

App Inventor + IoT: read knob status with Micro:bit I/O pins



(with Basic Connection
tutorial completed)

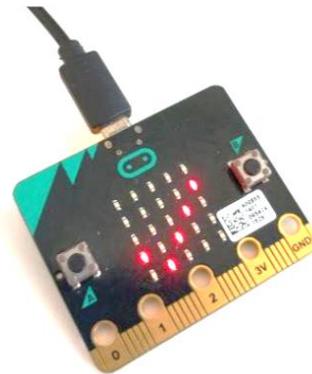
Level: advanced

This tutorial will help you work with App Inventor + IoT and read the status of a potentiometer connected to a [micro:bit](#) controller.

- [source .aia](#)

Pairing with Micro:bit

First, you will need to pair your phone or tablet to the micro:bit controller, using these [directions](#). Your device must be paired with the micro:bit in order for the app to work.

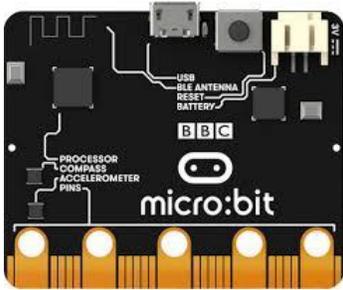


Hardware list

In this project, we are going to read the status of potentiometer (which is connected to Micro:bit) using App Inventor, when you rotate the potentiometer knob counterclockwise, the imageSprite will go leftward, and rotate clockwise to make the imageSprite go rightward.

Here are the components you need for this project:

- BBC micro:bit dev board, 1
- breadboard, 1
- wires, 3
- potentiometer, 1

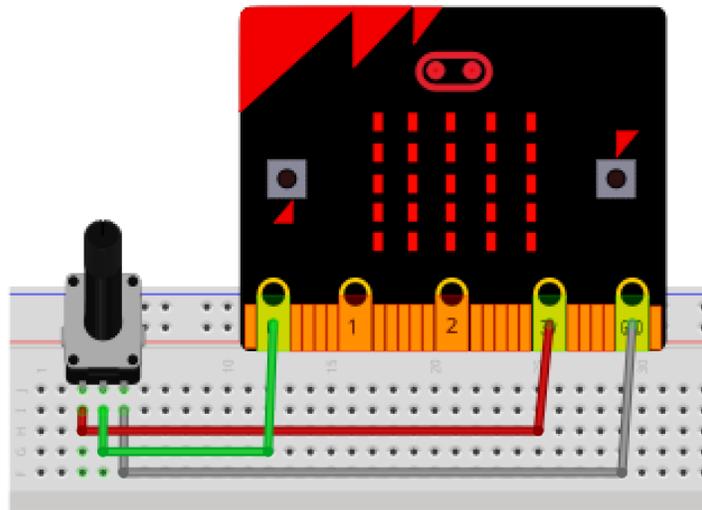


Demo video: <https://youtu.be/TQcRy1JkFBc>

Please connect Micro:bit and RGB LED according to this table:

Micro:bit	Potentiometer
GND	right pin (grey wire)
P0	middle pin (green wire)
3V	left pin (red wire)

