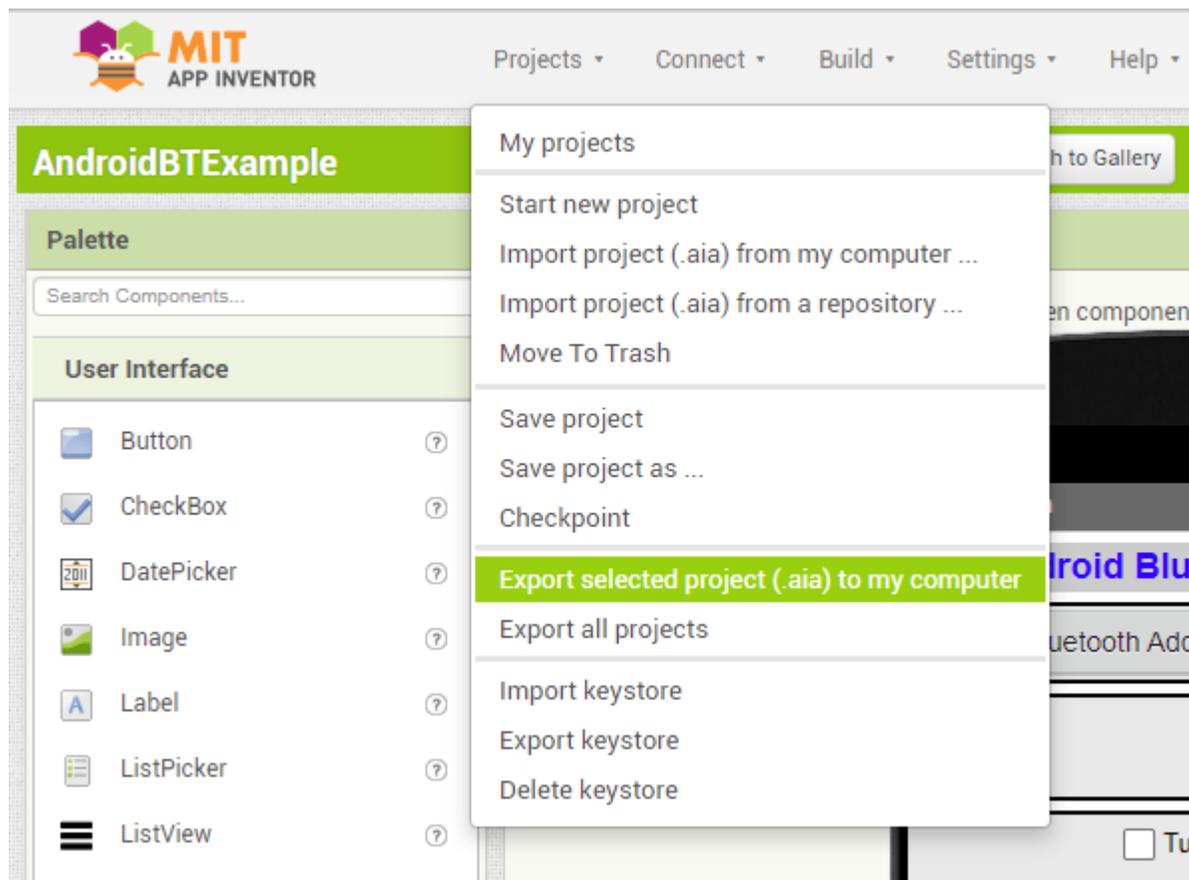
```
? when LEDCheckbox .Changed
do
  if BluetoothClient1 .IsConnected
  then
    call sendCheckBoxState
```



```
? to sendCheckBoxState
do
  if LEDCheckbox .Checked
  then
    call BluetoothClient1 .SendText
      text " on "
    set voltValueText .Text to
      call BluetoothClient1 .ReceiveText
        numberOfBytes 9
  else
    call BluetoothClient1 .SendText
      text " off "
    set voltValueText .Text to
      call BluetoothClient1 .ReceiveText
        numberOfBytes 9
```