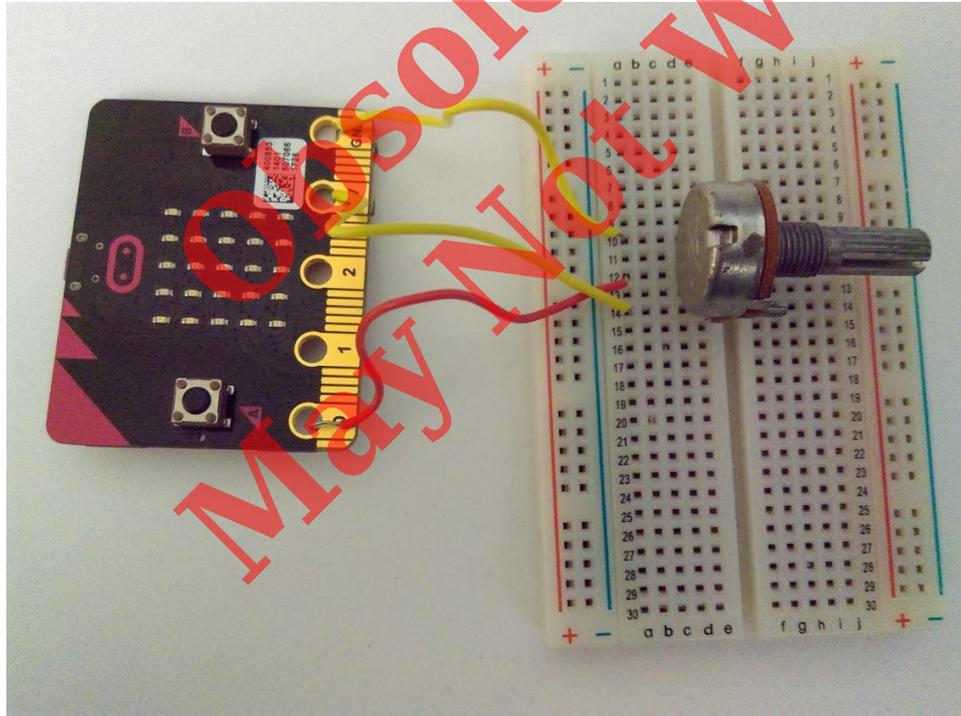
*Note: potentiometer is a non-polarized component, which means the difference to connect potentiometer **left** pin to MCU board's 5V pin (another pin to GND pin) is that when you rotate potentiometer knob clockwise, the pin value will change in opposite way than to connect its **right** pin to MCU board's 5V pin.*



Finish as below, let's take a look:

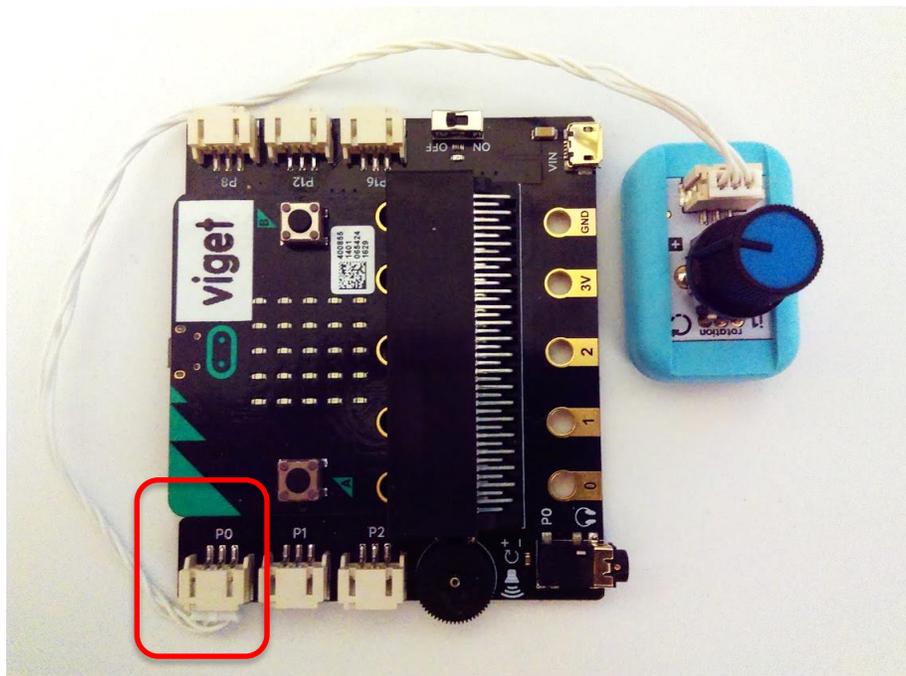
GND
3V

P0



Right pin
signal
left pin

Or you can use extension board, like [DFRobot's BOSON extension board](#) :



App Inventor

This app will move an imageSprite back and forth according to how you rotate the potentiometer on micro:bit. Technically speaking, App Inventor is asking micro:bit to report its analog pin status and this is where we connect the potentiometer to. First, log into [MIT App Inventor site](#) and create a new project.

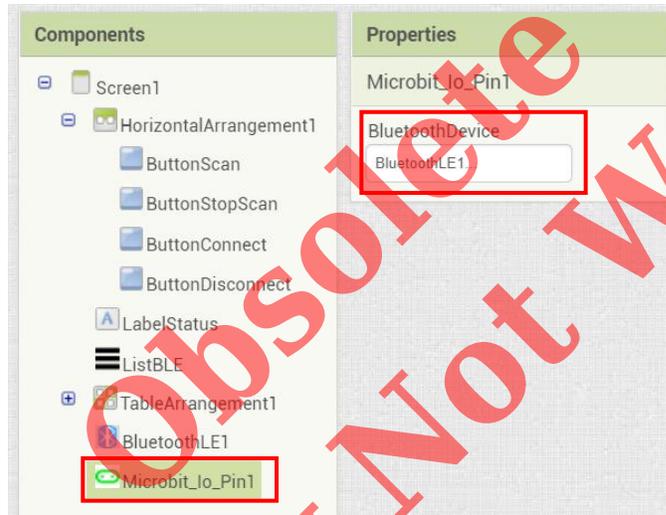
Designer

You should complete the [App Inventor + IoT Basic Connection tutorial](#) to make a basic connection to the micro:bit device. If you prefer, you can download the completed .aia file [here](#).

The remaining steps all build off of the the starter code for Basic Connection tutorial and its .aia source code.

First, we need to add the necessary extension.

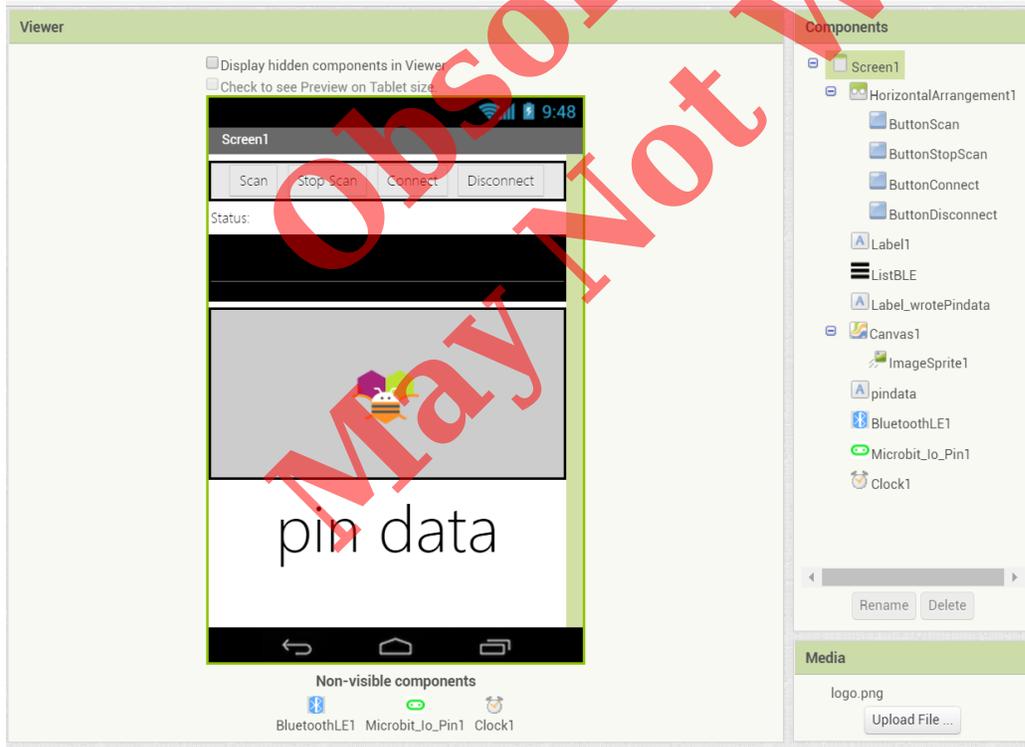
- In the Palette window, click on Extension at the bottom and then on "Import extension" and click on "URL".
 - Paste micro:bit extension URL:
<http://iot.appinventor.mit.edu/assets/com.bbc.micro:bit.profile.aix>
- Add a **Microbit_IOpin** extension to your app by dragging it onto the Viewer, set its *BluetoothDevice* to "**BluetoothLE1**"(Don't forget!).



Let's add more components to our app to read the magnetometer status.