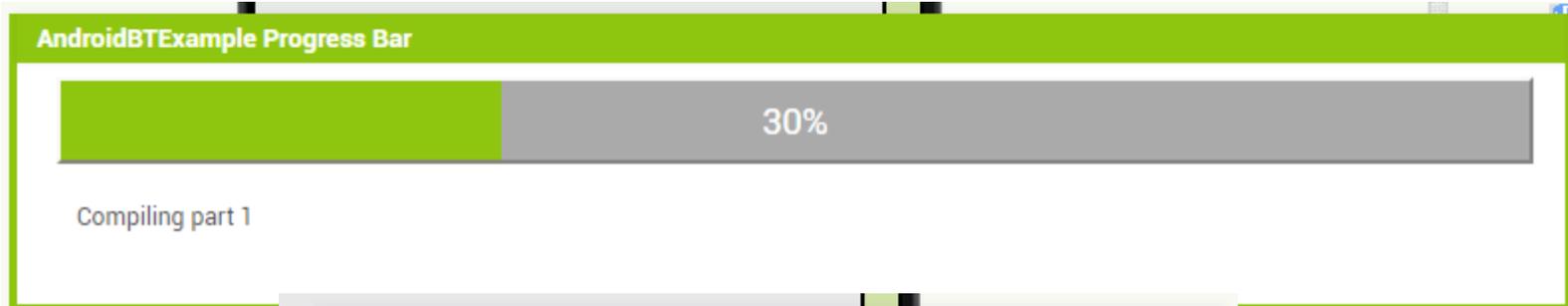
Saving your Android app

- Projects are normally stored against your log in in the cloud
- You can also save them to your PC by clicking on My Projects/ Export selected project(.aia) to my computer as shown below
- You can load up a .aia file from your computer using the import feature on the same menu

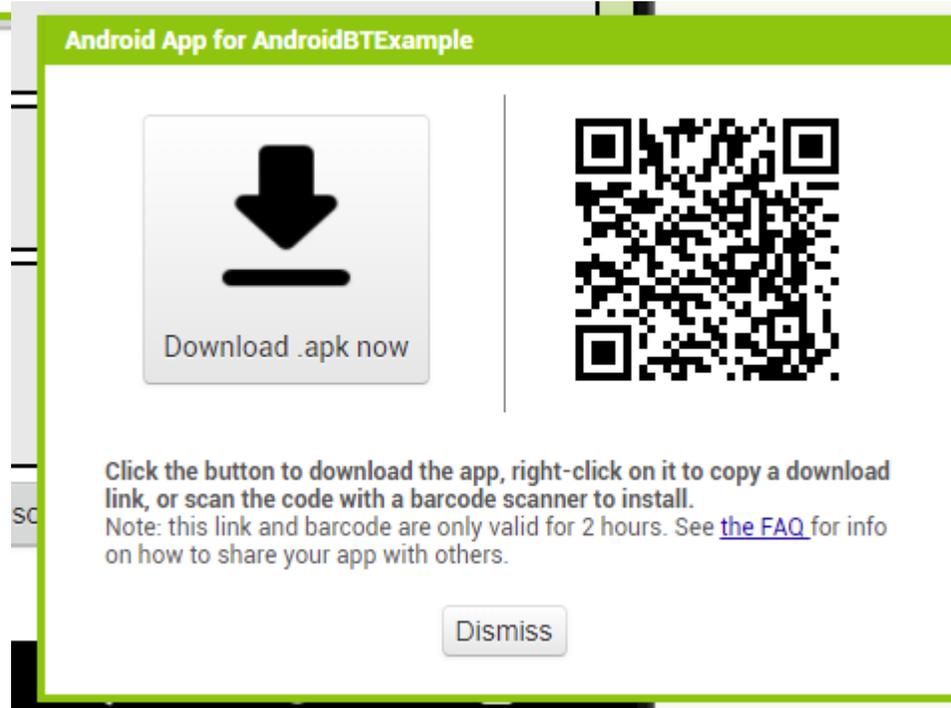


Building the app for your phone

- Click on the Build button and select Android app (apk) from the dropdown and wait for the build to complete

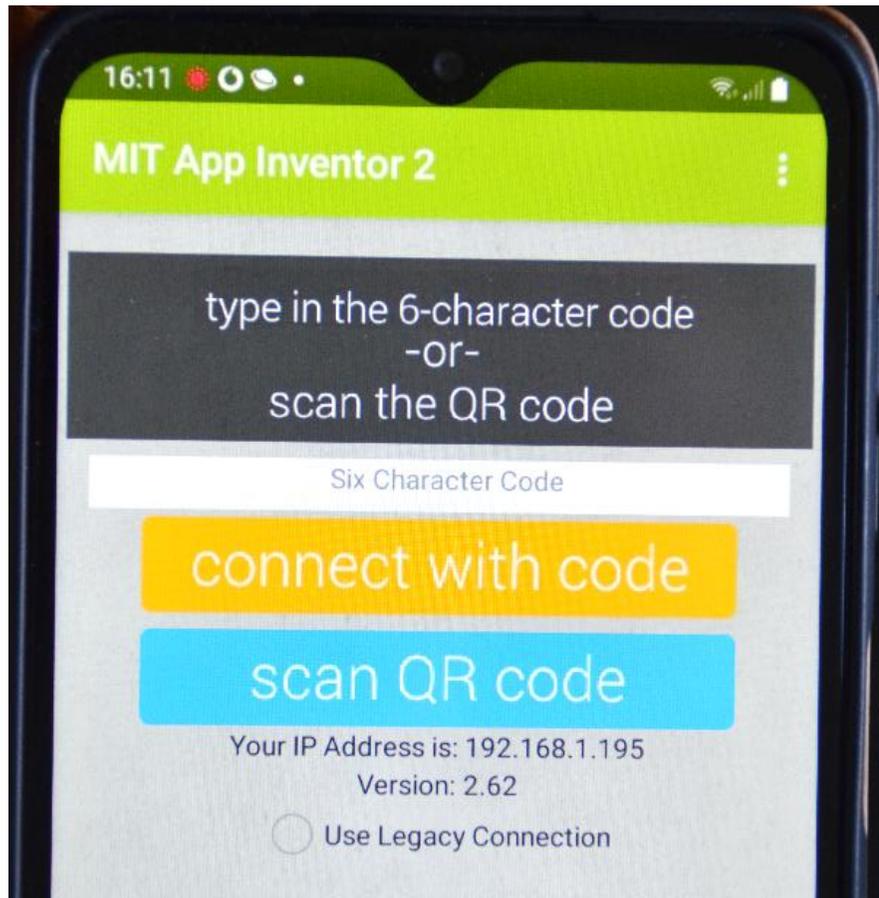


When complete, this screen will appear



Putting the app on your phone

On your phone open your MIT AI2 Companion app



Tap on “scan QR code” on your phone then point it at the QR code on the build screen on your PC (enabling the app to use your camera if needed).

When it recognises the QR code you should get one or two messages asking you if you want to download the file.

Confirm these and it will install the app on your phone and create a new icon for it looking like this



Now for the Arduino Nano code – page1

`Serial.begin(9600); // in Setup section of sketch`

```
void bluetooth(){  
  digitalWrite(LED13, LOW);  
  while (true)  
  {  
    delay (30);  
    Serial.write("app start");  
    String t; // empty string to store messages from Android  
    while (Serial.available()) {  
      t += (char)Serial.read();  
    }  
  }  
}
```

This example receives ON or OFF message from the phone and switches the LED on or off on pin 13

Now for the Arduino Nano code – page2

```
if (t.length()) {  
  if (t == "on") {  
    digitalWrite(LED13, HIGH);  
    Serial.write("LED is on");  
  }  
  else if (t == "off") {  
    digitalWrite(LED13, LOW);  
    Serial.write("LED - off");  
  }  
}  
}  
}
```

This example receives ON or OFF message from the phone and switches the LED on or off on pin 13

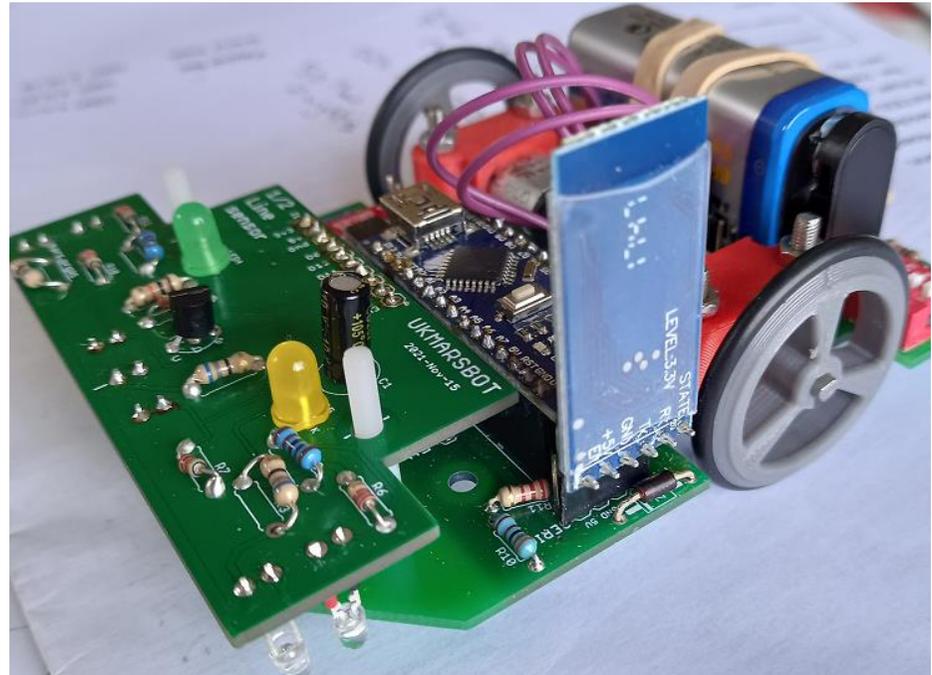
UKMARSBOT hardware needed

If you have a UKMARSBOT marked version 20210924 it just needs the 3 Bluetooth components and the 4 way connector added to the board, plus an HC05 Bluetooth module - £4 from thepihut.com

If you have an older board you will need to make up an adaptor board for the connection - see instructions for this at:

<https://ukmars.org/projects/ukmarsbot/developer-notes/serial-over-bluetooth/>

Plug the HC05 module into the connector with one of the 6 pins out on each side of the 4 way connector



Configure your Bluetooth connection

- Switch on UKMARSBOT – HC05 will flash quickly
- To pair your Android phone with the HC05
 - In Settings / Connections switch on Bluetooth then click on it to see available devices. HC05 should be shown. Click on it
- Enter pin number 1234 into Bluetooth pairing request screen
- Open the android app that you wrote
- On top of screen click on Choose Bluetooth Address – this should establish a connection to UKMARSBOT. The HC05 should now just give a double flash ever 5 seconds
- App screen should now appear for you to control your robot

Want to see more information?

- Adding buttons / more checkboxes etc – see User interface reference at <http://ai2.appinventor.mit.edu/reference/components/userinterface.html>
- Neil at Fortronics has put a presentation on youtube for controlling a remote car with his Android Nexus tablet. You can see this at https://www.youtube.com/watch?v=2_y_m9rVgtE&t=153s
- I have the Android .aia file for this but not the Arduino code

Have fun with using this information
to control your robot and good luck