- From the Drawing and animation palette, add a **Canvas** component. Set its width to "**Fill parent**", height to **150** pixels.
- From the Drawing and animation palette, add an **ImageSprite** component, set its Picture to some cute image (no bigger than the canvas).
- Add a **label**, set its FontSize to **60** and Text to "**pin data**". We will update the micro:bit potentiometer status here.
- From Sensor palette, add a Clock component, set its TimeInterval to **100**, which means its timer will trigger 10 times per second.

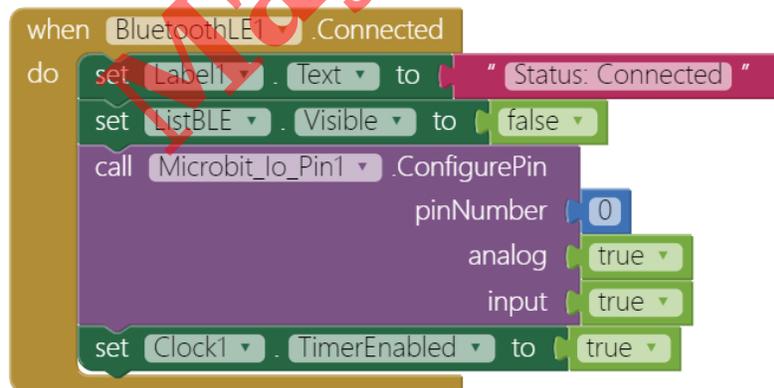
After some adjusting, your designer should look similar to this. It doesn't have to be exactly the same. Feel free to modify the component properties, such as background color, position and text size.



Blocks

STEP 1: Request updates when connected

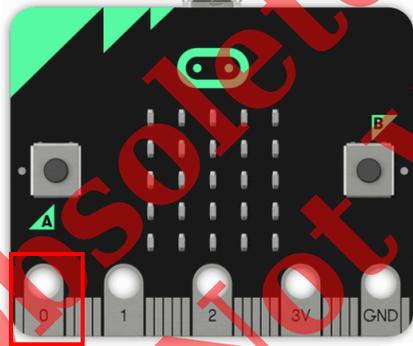
In the **BluetoothLE1.Connected** event, we show messages to tell user that we are connected with micro:bit and set micro:bit's pin status as "analog input". Since we are going to read the button status in this project. Check the **Microbit_lo_Pin.ConfigurePin** method, please specify the **pinNumber** to 0 (means **P0** pin of micro:bit and set the **analog** field to **true** and the input field to **true**. And don't forget to set **Clock.TimerEnabled** to true, which means we are using the Clock component to read micro:bit pin status periodically.



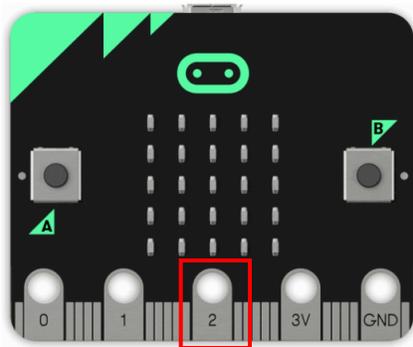
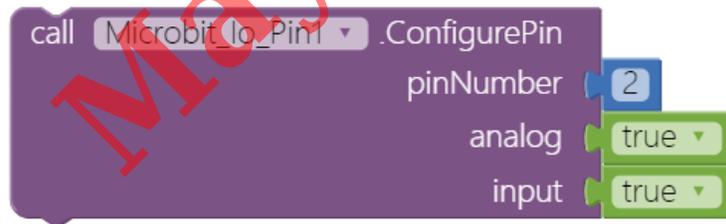
Let's let a look of **Microbit_lo_Pin.ConfigurePin** method, it has three parameters: **pinNumber** (pin index), **analog** (true to analog, false to digital) and **input** (true to input, false to output).

This is to set micro:bit's **P0** pin as **digital output**. You can connect component like LED to this pin. For micro:bit I/O pins detail please check this link: <http://microbit.org/guide/hardware/pins/>





And this is to set micro:bit's P2 pin as **analog input**. You can connect component like potentiometer to this pin.



STEP2: read sensor status periodically

In **Clock.Timer** event, we call **Microbit Io_Pin.ReadInputPinData** method to read a specified micro:bit pin data, which is **P0** in our case. Since we've set Clock's **TimerInterval** property to 100, this means we are reading micro:bit pin data every 100 milliseconds (10 times per second).

Note: you must configure the pin as **analog input** (in STEP1) to

read its data correctly.

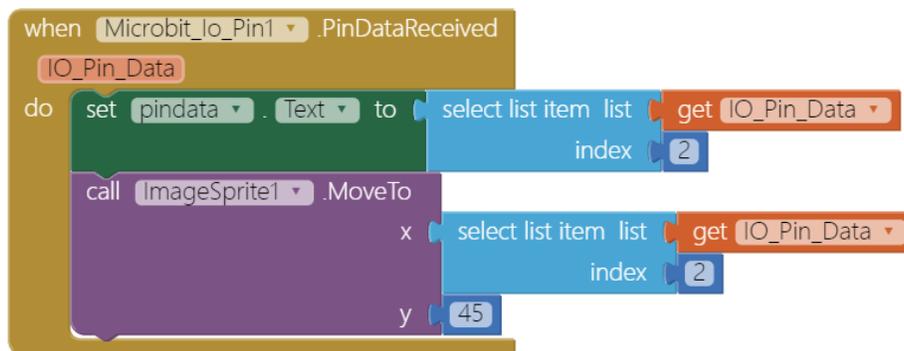


STEP3: read sensor status periodically

Microbit_Io_Pin.PinDataReceived event will be called after the pin data is read successfully, and it will return a list (**pin index, pin data**) as a result. You can use a **select list item** method to get pin data and show it on the label.

To make our app more interactive, we will move the ImageSprite back and forth horizontally according to the pin data (**ImageSprite.MoveTo** method).

Note: the data range of micro:bit analog input pin is from 0 to 255.



STEP4: Disconnect from micro:bit

You can disconnect from micro:bit by clicking the **ButtonDisconnect** button. This will reset the app to its initial state to wait for next connect request.

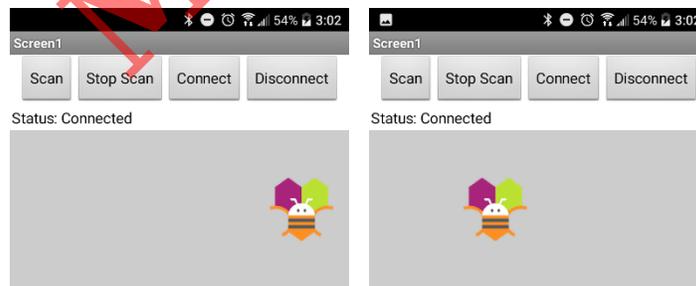
```
when ButtonDisconnect .Click
do call BluetoothLE1 .Disconnect

when BluetoothLE1 .Disconnected
do set Clock1 .TimerEnabled to false
set Label1 .Text to "Status: Disconnected"
```

Tips

Your app should now be working! Make sure you have paired the Bluetooth on your Android device to your micro:bit. Then test it out by connecting your micro:bit device using the MIT AI2 Companion (if you haven't already) or installing it by .apk.

Rotate the knob, you will see pin data on the label is changing and the App Inventor bee logo should be moving!



245

89

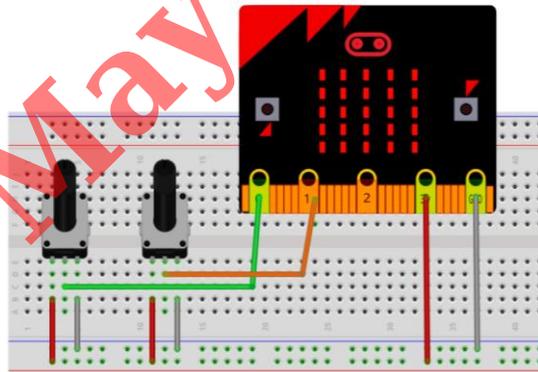
Brainstorming

1. Try to adjust the size of the ImageSprite by rotating the potentiometer. (*Hint: ImageSprite.Z property*)
2. Add one more potentiometer to control the ImageSprite to move along the Y-axis. Or you can use a joystick module to replace two potentiometers.



([joystick module on Arduino.cc](http://joystick.module.on.Arduino.cc))

Hint: you can connect two potentiometers to micro:bit, one potentiometer signal pin to micro:bit P0 and the other's to micro:bit P1, finish like this:



Connect joystick's vertical pin to micro:bit P0, horizontal pin to micro:bit P1, finish like this:

